

Study of the Impact of Quality Management  
System on Chinese Baby Dairy Product  
Industry

by

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## Declaration



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## **Abstract**

Since 2007, there have been many incidents related to food contamination in the Chinese baby dairy product industry, especially milk powder contamination. The melamine contamination caused kidney stones and affected around 294,000 babies in China. Due to growing concerns among consumers about food safety and protection, and pressure from central government, companies are taking action to ensure food quality through the use of quality management systems (QMS). On the other hand, researchers have investigated the health and safety aspects of food industries and products, but quality issues concerning food products in China have been largely overlooked. The quality issues associated with baby dairy products have not been discussed in depth.

The aim of this research is to propose an integrated framework (pre-production stage) based on critical examination of the impact of implementing QMS in the Chinese baby dairy product industry, with particular emphasis on its drivers, barriers, external issues and challenges, supply chain management, quality standards, legislation and regulations. A mixed method approach is adopted, involving both qualitative and quantitative research methods. In MPhil stage, the research approach used pilot interviews that were designed to investigate the management, concepts and controls of quality of four companies, selected on the basis of purposive sampling where those companies were selected which matched the pre-defined criteria. The preliminary analysis was conducted to establish the reliability and validity of the interview questions in order to further research in the PhD stage. In the PhD stage, the managers of selected companies and government officials were invited to carry out the interview and focus group discussion. The managers of selected companies have also participated in the questionnaire of this research which was administered for validating the presented framework.

Preliminary analysis of the interview questions revealed that legislation i.e. Food Safety Law, Quality and Safety (Quality Management Certifications) and ISO 9001 for the

dairy product companies have been adopted during recent years. The findings revealed that the selected organisations are moving towards implementing quality management concepts and standards, but there is still need for improvements which have been identified by the interviewees to include better implementation of QMS, training of employees, controlling quality and executing of quality standards and regulations.

Further study in PhD stage has helped revisit the implementation of QMS in the selected companies. The quality standards, regulations and laws of QMS are critically evaluated. In this research, there is a comprehensive analysis and evaluation of current legislations that are applied by the Chinese baby dairy product sector. Furthermore, the research has presented an integrated framework about the factors which are important to be considered for improving the quality management in baby dairy product industry in China. The focus of this framework was on pre-production stage as findings of this research proved that problems occurring at the pre-production stage need the utmost attention.

The contribution of this research is significant for both academicians and practitioners. The present study contributes to the literature as it has focused significantly on contextual factors, especially the legal context, which indicates that the researcher has attempted to narrow the literature gap highlighted by previous researchers. Furthermore, on the contextual point, the previous studies also looked at quality management practices in China, but they considered the service sector and SMEs, respectively, for the empirical investigation. This research has precisely focused on baby dairy product industry of China which is not previously examined. Moreover, this research will be worthwhile for industry practitioners as it has investigated QMS in the Chinese baby dairy product industry, and found that it is most crucial to resolve and prevent quality issues at the pre-production stage. After finding the main problem areas, this research has presented a framework for managers in the Chinese baby dairy product company. This framework provides guidance on managing the industry with the help of the implementation of QMS. In the end, recommendations for future research were provided.

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## List of Acronyms/Abbreviation

ABPs	Animal By-Products
AMS	Automatic Milking Systems
AQSIQ	Administration for Quality Supervision, Inspection and Quarantine (China)
BFQ	British Quality Foundation
BRC	British Retail Consortium
BSE	Bovine Spongiform Encephalopathy
CAC	Codex Alimentarius Commission
CAGR	Compound Annual Growth Rate
CAP	Common Agricultural Policy
CCTV	China Central Television
CDIA	China Dairy Industry Association
CFDA	China Food and Drug Administration
DEFRA	Department for Environment, Food and Rural Affairs (UK)
DPM	Defects Per Million
EFQM	European Foundation for Quality Management
EMS	Environmental Management System
FDA	Food and Drug Administration
FEHD	Food and Environmental Hygiene Department (China)
FSMS	Food Safety Management System
FSSAI	Food Safety and Standards Authority of India
FSSC	Food Safety System Certification
GAP	Good Agricultural Practices
GDFDA	Guangdong Food and Drug Administration (China)
GFSI	Global Food Safety Initiative
GHP	Good Hygiene Practice
GMP	Good Manufacturing Practice
HACCP	Hazard Analysis and Critical Control Point
HRM	Human Resource Management
ISO	International Organisation for Standardisation
KPIs	Key Performance Indicators
MES	Manufacturing Execution System
MIIT	Ministry of Industry and Information Technology (China)
MOA	Ministry of Agriculture (China)

MOH	Ministry of Health
MWR	Ministry of Water Resources (China)
NFU	National Farmers Union
OMP	Osteoblast Milk Protein
PCBs	Polychlorinated Biphenyls
PDCA	Plan, Do, Check and Act
QACP	Quality Assurance Control Point
QMS	Quality Management System
RASFF	Rapid Alert System for Food and Feed
RFID	Radio Frequency Identification Devices
SAIC	State Administration for Industry and Commerce (China)
SFDA	State Food and Drug Administration (China)
SMEs	Small- and Medium-Sized Enterprises
SPC	Statistical Process Control
SQF	Safe Quality Food programme
TQM	Total Quality Management
UNICEF	United Nations International Children's Emergency Fund
WHO	World Health Organisation
WMO	World Meteorological Organisation
WTO	World Trade Organisation

## **Chapter 1: Introduction**

### **1.1. Background**

The baby dairy product industry is growing rapidly all over the world (Johanson and Kao, 2015) and China is no exception. During the last three decades, the Chinese government has been involved in expanding this industry but, at the same time, it has been neglecting the quality of the industry's products (Chen et al., 2013; Lu et al., 2014). Due to this situation, there have been reported incidents between 2008 and 2010 in which different companies in this sector have been found guilty of selling contaminated products (Burns et al., 2015). For example, in 2008, melamine was detected in the formula milk powder produced by the Sanlu Group. Following this, other well-known companies were also found to have used melamine to increase the apparent protein content of products. Melamine contamination can cause kidney stones and it affected around 294,000 infants in China. There were 6 deaths reported when infants drank contaminated milk (Jacobs, 2008). In 2009, baby dairy products from the China Mengniu Dairy Company were found to be contaminated with Flavacin M1, which is a food mould that can cause severe liver damage, including liver cancer and, in fact, the World Health Organisation (WHO) has listed Flavacin M1 as a carcinogen (Petry and Liting, 2009; WHO, 2008). Following these incidents, the government and other stakeholders identified a serious issue of ineffective quality management in the Chinese baby dairy product industry and found that quality standards were not being implemented and adhered to.

In the period from 2000 to 2008, the production of Chinese infant formula milk increased by 23 per cent annually (Chu, 2008). In 2006, production reached 30 million tonnes, which was 10 times the amount reported in 1996 (ibid). In 2007, the value of the industry reached CNY 112 billion (equivalent to GBP 12.4 billion), but this value decreased by 14 per cent after the melamine scandal (Spears, 2008). As a result, corruption between Chinese government officials and the baby dairy product companies was exposed, as both of these parties were only looking for profit generation

by expansion (Kim, 2013). In addition, the demand for domestic baby dairy products was reduced after that incident and 2 million Chinese farmers suffered financial losses (Chen, 2008). According to the China Dairy Industry Association (CDIA), the financial loss was around CNY 20 billion (equivalent to GBP 2.23 billion) and the negative impact was sustained from 2008 to 2010 (Tuv, 2008). After this period, Chinese companies in all industrial sectors have undergone dramatic changes with regard to quality management and they are still reforming their quality management systems (QMS). Companies realised that there had been many indirect impacts of this incident on consumers, dairy farmers and on the business performance of all baby dairy product companies. Consumers no longer trusted local products and this resulted in a decrease in profitability and lower stock prices. Lack of proper quality control and supervision systems (including at milk collection stations), flaws in the production process, illegal activities and outdated management practices, raised serious doubts as to the ability of government to regulate the baby dairy product industry properly. All of the above indicate that this incident has had a nationwide, even global impact (Silanikove and Koluman, 2015).

Due to the growing awareness among consumers about food safety, it is very important for companies to consider the importance of protecting food quality through implementing QMS in a better manner. Indeed, many companies already had QMS, but they were not using them effectively (Wu, 2015). The existing literature on QMS tells that there are many challenges and barriers which impede companies to effectively implement the QMS. These problems need to be explored further and this research is to examine challenges and barriers are encountered by Chinese baby dairy companies. As awareness of external issues, such as legislation, corruption and economic pressure, increases, it is expected to influence the QMS implementation in companies. This research is also to examine those external issues. QMS involves various supply chain actors and without supply chain management process, QMS cannot be implemented. This research will focus on the roles of key actors in the supply chain of baby dairy product industry. The barriers and drivers of QMS can also influence the

implementation, so this research will examine these in further detail. The implementation of QMS is to be investigated for identifying the measures, which can strengthen QMS. QMS brings numerous challenges for management and staff. This research will examine those challenges in the Chinese baby dairy companies. In QMS, the standards and legislation play an important role. This research is also to critically analyse and evaluate them. The implementation of QMS is a critical and complex task and there is involvement of many stakeholders. This present research will present a framework for improving the implementation of QMS.

It is necessary to explore the pressures on QMS in order to analyse their implementation. It is also important to understand the theory behind QMS: i.e. considering food safety so that companies can produce quality products for consumers and both groups can obtain mutual benefits (Pepper and Spedding, 2010). QMS can be formally defined as a set of integrated activities and procedures that regulate the way the elements of an organisation contribute towards the collective achievement of quality control, implementation of policies and achieving milestones defining attainment of ISO certifications (Yiming, 2012a). It should be noted that QMS are a complete system under which quality is checked, managed and controlled and it is not just about quality control because this is only one part of the quality management process (Dale, Dehe and Bamford, 2016). Goetsch and Davis (2014) defined QMS as the set of policies, processes and procedures which are needed to plan and execute in business functions. Through this, ability of the organisation to satisfy customer requirements is improved. According to Nanda (2016), QMS refers to a formalised system that do the documentation of policies, processes and responsibilities which help in achievement of quality policies and objectives. Through this, all organisations' activities are coordinated in a better manner for meeting requirements of customers and regulatory bodies on a continuous manner. Heras-Saizarbitoria and Boiral (2013) stated that QMS refers to the set of business processes which are targeted towards fulfilling customer requirements leading towards their enhanced satisfaction.

Many scholars have carried out relevant research on QMS. For example, Tsegaye (2004)

conducted a research study on Ethiopian food industries. Certain issues were identified, such as failure to adhere to QMS, lack of implementation of environmental management systems (EMS) and non-compliance with international standards. Among these problems, not being able to provide quality products was crucial. In addition, Aggelogiannopoulos et al. (2006) carried out research on firms operating in Greece and the same results were found, i.e. companies were not complying with international quality standards. Further, Enderwick (2009) undertook research in China that examined the quality problems in baby dairy product companies and somewhat similar results emerged: QMS were lacking in Chinese companies. These research studies have highlighted the importance of quality management and its role in improving companies' competitiveness (Yang et al., 2010). Furthermore, Alli (2003), Hines (2002) and Ni and Zeng (2009) have highlighted potential implications for companies that neglect quality management. Although these research studies in quality management were carried out in different industries and also in different countries, they have provided recommendations to help develop and strengthen the quality management process in the Chinese baby dairy product industry.

Prior to the melamine incident in 2008, Chinese baby dairy product companies had neglected quality management until the government and regulatory authorities realised that they needed to pay attention to this aspect of manufacture (Early, 2017). In China, food companies had only limited standardised guidelines for quality checks and control. The government had mainly focused on expanding the industry and no attempt had been made to improve the laws, regulations and standards with regard to the operations of Chinese baby dairy product companies. This research considers the issues related to the implementation of QMS and the laws, regulations and standards pertaining to quality management. Previous research studies have considered the melamine incident using different research variables, e.g. corporate social responsibility (Zhang and Liao, 2015), corporate governance (Yang and Cao, 2013), clinical profiles of affected children (Wang et al., 2013), buying behaviour (Tong et al., 2015) and several others. According to Pei et al. (2011), Qian et al. (2011) and Snell (2014), the previous research studies

have not addressed this issue in the context of QMS, which shows that there is a gap in the literature. The present study addresses this gap and relates the melamine incident to QMS. Through examining this research problem, the current situation with regard to QMS and quality control in the Chinese baby dairy product industry can be improved, as the research will uncover some of the implications for this sector. In addition, the contribution of this research will be theoretical as well as empirical. From a theoretical point of view, the information that is included in the literature review has identified various aspects of the melamine incident worthy of further consideration from the standpoint of quality control, and it has illuminated the barriers to, drivers for and challenges faced with regard to the implementation of QMS in the Chinese baby dairy product industry lacking in the previous research. The empirical findings of this study will explore these issues in greater detail.

## **1.2. Aim and objectives**

The aim of this research is to propose an integrated framework (pre-production stage) based on critical examination of the impact of implementing QMS in the Chinese baby dairy product industry, with particular emphasis on its drivers, barriers, external issues and challenges, supply chain management, quality standards, legislation and regulations. The ten objectives of the study both for the MPhil and PhD stages are stated below.

### **1.2.1. MPhil stage objectives:**

- 1) to review QMS and quality standards (e.g. ISO standards and total quality management (TQM)) generally and their implementation specifically in the Chinese baby dairy product industry;
- 2) to review the recognition and awareness of external issues (the part played by the Chinese government, legislation, corruption, economic pressures) that are influencing the actions of selected companies involved in baby dairy product manufacture.;
- 3) to identify key actors in the supply chain management process from procurement to end product with regard to Chinese baby dairy product companies;

- 4) to identify and review the barriers to and drivers for the implementation of QMS that Chinese baby dairy product companies must address;
- 5) to do preliminary research on selected companies regard to implementation of QMS in these companies to understand the measures they have already taken to further strengthen their QMS.

### **1.2.2. PhD stage objectives:**

- 6) to identify the challenges faced by the managers and staff of selected companies in the Chinese baby dairy product industry during the implementation of QMS;
- 7) to evaluate critically various standards relating to QMS that have been implemented by the selected Chinese baby dairy product companies;
- 8) to analyse and evaluate current legislation that applies to the Chinese baby dairy product sector;
- 9) to evaluate the QMS in UK baby dairy product industry and compare with Chinese baby dairy product industry
- 10) to develop an integrated framework (with a focus on the pre-production stage) in relation to the information-sharing system, the role of the government, and laws, regulations and standards that will guide the implementation of QMS for all stakeholders and validate the framework through using the China's baby dairy product industry's managers' perspective.

### **1.3. Importance of the research**

The increasing concern of consumers with regard to the quality of food products and their effect on health and safety has directed companies and made it important for them to adhere to quality management standards. It is, therefore, important to discuss the issue of QMS in order to come to a conclusion about their impact on the health and safety of consumers (Bauman et al., 2016; Atkins & Bowler, 2016; Asselt et al., 2017). In order to gain a competitive edge and an above average return, Chinese baby dairy product companies need to attract consumers by providing high quality, safe products

that will have no adverse effect on their health; the competition in the market has increased significantly and consumers have many alternative products to choose between. Since the melamine incident it has become more critical to minimise quality problems with the implementation of QMS. As there are numerous problems that could occur during the implementation of QMS in the Chinese baby dairy product industry, this research will be of considerable importance as it will help in understanding how these problems could be solved. Possible solutions for addressing the problems are also presented. In addition, the research minimises the gaps identified in previous research studies (e.g. Pei et al., 2011; Qian et al., 2011; Snell, 2014; Niu and Fan, 2015). Hence, this research is a significant contribution to the existing literature about implementation of QMS.

This research is related to QMS and their impact on the Chinese baby dairy product industry. However, it is not only China that is being forced to deal with the issue of QMS, but many other countries too (Zhangyue, 2010). Hence, this research will also serve as an example for future researchers anywhere in the world who want to research in the same field. Likewise, the research will also prove useful for companies who seek to pursue and eventually ensure proper QMS. With the increased competition in the market, companies are trying to focus more on the quality of their products and making efforts to ensure that quality is their competitive edge. For this reason, the research will be of considerable benefit to all industries who consider the issue of quality management key for making progress in the market (Pepper and Spedding, 2010).

#### **1.4. Limitation/scope of the research**

The present research is limited to the implementation of QMS in the Chinese baby dairy product industry. It does not consider QMS in any other industry. The QMS of other industries might have different aspects, but these are not part of this study. Moreover, the main focus of the present research is on the implementation of QMS in the pre-production stage (including dairy farm management, control over dairy farms, quality of raw materials, animal management plan, role of dairy farmers, quality and safety inspection and use of technology) with regard to the Chinese baby dairy product

industry. Other stages are important, but these have not been examined in detail. The scope of the research has been further specified in terms of the qualitative analysis that has been carried out using thematic analysis; software has not been used for analysing the collected qualitative data.

### **1.5. Outline of the thesis**

The contents page will provide a basic outline of the research and a short description of what is included will introduce each chapter in order to lead readers into it.

**Chapter 1: Introduction.** The introduction presents the important foundational and basic information about the research. In this chapter, the general background to the research and the context of the problem is discussed. In addition, the aims and objectives of the research are outlined.

**Chapter 2: Quality, Quality Management and QMS.** This chapter includes a discussion of previous research related to the topic of the thesis. Previous data related to QMS and research already carried out in relation to the Chinese baby dairy product industry is thoroughly analysed in order to give support to the current research. The purpose of discussing previous literature is to present the overview of already conducted research in Chinese food industry, examine the issues which are unexplored and has motivated the researcher to work on this research issue. This chapter also reviews the relevant laws, standards and regulations that apply to the Chinese baby dairy product industry. The local Chinese situation with regard to the baby dairy product industry is also discussed. The concept of QMS is analysed in detail and is critically reviewed. In addition, contextual information and information on current regulations and the situation in general with regard to QMS in China is included.

**Chapter 3: The Implementation of QMS in China.** This chapter is the 2<sup>nd</sup> literature review and it analyses critically the issues influencing the implementation of QMS in China. Firstly, it examines the development of QMS in the global market, and then in China. Secondly, it reviews the implementation of QMS in Chinese baby dairy product companies. Thirdly, it analyses the melamine incident and its impact on the Chinese

baby dairy product industry. Finally, the reaction of the government and the consequences of the melamine incident are discussed.

**Chapter 4: Supply Chain Management - Barriers, Drivers and Other Issues in the Chinese Baby Dairy Product Industry.** This chapter is the 3<sup>rd</sup> literature review that begins with the changing dairy supply chain in China. It starts by summarising the issues with regard to supply chain actors. It then examines how coordination and information sharing takes place among them. The chapter continues by analysing how technology could be used in the Chinese baby dairy product industry. Next, it reviews the barriers to, drivers of and challenges faced in relation to the implementation of QMS. In addition, an analysis of the role of top management and Human Resource Management (HRM) in the implementation of QMS is also part of this chapter. Finally, the issues of recognition and awareness affecting the implementation of QMS in the Chinese baby dairy product industry are discussed.

**Chapter 5: Research Methodology.** This chapter describes the research methodology used to collect the data. The methodology adopted is a mixed methods approach in which both qualitative and quantitative data were gathered. The research used 6 case study companies selected from different areas of China (4 companies) and the UK (2 companies). Data were gathered by means of interviews, a focus group and a questionnaire. The interviews were conducted with managers from the selected case study baby dairy product companies and also with government officials. The focus group discussion included managers from the baby dairy product companies and government officials. On the basis of the interview results and the focus group discussion, a framework has been constructed as a means of recommending improvements that the Chinese baby dairy product industry needs to consider. The framework has been further endorsed with the help of a questionnaire sent to the managers of the baby dairy product companies who were previously interviewed. Their responses have been used for the validation of the framework.

**Chapter 6: Preliminary Data Analysis.** At the MPhil stage, a pilot study was conducted. This chapter is based on the initial interviews that were conducted with 4

managers of selected case study baby dairy product companies and government officials in China. Firstly, this chapter discusses the details of the instrument used for data gathering and the sample size, target audience and type of interview. Secondly, the findings of the pilot study are outlined. This preliminary analysis concerns the implementation of QMS in the Chinese baby dairy product industry, key actors in its supply chain and barriers to and drivers for the implementation of QMS. This chapter also analyses the issue of recognition and awareness of problems in the Chinese baby dairy product industry. Finally, a summary of measures already taken for quality management in the sector is presented.

**Chapter 7: Findings and Analysis in Relation to the Chinese Baby Dairy Product Industry.** This chapter presents and analyses the findings from the interviews and the focus group that were conducted with stakeholders in the Chinese baby dairy product industry. After first examining the current situation with regard to the industry, the chapter then discusses how quality management is being carried out in all 4 case study companies. Following on from this, the important challenges faced by companies with regard to the implementation of QMS in the Chinese baby dairy product industry are critically analysed. The chapter goes on to analyse and critically evaluate the relevant laws, regulations and standards in relation to quality. Finally, on the basis of the interview and focus group findings, the most significant factors for quality management in the Chinese baby dairy product industry are identified. These factors are considered as the foundation for the framework presented in Chapter 10.

**Chapter 8: Findings and Analysis with Regard to the UK Baby Dairy Product Industry.** This chapter examines the implementation of QMS in the UK baby dairy product industry. Two case study companies were selected and the findings are based on interviews with the managers of these companies. This chapter considers quality management practices, laws, regulations and standards in relation to quality, the information-sharing system and management with regard to the UK baby dairy product industry.

**Chapter 9: Comparison between the Chinese and UK Baby Dairy Product Industries.** This chapter discusses and critically analyses the findings from Chapters 7 and 8 and provides an in-depth comparison of QMS in the Chinese and UK baby dairy product industries. The chapter also compares the findings of this research with the results and findings of previous research studies conducted in different contexts.

**Chapter 10: Framework – Pre-Production Stage.** On the basis of findings explained in previous chapters, it was found that the pre-production stage of the manufacturing process in the Chinese baby dairy product industry is the most crucial for the successful implementation of QMS. Therefore, the framework which is presented in this research focuses on the pre-production stage. This chapter presents the framework and its focus is on the milk source, an information-sharing system, the role of the government, and laws, regulations and standards.

**Chapter 11: Validation of the Framework.** This chapter validates the framework presented in Chapter 10 which is based on the findings of the questionnaire sent to the managers of the selected case study companies from the Chinese baby dairy product industry. The managers' responses have helped evaluate whether or not the framework presented is of any worth for the Chinese baby dairy product industry. The chapter presents the findings in the form of tables and graphs, and percentage and frequency distributions are used for analysing the data obtained.

**Chapter 12: Conclusions and Recommendations.** In this final chapter, the findings of this research are summarised in a concise manner. The chapter contains further information as to whether the set objectives for the research have been fulfilled or not. Importantly, the chapter provides recommendations for the Chinese baby dairy product industry. Furthermore, this chapter also has a section on possibilities for future research and recommends an analysis of quality management in the other two stages of the industry's production process, i.e. the production and post-production stages, to future researchers.

## **Chapter 2: Quality, Quality Management and Quality Management Systems**

Due to globalisation, the world has become a very competitive market place and every company tries to achieve its maximum share of the market and profits. Companies can benefit and achieve goals by identifying competitive advantage (Singhal, 2012), and companies that base their competitive advantage on key critical points, such as quality, can sustain it. (Vitez, 2012). Chinese companies are facing problems in relation to quality more and more because of a lack of the required quality system awareness in production systems and processes. Due to the industrial evolution in China and the transition of the Chinese economy from a planned to a market one, companies are more concerned about profit and less about food safety issues (Shehane, 2011).

According to the Asian Productivity Organisation (2005), food safety and the resulting benefits to health are the basic rights of the people concerned. Companies should devote maximum efforts towards guaranteeing proper quality and safety of food for customers, worldwide (APO, 2005). This literature review is about QMS, their history in general, problems involved in implementing them and their importance in the manufacture of baby dairy products. Quality issues that arise due to the lack of QMS in the baby dairy product industry will be discussed. The focus will be on infant formula milk products produced without any QMS, the effects of this and the reasons for the lack of QMS in the Chinese baby dairy product industry.

### **2.1. The concept of quality**

The world has become a global place and the priorities of organisations have changed. This change is the result of the desire to meet and exceed the needs of customers. Manufacturing companies have realised that this can only be achieved through constant improvement in their various processes (Kotler and Armstrong, 2010). Quality standards, and the awareness of the importance of these that have been created by the governments of various countries have had a positive impact on companies (McDonald, 2008).

Quality can be perceived by consumers in terms of the way in which a product is used or the way it looks (Chinn, 2001). Most importantly, the meaning of quality has changed over time. Quality has no single definition, but most researchers have settled for the main standards as defined by the International Organisation for Standardisation (ISO) (Greaves, 2006). As defined by Champan (2009), it is the standard for products and services measured against degree of excellence. The customer might see quality as performance that meets and exceeds his/her expectations (Boon and Kurtz, 2006). In more specific terms, quality is the conformance of the product or service to fulfilling the expectations of the companies and the customers (Singhal, 2012).

Other than these general definitions, quality has been described by other philosophers and practitioners as the suitability of the product for a purpose that it is made to perform (Deming, 1986) and the suitability of a product for use by the client (Juran and Godfrey, 1999). Driven through research work, quality is achieved by compliance with the requirements and standards established by the certification bodies (Crosby, 1979). This last definition will be the base for the current research as the main emphasis will be on the functioning and monitoring of standards such as GMP (Good Manufacturing Practice), those developed by the ISO and many others.

### **2.1.1. Importance of quality**

Quality is the major factor in achieving the goals of an organisation by eliminating non-productive factors from the processes, followed by marketing, production, management and other areas (Tanner, 2004). QMS, if incorporated correctly, will steer the organisation on the path of success by improving the processes constantly. Quality is the main factor that ensures the systems of an organisation can meet and exceed the expectations of customers and comply with safety and hygiene laws, regulations and standards with regard to manufacture, labelling and distribution (Chapman, 2009). QMS and standards have given rise to a structure that has made it possible for companies to keep a check on their production processes (Quince and Phillips, 2013). The main reasons that companies now take quality into consideration and realise its importance are the pressure from customers to provide the best quality products and

pressure from the supply chain.

Quality ensures that a company's products are well received, and it should be managed and implemented at the most basic level of production. It is, in fact, the most important factor in any industry and companies using relevant quality standards do benefit (Kapoor, 2007). As stated in the paragraphs above, quality is very important, yet there are many companies that are neglecting this important fact; achieving quality accreditation across the industry needs more efforts.

### 2.1.2. Elements of quality

Quality, as described by researchers, includes 2 dimensions, one is objective, the other subjective (Goh, 2000; Costanza et al., 2006). The objective measure is related to a predetermined set of criteria. These criteria are presumed to be essential to the ultimate value that the product provides to the user. The subjective side of quality refers to the perceived value as determined by the person who gets the benefit from the outcome of the process (Chinn, 2001). An example of this type of quality is the pain relief that a person gets from medication. Keeping in mind the definition of quality, Crosby (1979) illustrates the elements of quality in Figure 2.1.



Figure 2.1: Elements of quality.

(Source: Crosby, 1979.)

Figure 2.1 shows that quality is made up of 3 elements: customer, processes (used to make the product) and the employee (education and satisfaction). Quality consists of

fulfilment of the customers' perceptions and needs for the product or service. This means that a product will have quality as perceived by the customers through the use of that product. The use of the product provides the foundation for the subjective part of quality (Boon and Kurtz, 2006). A delighted customer will give any value to the product if the outcome is desirable as he/she perceives it through consistent use of the product. The process is the second element of quality and the focus is on the way the outcome has been achieved. The product is considered to be a quality one if the process through which it has been made is safe. Safe means that the ingredients and chemicals that have gone into it, and the production facility that has been used to make it, are safe and hygienic in all respects (Singhal, 2012). The third important factor of quality is the employees of an organisation. Through their skills, education and experience, employees add value to the production process. If these elements of quality are not satisfied, then the product will not be considered of value (Corbett, 2007). So, in order to produce a quality product, a company's management must include the factors discussed above. In other words, the process of production must be error free, according to the needs of the customers and managed by qualified staff. This is similar to Crosby's concept of zero defects (Crosby, 1979). Although quality integrates these 3 elements, there are still many companies that are not taking all of them into account and are neglecting one or more of them. The analysis shows that both objective and subjective dimensions are important for implementing QMS.

Quality is a concept that is different for different people. In fact, it changes as the quality of the product improves over a period of time (Vitez, 2012). For example, there was a time when Sony's electronic products were considered as the benchmark for quality, and names such as LG and others were not regarded as highly (Steenkamp, Van Heerde and Geyskens, 2010). Now, however, LG is considered to be a very reliable brand with a significant market share around the world. Similarly, the Ford Model T was considered to be the best car (many years ago), but due to innovation and technological advances, the opinion of customers has changed. They now consider hybrid cars, such as the Toyota Prius and Honda Insight, as the ultimate benchmark as far as cars are

concerned (Shigeki, et al., 2012). From these examples, it can be deduced that as time passes new products are introduced which meets the same need in a better manner having better quality. Hence, due to changes in the expectations of customers due to changes in products' nature and customers prefer those products which have higher level of quality.

Table 2.1 depicts some elements of quality through customer focus, process improvement, the use of quality tools in production and product design, the employees and the suppliers. In order to investigate the concept more thoroughly, it is important to look into each and every element of quality and the Table 2.1 analyses them one by one.

Table 2.1: Summary of quality concepts.

<u>CONCEPT</u>	<u>MAIN IDEA</u>
Customer focus	Goal is to identify and meet customer needs
Continuous improvement	A philosophy of never-ending improvement
Employee empowerment	Employees are expected to seek out, identify and correct quality problems
Use of quality tools	Ongoing employee training in the use of quality tools
Product design	Products need to be designed to meet customer expectations
Process management	Quality should be built into the process and sources of quality problems should be identified and corrected
Managing supplier quality	Quality concepts must be extended to the company's suppliers

- The concept of customer focus states quality is all about identifying and meeting the needs of the customers. For managing quality, the main emphasis is required to be on customers. Nowadays, customers have become more aware hence their quality consciousness is also increasing. This quality concept presents that as expectations of customers keep on changing; it is important to modify the quality management strategy accordingly (Bisgaard and De Mast, 2006).
- As per continuous improvement, quality management is based on the idea of never-ending improvement. This a continuous process where planning, doing,

acting and checking is done in a continuous way, and the purpose of whole process is to improve the overall system. With the changing expectations and needs of customers, it is not desired to have stagnant quality management system or philosophy, therefore, this quality concept states to bring the improvements in a continuous manner (Beer, 2003).

- Employee empowerment is also important for quality management as when employees are provided adequate level of empowerment, they become able to identify and solve quality problems. The foundation of quality management is on those individuals who are responsible for implementing it i.e. employees. Therefore, this concept states that employees should be provided with sufficient authority and decision making power to handle the quality problems independently. Instead of waiting for approval from top management, employees are to be provided with sufficient resources and authority to take the required steps, if any problem occurs (Batt, 2006).
- All of the relevant quality tools including employee training needs to be utilised effectively for ensuring quality. Employee training is the critical aspect of any QMS. Employees must have sufficient skills, knowledge and abilities to manage and implement the quality programmes. Therefore, this concept is about providing sufficient training to employees who are responsible for implementation of QMS (Basir et al., 2017).
- The element of product design states that the design of products should be based on the needs of the customers. This is similar to the 'customer focus' concept, but it is specific to the product design. It is said that whatever product is introduced in the market should be designed in a way that it fulfils the needs of customers (Barrie, 2007).
- As a process management concept, quality is about developing the process which means it should not be one-time programme. Quality concept should be incorporated in the routine processes of the business. The processes should be alike that quality problems could be identified and corrected (Bangert, 2007).

- It also gives an additional element, i.e. the suppliers. If the quality of the raw materials supplied to the manufacturer is not good, then quality products will not be made. Therefore, the involvement of suppliers is also critical for managing the quality of products or services offered by an organisation. The involvement of supply chain actors will enable the organisation to accomplish the quality related objectives (Batt, 2006).

The most credible work on QMS was undertaken in the 1960s, as highlighted by Goh (2000). Three constituents of quality were identified: quality control, planning and improvement. Not only was the end user/customer focused on quality management, but all the other members of the demand and supply chain (producers, retailers and distributors - referred to as internal and external customers) were included. From this, it can be deduced that QMS have many stakeholders and involvement of all of them is required if the systems are to be implemented successfully.

### 2.1.3. Quality management

The concept of quality management has been recognised and developed by many philosophers, but a major breakthrough was acknowledged at the beginning of the 1900s. Quality as a concept was addressed in 1914 by Frederick Taylor in his book *Principles of Scientific Management* (Taylor, 1914). This was a major turning point for the theorists. Shewhart (1931) wrote a book on the ‘economic control of the manufactured product’, and this became the stepping stone for quality improvement as it included sections on the use of statistics in quality control and assessment (Batt, 2006).

Table 2.2: Summary of the history of quality management.

<u>QUALITY GURUS</u>	<u>MAIN CONTRIBUTION</u>
<i>Walter A. Shewhart</i> (1891-1967)	<ul style="list-style-type: none"> <li>➤ contributed to the understanding of process variability</li> <li>➤ also developed the concept of statistical control charts</li> </ul>
<i>W. Edward Deming</i> (1900-1993)	<ul style="list-style-type: none"> <li>➤ stressed management’s responsibility for quality</li> <li>➤ developed ‘14 points’ to guide organisations in</li> </ul>

	improving the quality of their processes and products
<i>Joseph M. Juran</i> (1904-2004)	<ul style="list-style-type: none"> <li>➤ defined quality as ‘fitness for use’</li> <li>➤ developed concept of the cost of quality</li> </ul>
<i>Armand V. Feigenbaum</i> (1922-2014)	<ul style="list-style-type: none"> <li>➤ introduced concept of total quality control</li> </ul>
<i>Philip B. Crosby</i> (1926-2001)	<ul style="list-style-type: none"> <li>➤ invented the phrase ‘quality is free’</li> <li>➤ introduced concept of zero defects</li> </ul>
<i>Kaoru Ishikawa</i> (1915-1989)	<ul style="list-style-type: none"> <li>➤ developed cause and effect diagrams</li> <li>➤ also identified the concept of the internal customer</li> </ul>
<i>Genichi Taguchi</i> (1924-2012)	<ul style="list-style-type: none"> <li>➤ main focus was on product design quality</li> <li>➤ also developed the Taguchi loss function</li> </ul>

As depicted in Table 2.2, it can be seen that quality evolved through many great researchers who were interested in quality management. From Shewhart to Taguchi, each one has developed a new facet of quality.

During World War II, Deming and Juran worked on mathematical models and statistical processes. Juran helped in redesigning the critical supply processes in the lend-lease administration. After the war ended, both Deming’s and Juran’s work was recognised worldwide. Because of what they had achieved, they were invited to collaborate with the Union of Japanese Scientists and Engineers and in the early 1950s went to Japan and worked in its industries with the local engineers. Deming taught them how important both suppliers and consumers were in the production system for the wellbeing of society (Landsberg, 1999). Juran and Deming both implemented the concept of statistical measurement in Japanese production units. In recognition of their efforts they were presented with medals by the emperor of Japan. It was due to the efforts of Deming that the cycle of Plan, Do, Check and Act (PDCA) came into being (Nakayama et al., 2010). In the long term, the work of these 2 men has motivated managers to be more conscious about quality systems in their organisations. Their research showed that quality management is a long-term commitment. Further to their findings, an appraisal of the system of work and careful planning are the main things

that should be taken into account when considering quality improvements (Bunkly, 2008). It needs to be recognised that the work of these quality gurus and their efforts with regard to quality management is seminal and should be taken into account.

It was not until the beginning of the 1960s that the 'quality circles' of Dr Ishikawa were recognised as the best practice for eliminating variations from processes and improving the formulation of products in manufacturing concerns (Ramakrishna, 2007). In 1969, a conference on quality control was held in Tokyo, which was sponsored by Japan, the US and certain European countries including Finland and Denmark. This was the first time the countries involved had been introduced to the concept of total quality management (TQM) (Sallis, 2014). At the conference, the concept of quality was used to define a wider range of issues, such as planning, and business and management accountability. Through the conference, the whole world became aware of the significance of implementing QMS and, afterwards, the US became the centre of attention with regard to the issue (Kenneth, 2005).

The quality revolution in the West was slow to begin and results were not seen until the end of 1980. The 1970s and the 1980s were the most crucial 2 decades for the development and implementation of QMS in industry (Batt, 2006). On returning from Japan, Deming published his 14 rules with regard to the implementation of quality, i.e. continuous improvement in the processes (Ge and Yang, 2009). These are: create constancy of purpose; adopt the new philosophy; stop relying on inspection; move towards a single supplier for any one item; aim for continuous improvement in planning, process and production; promote on the job training; institute leadership; drive out fear; remove barriers between departments; eliminate exhortations, slogans and targets for the workforce, including numerical targets; remove barriers that prevent hourly paid workers from achieving the best workmanship; remove any annual rating and merit system; introduce vigorous self-improvement programmes; and make sure that everybody in the company works towards the transformation. He wrote these in his famous book entitled *Out of the Crisis* (Deming, 1986). Taguchi (2013) introduced the method of quality control for managing the quality. It was highlighted by this quality

guru that quality control, which is about emphasising the role of research and development, product development and product design for minimising the failure and defect occurrences in the products. This quality guru says that design is most crucial aspect for managing the quality and by focusing on the design; variances in the production process can be reduced (Kalpakjian and Schmid, 2014). Being a Japanese statistician and engineer, this author developed few methods known as ‘Taguchi Methods’ while he was working on the development of telephone-switching system for a Japanese company named Electric Communication Laboratory. The success of his methods was recognised not only in Japan but also in United States and many successful companies like Boeing, Ford, Toyota and Xerox applied his methods in their production process for controlling the quality. The methods presented by this guru focuses on combination of process control and control chart with product design for designing a robust total design. The aim of this methodology is to reduce the variability of production outputs through the specific product design which is developed. Despite criticisms on this method, the work of Taguchi still holds the significant importance in quality management (Kokkulunk et al., 2014). Another theorist, Crosby, wrote a book called *Quality is Free* on the wider scope of quality. Crosby’s philosophy was quality without tears, which means that it can be established through prevention not appraisal.

The implementation of QMS is the process through which organisations manage their activities by guiding, monitoring and directing quality. Implementation also includes making policies for quality application by incorporating them into the objectives of the organisation (Kapoor, 2007). The analysis shows that QMS have evolved into TQM (Chowdhary, 2005).

This concept is further refined by Feigenbaum as total quality control (Batt, 2006). He describes this as an arrangement to integrate the quality development, maintenance and improvement actions of different departments. As a result, the whole system of the organisation will be able to produce goods at an economic level so that the end user can be satisfied along with the organisation (Chapman, 2011). For a quality system to be effective, 3 steps should be followed at the organisational level: first, quality leadership;

second, modern technology (quality); third, commitment at the organisational level (Tania, 2008). TQM has evolved into the wider concept that includes the overall performance of an organisation and also improvement at the departmental level. This helps an organisation to achieve excellence in performance (Kapoor, 2007). In Europe, the concept of QMS has taken the shape of the widely accepted model of business excellence and is also endorsed by the European Foundation for Quality Management (EFQM). In addition, the same model is being promoted in the UK by the British Quality Foundation (BQF) (Vitez, 2012). Likewise, Codex Alimentarius Commission has introduced set of internationally recognised standards, codes, and guidelines for food safety, food production and other related aspects; HACCP is also an example of standard introduced for managing food quality. From this, it can be deduced that QMS concentrate on overall performance and they target improvements in all levels and departments of an organisation through the use of distinctive quality concepts and models including TQM, EFQM, BQF and HACCP.

#### **2.1.4. QMS and standards**

Most organisations rely on informal ways of managing quality (Chan et al., 1998). This means quality is not always integrated into systems and processes, and only selected people take particular actions for managing quality. This is considered problematic as many times people might leave or they might get involved in the fraudulent and deceptive activities (Chang, 2009). The right path is not to rely on people but integrate it into processes and systems (Harris, 2011). This helps to integrate quality into every system and department. In the initial stages, implementation is carried out by the formalisation of a plan for services, methodology, strategies, and records of procedures and practices. The most important thing to consider is the format of the plan will take. It needs to include: descriptions of how the organisation operates at different levels; instructions of the work to be done; forms that need to be completed; timetables; minutes of meetings discussing the implementation process; and control of support structures (Tsim, Yeung and Leung, 2002). The format depends upon the individual organisation. Plans can be kept as videos, flowcharts, electronic data, and in many other

formats too (Stamau, 2003).

A systems approach to a quality management framework requires total presence and compliance, which means the involvement of the whole organisational system (McDonald, 2008). An organisation needs to build mechanisms that will help in evaluating and monitoring the regulatory changes to make sure that alterations to rules and practices are stopped when an optimum state is reached (Singhal, 2012).

In general, QMS provide practitioners with interrelated processes which, in turn, are also related to the support structures. These support structures include the documentation of the processes and the resources to facilitate what needs to be put in place for the achievement of a specific purpose (Rogers, 2011).

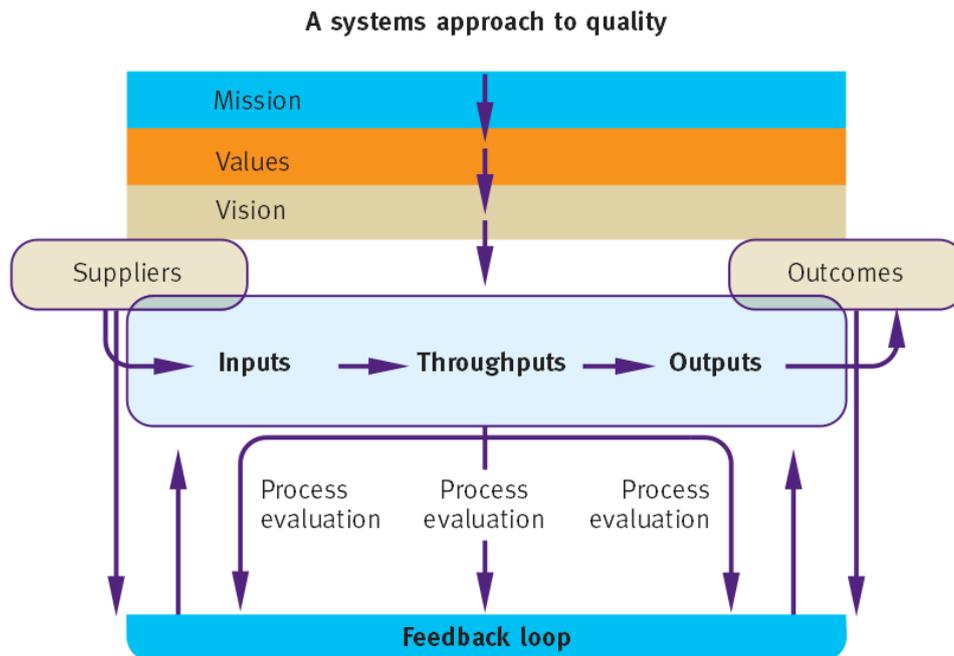


Figure 2.2: Quality management systems.

(Source: Chang, 2009.)

Figure 2.2 depicts the systems approach to quality management. In this approach, the identification and management of interrelated processes for a given objective are carried out in order to achieve effectiveness and efficiency (Chang, 2009). In essence, QMS can be referred to as the set of integrated activities and procedures that regulates the way the elements of an organisation will contribute towards the collective achievement of quality control. QMS is also about the implementation of the policies

pertaining to the latter and the milestones defining the achievement of quality control.

Sillayo (2012), a project leader at the World Meteorological Organisation (WMO), argued that the proper implementation of QMS could be achieved by documentation, which has to be done at 3 levels for more support and authenticity: strategic, tactical and operational levels (Sillayo, 2012).

Structured documentation is at the heart of QMS. Such documentation will describe the way in which an organisation operates at various levels and formalises its rules and procedures. The QMS of a company need to include written documentation describing organisational procedures and processes at the strategic, tactical and operational levels, which should incorporate the ISO 9000 standards (Narayanan, 2010). At a strategic level, for example, details of the company's quality policy, which should include a guide in the form of a quality manual, and objectives with regard to implementing QMS, need to be given. On a tactical level, the procedures attached to each policy (for achievement of the main objectives as defined at strategic level) should be defined.

The research conducted by Ayala (2012) and Hazal (2010) on 1) QMS and 2) standards shows 2 important insights into the development and maintenance of the overall concept of the system.

- QMS revolve around a very basic concept concerning the company's framework together with the procedures, systems, methods and resources that are needed to maintain the organisational system. This is achieved through measurement of the effectiveness of the goods and services produced for the consumers and clients (Ayala, 2012).
- On the other hand, organisations use various standards for the purpose of measurement of effectiveness which eventually leads towards customer satisfaction and the organisational benefit of cutting costs incurred due to previous poor product quality (Hazal, 2010).

### **2.1.5. ISO standards**

The ISO (International Organisation for Standardisation) is located in Geneva,

Switzerland. It was formed in 1947 in order to establish and form common standards that can be recognised internationally (Powley, 2006) and includes members from 160 countries. The central secretariat undertakes coordination between members. The ISO is non-governmental, connecting the public and private sectors (Poza et al., 2009). The international appeal of companies increases if they are able to comply with international quality standards and supply chain pressure means that companies have to ensure that products conform to quality standards. Due to advancements in information technology, customers are well informed about quality standards and their rights if they purchase substandard goods. This brings us to the most important issue, which is compulsory application of standards to companies (Powley, 2006). Companies need incentives in order to implement QMS. A piece of paper alone cannot improve the quality, which requires commitment by companies. If implementation of standards is done correctly, then it will improve a company's quality systems and will add value (Tari et al., 2017).

Industries all over the world have been motivated to adopt ISO standards due to their many benefits (Enas, 2012). Three main ones can be identified. The first is less waste leading to reduced costs. The second is the fact that companies are differentiating themselves as being companies that produce quality goods and, as such, they achieve a sustainable competitive advantage. The third reason is that they can be applied to a company's supply chain and distribution system so that the whole process of manufacture from procurement of the raw materials to the finished product can be covered (Bangert, 2007).

The ISO standards are internationally set standards and are for the facilitation of continuous improvement in organisational performance. There are eight guiding steps behind ISO standards which are accepted all over the world (Hazal, 2010). These are: (1) customer focus, this being the first and most important principle because customers are the main reason for producing anything in the first place; (2) leadership by top management to raise awareness and motivation among employees; (3) involvement of staff; (4) the process approach, which includes determining the key responsibilities and skills of those present in the organisation, and establishing measures for carrying out

improvements and monitoring them; (5) the systems approach (QMS), leading to; (6) continuous improvement; (7) the factual approach, which is very important because it makes sure that the relevant information is accessible to everyone; and (8) a mutually beneficial association between suppliers and companies (Chaw-Chua , 2003; Geoffrey, 2010). The eight steps are depicted in Figure 2.3.



Figure 2.3: Eight steps for QMS (ISO) compliance.

(Source: Ludwig-Becker, 2001; Chaw-Chua, 2003; Geoffrey, 2010.)

The ISO standards are based upon Deming's PDCA cycle (Sirkin, 2012). The key features of this cycle are: establishing QMS, documenting them, implementing them, reviewing the outcomes, conserving the systems and improving them (Tsim et al., 2002).

The ISO 22000 series is the family of international standards that addresses food safety

management. They assist in identifying the safety requirements of any food producing, processing or packaging organisation in the food chain (Singhal, 2012) and the system helps in recognising the elements that are critical to the production of processed food in order to ensure safety. This is achieved by applying the standard to all processes through which food passes, from the raw material stage to the finished product and beyond (Medori and Steeple, 2000). Communication is important on every level, including internationally and across the supply chain. ISO 22000 should be aligned with the ISO 9001 quality standard (Raid, 2011).

#### **2.1.6. ISO certification process**

According to Terziovski and Guerrero (2014), companies are not certified by the International Organisation for Standardisation (ISO) itself, but by one of a number of certification bodies that audit companies and issue compliance certificates upon success. The QMS of a company can actually be certified by ISO 9001:2015. No ISO 9001:2008 certificates can be issued with an expiry date after 15 September 2018. ISO 9001 is commonly known as the ISO 9000 series. As stated by Gray, Anand and Roth (2015), in different countries, the certification bodies are authorised by various accreditation bodies. Companies are charged fees by both certification bodies and accreditation bodies. The certificates provided by one accredited certification body are accepted internationally by different accreditation bodies. As highlighted by Heras-Saizarbitoria, Dogui and Boiral (2013), this is due to the presence of mutual agreements between various accreditation bodies. Certification bodies themselves work under another quality standard, which is ISO/IEC 17021. In addition, the accreditation bodies work according to ISO/IEC 17011. As stated by Dogui, Boiral and Heras-Saizarbitoria (2014), organisations are provided with ISO 9001 certificates after a detailed audit. The audit is done on the basis of an extensive sample of an organisation's functions, procedures, goods and sites, as well as services, and a list of areas examined is provided to the management by the auditor. A certificate is provided to the organisation if there are no major nonconformities observed by the auditor. In the case of these being found, the firm then has to provide an improvement plan. This may contain details about corrective

actions for resolving the issues identified. When it has satisfied the certification body, a certificate is issued to the organisation (Di, Noia and Nicoletti, 2016). It should be noted that the certificate is provided to every company on an individual basis. For example, a company making volleyballs would be issued with a certificate for that product. It is very important for company managers to be aware that an ISO 9001 certificate is not simply a once-in-a-lifetime issue and it has a specific renewal date, usually every three years (Wiengarten, Pagell and Fynes, 2013).

### **2.1.7. ISO 9000: Quality management**

According to Goetsch and Davis (2014), different aspects of quality management are presented by the ISO 9000 family of standards, the ‘tools’. The tools also include directions for implementation and by using these companies can make sure that customers’ needs are met and continuous improvement in quality is made.

The ISO family consists of the standards given in Table 2.3 below.

Table 2.3: ISO Family.

ISO standards	Details
ISO 9000:2015	Includes core language as well as concepts
ISO 9001:2015	Provides requirements for QMS
ISO 9004:2009	Provides the details for making improvements in QMS
ISO 19011:2011	Provides directions about external as well as internal audits

(Source: ISO, 2015.)

#### **2.1.7.1. ISO 9001:2015**

According to Heras-Saizarbitoria and Boiral (2015), ISO 9001:2015 provides the guidelines for QMS. This is considered to be the single standard in the ISO family that can be used by any organisation (regardless of size, action or business activities). There are more than 1 million companies certified to ISO 9001 (in more than 170 different countries). As mentioned by Jasper and Jamison (2016), a wide range of principles related to QMS are included in this standard. These principles are concerned with

customer focus, approaches for continuous improvement, and motivation, and involve implications for management. Being certified to ISO 9001:2015 ensures that a company provides an excellent quality of goods and services and is capable of retaining customers.

According to Chen et al. (2016), the major role of ISO 9001:2015 is to check whether the system is working properly or not. It is suggested that before applying for certification, an organisation conducts an internal audit to check how its QMS are functioning. A company might also ask its customers to give their opinions on the quality of its products. As stated by Wilson et al. (2016), QMS are essential for an organisation when:

- a) it needs to show its capability to constantly offer goods and services that fulfil the needs of customer as well as regulatory and applicable statutory requirements;
- b) it wishes to improve the level of customer satisfaction.

It is important to note that all of the requirements of ISO 9001:2015 are basic and are appropriate for any organisation regardless of its size, activity or nature (Wilson et al., 2016).

ISO 9001 is accepted at a global level and, according to Savino, Brun and Xiang (2017), it is a significant thing to have. The majority of buyers require their suppliers to hold an ISO 9001 certificate. Furthermore, ISO 9001 certification is not only useful for different stakeholders; a survey conducted by the British Bureau in 2011 found that 44 per cent of their certified clients had won new business. According to Borisova et al. (2016), certified business concerns attained higher returns on assets compared with those that were uncertified. It is mentioned by Hunt (2016) that ISO 9001-certified business concerns have comparatively good performance and it was further confirmed that this was not associated with the size of the firms. As per the same study (Hunt, 2016), automotive companies in the US that have implemented ISO 9001 have high operational performance. In addition, Gadenne and Sharma (2009) found similar improvements in financial as well as operational performance. According to Tricker

(2016), companies in Denmark attained better financial performance by obtaining ISO 9001 certification. According to Marques et al. (2016), shareholders of those companies that are ISO 9001 certified are rewarded well because the market value for shares increases.

Many scholars, including West and Cianfrani (2016), have stated that business concerns already performing well can seek ISO 9001 certification for further improvement of results. According to Silva, Fonseca and Sousa (2016), there are also certain operational improvements related to certification. These improvements include reductions in stock as well as cycle time. It is mentioned by Murray (2016) that business concerns' improvements in their internal procedures can result in visible improvements externally as well. In addition, companies can gain the advantages of increased international trade and local market share. Moreover, internal benefits are customer satisfaction, improved work procedures and better relationships with suppliers. Basir et al., (2017) referred ISO certification and proper implementation is never possible without the involvement and commitment of top management. Without this, efforts for ISO are wasting. Moreover, there is a need of a representative for taking charge of the implementation of ISO, the commitment, knowledge, and passion of this person will lead towards the success of this process. Furthermore, training is also mandatory for this. Most importantly, the process of certification involves costs which is also the barrier for its implementation. Despite of these downsides, the benefits outweigh the costs (Chen et al., 2016).

#### **2.1.7.2. Contents of ISO 9001:2015**

According to Jonsson and Berglund (2016), ISO 9001:2015 is considered to be an significant document containing almost 30 pages that is obtainable from the national standards association of every country. ISO 9001:2015 is directly audited against third party evaluation objectives. As given by the International Organisation for Standardisation (2015), the basic outline of ISO 9001:2015 is:

- Section 1: Scope
- Section 2: Normative references

- Section 3: Terms and definitions
- Section 4: Background of the organisation
- Section 5: Leadership
- Section 6: Planning
- Section 7: Organisational support
- Section 8: Operations
- Section 9: Performance evaluation
- Section 10: Improvement

Fundamentally, the outline of this standard is similar to the earlier one, ISO 9001:2008. It is important to note that the certification body can provide or renew the certification only when the auditor is satisfied with the firm. The auditor first evaluates the firm as per the requirements of sections 4 to 10 and the certificate is then issued. Sections 1 to 3 are not directly audited. However, these should be considered by management because they include scope and definitions. The companies complying with ISO 9001:2015 have to document various processes needed for its effective functioning. In addition, it is also required by the standard that companies should create the documented quality policy. This policy should include a guide in the form of a quality manual as well as other records. In 2015, a new requirement was made which requires companies to evaluate opportunities as well as risks (Section 6.1) for identification of external and internal problems relating to their purpose and strategic direction (Section 4.1) (International Organisation for Standardisation, 2015).

#### **2.1.8. ISO 22000: Food safety**

ISO 22000 is concerned with food safety and is considered to be the common derivative of ISO 9000. Food safety is concerned with the existence of issues in relation to food at the point of utilisation. Food safety risks are present in the food chain and can manifest themselves at any time, which is why it is of fundamental importance to control them. Consequently, a joint approach for all parties in the food chain is needed (Escanciano and Santos-Vijande, 2014). According to Psomas and Kafetzopoulos

(2015), the basic components of a food safety management system (FSMS) according to ISO 22000 include:

- communication between all stakeholders at all levels;
- principles associated with Hazard Analysis and Critical Control Point (HACCP);
- system management;
- prerequisite programmes (PRP) and plans.

Different scholars have presented critical reviews with regard to the above-mentioned components. Jayasinghe (2016) believes that communication – both upstream and downstream – is the most important factor and that it is essential in the food chain to ensure that all relevant food safety risks are recognised and effectively handled at each phase. When the potential risks are identified and effectively handled by the management then the requirements of customers as well as suppliers can be met effectively. Likewise, Soman and Raman (2016) say that identification of the company's responsibility and position within the food chain is necessary to make sure that useful communication takes place throughout the chain in order that food items which are safe to eat are delivered to the end consumer.

According to Escanciano and Leticia Santos-Vijande (2014), through ISO 22000, highly useful and efficient food safety systems are developed as part of a structured management system and incorporated into the general management of a firm. ISO 22000 has many advantages for companies. Soares, Martins and Vicente (2015) highlighted that both ISO 22000 and ISO 9001 are aligned so as to improve their compatibility in dual use. ISO 22000 can be applied separately from other management system standards. Fernández-Segovia et al. (2014) explain that HACCP system principles are also incorporated by ISO 22000. HACCP is considered to be an effective FSMS. By carrying out a hazard analysis, the information needed for creating an effective combination of control measures can be obtained by management. As per ISO 22000, different potential hazards that can be rationally anticipated to occur in the food chain should be identified and evaluated before being documented. According to

Gaspersz (2013), while carrying out a hazard analysis, it is important for the company to identify the strategy that will be used to guarantee hazard control with the help of a HACCP plan as well as PRP.

According to the International Organisation for Standardisation (2016), ISO 22000 is called the ISO 22000 family of standards. Some of them are:

- ISO 22000: This provides the requirements for the food chain of any company.
- ISO 22001: This offers guidelines on the application of ISO 9001:2000 to the food and drink industry.
- ISO/TS 22002: This contains details about PRPs relating to food safety. In addition, part 1 is concerned with the production of food.
- ISO/TS 22003: This provides details about certification as well as the audit of FSMS.
- ISO/TS 22004: This includes guidance on the application of ISO 22000:2005.
- ISO 22005: This is concerned with traceability in the food and feed chains.
- ISO 22006: This provides details as to how ISO 9002:2000 can be applied to crop management.

The requirements for a FSMS are provided by ISO 22000:2005. As per this system, companies in the food chain have to show their capability for controlling food safety risks. This standard is applicable to all companies (irrespective of size) that are eager to provide their customers with food that is safe to eat. The requirements imposed by ISO 22000:2005 can be fulfilled by using external as well as internal resources or assets (International Organisation for Standardisation, n.d.).

ISO 22000:2005 certification is useful for companies when developing and implementing a food safety management system, as well as operating and updating it (Varzakas, 2015). It shows compliance with regulatory food safety requirements as well as relevant statutory ones (Soares and Martins, 2015). According to Silva et al. (2016),

ISO 22000:2005 helps in assessing and measuring customer needs and showing compliance with food safety systems in order to improve customer satisfaction. The systems it requires to be put in place are useful for effectively communicating any food safety problems linked to the food chain to different stakeholders, including customers, suppliers and other parties (Gaspersz, 2013). A rigorous food safety management system is critical for declaring compliance with ISO 22000:2005 (Boys and Grant, 2014) and ISO 22000:2005 certification shows that the company is performing as per its documented food safety policy.

## 2.2. Comparison of ISO 9001 and 22000

Gaspersz (2013) explained that there were differences between ISO 9001 and ISO 22000. There are some major ones, while others are quite minor. Both ISO 9001 and ISO22000 have certain sections which discuss the particulars of the quality management system. The main idea of both standards is similar but there are few differences which are related to general requirements, documentation requirements, food safety policy, internal communication and continuous improvement. Generally, there are differences of the wording in both standards; while documentation needed for ISO 9001 is more detailed. The most important difference in these two standards is that there are no exclusions allowed in ISO 22000. ISO 22000 emphasises on compliance with food safety statutory regulatory and customer requirements which are not part of ISO 9001. Rest of the additional or different aspects among both are discussed in Table 2.4.

Table 2.4: Comparison between ISO 9001 and ISO 22000.

ISO 22000		ISO 9001		Details
Sections	Details	Sections	Details	
4.1.	General requirements	4.1.	General requirements	The general requirements for both standards are almost the same and there is only some difference in wording.
4.2	Requirements	4.2	Requirements	The requirements in relation to

	for documentation		for documentation	documentation for both standards are quite similar; however, ISO 9001 requires more detailed documentation.
4.2.3	Control of records	4.2.4	Control of records	Similar requirements for both standards.
5.2	Food safety policy	5.3	Quality policy	ISO 22000 requires that measurable objectives should be set by companies and that the objectives should support the food safety policy.
5.4	Responsibility and authority	5.5.1	Responsibility and authority	As per ISO 22000, food and safety issues should be reported and resolved by authorised personnel.
5.6.2	Internal communication	5.5.3	Internal communication	ISO 22000 puts emphasis on internal communication for ensuring efficiency of the food safety management system (FSMS).
8.5.1	Continuous improvement	8.5.1	Continuous improvement	The procedures for continuous improvement are provided in more detail by ISO 22000 as compared with ISO 9001.

(Source: Surak, 2014.)

### 2.3. TQM

Although ISO standards are the recognised standards for dealing with QMS in companies, there are other systems, tools and procedures through which quality can be improved, such as, TQM.

In the 1950s and 1960s, the works of Feigenbaum, Juran and Deming were recognised in Japan at a time when a team of Western scientists and Japanese engineers formed a committee of scholars to improve Japanese productivity and the post-war situation in

Japan (Ge and Yang, 2009). It created competition in manufacturing all over the world because of the quality products that were being produced by the Japanese. Because of this situation, US and European governments worked on quality issues, such as the use of poor quality raw materials, and QMS (Batt, 2006). The term TQM was first used by the United States Naval Air Systems Command to describe the Japanese approach to quality management. TQM evolved in stages, these being inspection, quality control and quality assurance. When all 3 are present, a state of TQM exists (Barrie, 2007). These stages emerged as industry developed and more researchers applied the concepts to the process of production. The timeline of the stages cannot be specified as it varies company to company. The various stages are depicted in Figure 2.4 below.

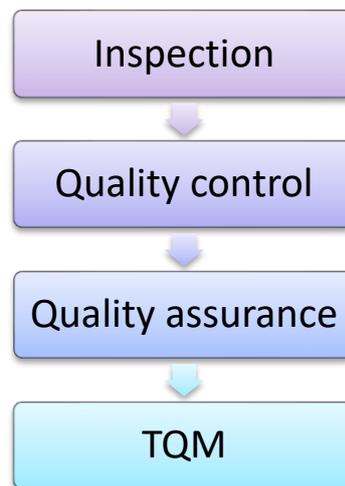


Figure 2.4: Stages of development of TQM.

Quality improvement or TQM must be at the heart of an organisation's production, communication and other departments (Hutchins, 1992). Juran argues that product quality is a small function of TQM (Juran, 1999). This clearly gives support to the fact that TQM is more than product quality; in fact, it covers all areas of a company and inspires all of a company's systems.

Elements of TQM include the systems and techniques used to bring about the necessary discipline and control for its achievement (Yong and Pheng, 2008). Process analysis in itself is an element of TQM (Janpen et al., 2005). Continuous improvement can be achieved only by putting in the effort to analyse processes, not just functions, and

accurate timing and reliable suppliers are the main ingredients for processes to work effectively. According to Tanner (2004) management is the most important element of TQM and the management style plays an important role in determining quality in processes. TQM becomes a way of life for a company. Other elements include the people in the company, organisational culture and teamwork. These elements define the TQM way and its importance to an organisation. If the elements are managed properly the organisation will experience TQM (Loughlin, 2008). The TQM model is more inclined towards checking, controlling and implementing quality and it neglects other aspects of a company such as the employees and the customer focus. Therefore, it has limitations.

Up till now, there is no widespread agreement with regard to what TQM actually is and what actions are involved in it (Creech, 1994; Juran, 1995). The key concepts of TQM as understood by the Navy are as follows (Holmes, 1992):

- 1) Customers' requirements define quality.
- 2) The major responsibility for quality lies with top management.
- 3) Through improvements in processes and systematic analysis, quality is ensured.
- 4) Quality is a continuous process that is organised throughout the organisation.

The techniques and tools that were used by the Navy were:

- 1) PDCA cycle, used for resolving issues;
- 2) ad hoc cross-functional teams and quality circles for solving urgent process issues;
- 3) permanent cross-functional teams that are accountable for improving processes in the long term;
- 4) steering committees for ensuring active management participation.

As there is no widely accepted definition of TQM, different researchers and organisations have presented their definitions highlighting different aspects of TQM.

According to the US Department of Defense (1988), TQM is a strategy that aims to

improve performance in a continuous manner and at every level. It is based on improvement efforts, fundamental management techniques and specialised technical tools to continuously improve the performance of processes, and is ultimately directed towards accomplishing goals related to quality, cost, mission, schedule and suitability. The most overriding objective of TQM efforts is to increase user satisfaction. According to Hoyle (2007), TQM is about the management philosophy and practices of a company that intends to utilise material and human resources in the best possible manner to accomplish organisational objectives. As per the definition provided by the ISO, TQM is the approach of management whose focus is on quality and which demands participation from all members of the organisation. TQM has long-term orientation and it emphasises improvement in customer satisfaction along with addressing stakeholders' welfare (Pfeifer, 2002). According to the American Society for Quality, TQM is a term that is used for describing the management approach to quality and it has various meanings. The main focus is on long-term success which is achieved by satisfying customers. The participation of all members of the organisation in question is crucial (Dusharme, 1995).

#### **2.4. Quality inspections and its importance for Chinese economy**

According to Khan, Jaber and Ahmad (2014), quality inspections are often conducted in relation to managing quality. They consist of using various methods to check, evaluate and test the features of one or more items to ensure compliance with quality standards. It is a vital task and is carried out by qualified specialists; inspections are not included in the role of manufacturing staff. Goods that fail to comply with the requirements are rejected or sent back for improvement. As said by Wang (2008), the first phase of the quality approach is considered to be quality inspection. The roots of the quality inspection can be found in the late nineteenth and at the beginning of the twentieth century when the principles for scientific management were established by Frederick Winslow Taylor. At that time, companies did not consider quality to be of importance and consumers had to buy the faulty items. In order to reduce complaints, the problem was resolved by replacing the faulty item with a new one. However, doing

this was too costly for companies. In order to reduce costs, manufacturers established the position of controller, a person who had to inspect the finished items. This early type of quality inspection was established as per the principle of ‘quality by sorting’ (Garcia, Maciel and Pinto, 2005).

According to Brosnan and Sun (2004), companies that focus on quality inspection consider the inspector to be a customer and behave accordingly. The best type of quality inspector is the person whose objective is to improve customer satisfaction. As Noordam et al. (2000) explain, there are 3 main objectives of a quality inspection:

- 1) recognising the quality issue;
- 2) informing the managers about the issue;
- 3) removal of the issue by management.

According to Sekar (2014), it is vital that companies carry out a quality inspection at the end of the manufacturing process. This will be the final inspection. However, management can carry out intermediate inspections at different phases of production. With improvements in statistical methods, a 100 per cent sample is not essential for inspection. If the quality inspectors fail to conduct the inspection efficiently then quality issues remain unresolved and customers have to buy items of low quality. Highly effective methods for inspection are preventative actions, where systematic inspection takes place to detect and correct potential problems, as well as quality self-evaluation. However, a number of authors, including Genichi Taguchi, are of the opinion that quality inspections do not produce value for customers. There are various techniques that could be used and the most common ones are discussed below:

- 1) **Inspection 100 per cent:** This is an inspection of all units manufactured. Because it takes a lot of time it is only applicable to goods that are produced in isolation or in small quantities (Gianni, Gotzamani and Vouzas, 2017).
- 2) **Statistical inspection:** This type of inspection is carried out with the help of a random sample based on size as well as sampling frequency. Management call this type of control a sample inspection. Inspectors adopt this method in the first stages of quality control (Zhang et al., 2014).

- 3) **Statistical process control (SPC):** This was the idea of Shewhart (1931), who produced the methodology for using statistics to identify possible problems before they occurred. With this method, supervisors can forecast issues on the basis of information relevant to the manufacturing process. This approach is used in quality assurance as well as quality management (Sun, 2016).

## **2.5. History of quality management in China**

As evident from the development in legislation, regulations and standards for quality, the Chinese government has expected to implement quality measures in manufacturing processes successfully in order to ensure quality goods for the market (Li, Anderson and Harrison., 2003). Although the government has, in fact, taken many measures, i.e. quality legislation, to ensure quality in the production of processed foods, the manufacturing industry still faces issues due to lack of interest on the part of owners, as noted by Tansy (2000). Chinese industry has arrived at its present state after going through various phases of different types of quality management as noted by Chin (2001). These stages were: the period of Russian influence, the Chinese experiential period and, finally, the transformational period (Chin et al, 2001). According to the research conducted by Kwai and his colleagues (2001), the Chinese economy overall underwent dramatic changes as it opened its doors to foreign business. It started with the learning stage in relation to quality standards and quality management. It then entered into the TQM period and, finally, it reached the stage of using ISO standards (Kwai et al., 2001).

Due to developments in QMS, the Chinese government took action to improve quality. These efforts were designed to imprint the concept of quality as noted by Sun (2000) on the minds of company employees. He found that 1985 saw the implementation of the concept of quality control in about 39,000 companies. By the end of 1997, in China, the number of companies which got certification of ISO for quality control was 12,839,000 (Sun, 2000).



Figure 2.5: Quality evolution in the world and in China.

(Source: Kwai et al., 2001.)

Figure 2.5 depicts the evolution of the quality management progress in both the world and in China. In 1930, after the efforts of Deming, Juran and others to improve the quality of production, companies all over the world tried to introduce aspects of quality control into their systems (Vietz, 2011). The most prominent of these were Motorola, Coca Cola, Toyota and the Delorean Motor Company. The 1950s was the era of inspection rather than the era of quality; it was a step towards TQM. The early research and methods used led to the development of QMS and the achievement of excellence by companies. China learned most of its quality lessons from Japan during the 1980s (Fisher and Niar, 2009). This awareness of Japan's methods provided an incentive for Chinese companies and they began ISO 9000 certification. With China's entry into the WTO, Chinese companies started to face many quality challenges as the competition became intense. At this point in time, the Chinese government took initiatives, such as educating the owners and managers of companies and providing quality procedures in the Chinese language.

The TQM period was introduced in China through a government directive, not as a direct market response (Martha, 2004). The next stage was the certification period, which started in 1991 and in which the China National Accreditation Committee for Product Quality played an important role (Li, Anderson and Harrison, 2002). This body

was established to standardise quality accreditation in accordance with national standards. The efforts of the Chinese government have made it possible for companies to be aware of the long-term consequences of ignoring quality management in their manufacturing processes (Tania, 2008).

Globalisation is a phenomenon that has resulted in both opportunities (e.g. low labour costs creating price advantage, and availability of raw materials) and threats (competition) for companies worldwide, and Chinese companies are no exception. Following the industrial revolution and China's entry into the World Trade Organisation(WTO), there were many new opportunities for Chinese companies (Jung et al., 2008) because they could produce goods with low labour costs. However, this opportunity turned into a threat for companies because of their low-quality products (Middler, 2009) and there were many unfortunate incidents concerning quality issues, e.g. international product recall due to substandard chemicals used in production, including pet foods containing low levels of poison; blood thinners in drugs; lead paint on toys; contaminated infant formula milk; and many others. To cut costs, Chinese companies repaired faulty products and used harmful ingredients to increase production instead of replacing the system and the ingredients (Aminpour and Woetzel, 2006). This created problems for importers because Chinese companies provided them with poor-quality products which then failed in the market (Middler, 2009).

Most companies retailing goods rely on Chinese manufacturers. This has caused Chinese companies to find and develop a cost-effective competitive advantage (Jung et al., 2008). However, this advantage is no longer a competitive one because Western retailers are looking for more sustainable advantages, such as quality, innovative products and new features. As far as China is concerned, implementing quality programmes is very difficult because most of the techniques used have been developed in Japan, Europe and the US. The national culture of a country does influence the need for quality methods and the way they can be implemented. In China, the government could only be assertive with regard to the introduction of quality measures to a certain degree. This was because the Chinese system and cultural values were under communist

control, creating centralisation in terms of planning, and bureaucratic control over systems. This kind of system creates a culture where no one makes a decision. Another important problem was the frequent job changes by unskilled workers who were the norm in China (Lee et al., 2011).

Furthermore, another important factor was the interest in short-term gains. Chinese company owners feel that it is unimportant to spend money on training and consider employees' health and safety. Relationships with customers are not mentioned because Chinese companies are oriented towards short-term profits (Tsui et al., 2006). Another barrier with regard to implementation of QMS in Chinese companies is sharing of knowledge with other groups. Staff work well in their own groups but do not accept information from other groups or from outside their organisation (Zou and Lee, 2010). Aspects such as uneducated staff, a closed culture and many other factors are hindrances to the implementation of QMS in Chinese companies. (Jung et al., 2008).

## **2.6. Quality standards in China**

According to Ke, Lennox and Xin (2014), Chinese standards for quality are either mandatory or voluntary. Mandatory standards are enforced by law and are concerned with the protection and safety of human health and property. All regulations and standards that are not mandatory are considered to be voluntary. According to Mol (2014), there are 4 categories of Chinese standards: national standards, professional standards, local standards and enterprise standards. These standards work in the form of a hierarchy.

Jia and Jukes (2013) explain that national standards are usually termed 'GB standards'. These have application for consistency across the whole of China and have been formulated for technical needs. In 2006, 21,410 Chinese national GB standards existed and, among these, 15 per cent were mandatory and 85 per cent voluntary. China's national GB standards are either mandatory or voluntary according to their prefix code: GB is the code for mandatory national Standards, GB/T is the code for voluntary national standards and GB/Z is for national guiding technical documents.

Most of the Chinese national GB standards have been adopted from ISO, IEC or some other developer of international standards and a database exists from which information on them can be obtained (Chen et al., 2014). In China, the regulatory bodies have an objective of significantly enhancing the number of standards.

According to Zhang et al. (2016), there are also some professional regulations and standards that are applied in China. Professional standards are generally termed 'industry standards'. These are formulated and applied in a case where there is no national GB standard, but where there is a need for technical regulation in a particular industrial sector in China. The industrial sector as a whole is involved with assigning codes to professional industry standards.

Zhang and Cong (2014) explain the reasoning behind local standards, which are applied in cases where there are no national or professional standards, but where there is a unified need for protection and cleanliness of industrial items within a local region. There are also different codes for local standards. For example, the code for mandatory local standards is DB + \* and the one for voluntary local standards is DB + \*/T.

Lin and Yao (2014) mention that, in addition to national, professional and local standards there are also enterprise standards. These standards are used for an individual company in China in cases where there is no suitable national, professional or local standard. However, organisations are encouraged to adopt national standards.

## **2.7. Needs for the establishment of food safety and quality commissions**

Chinese customers have begun to be aware of quality and quality standards. In order to constantly delight customers, it is, therefore, imperative for companies to implement and manage QMS in their organisations (Kapoor, 2007). Health issues are the major concern nowadays and these issues are usually raised due to non-compliance with laws, regulations and standards on the part of a particular company.

Internationalisation is the main reason for food to have found its way into international markets. Due to the availability of so many brands, concern for better and safer food has increased. To make food safer for customers, the United Nations Food and

Agriculture Organisation (FAO), in collaboration with the World Health Organisation (WHO), has designed the Codex Alimentarius Commission (CAC). This is a collection of internationally recognised standards, codes of practice, guidelines and other recommendations relating to foods, food production and food safety. It was created to ensure fair practice in the manufacture and distribution of processed food. In this collection, standards have been mentioned in broader terms and it includes the specific standards for commodities and most general standards for labelling and hygiene (Raju, 2002).

A global report published by the WHO indicated that about 30–35 per cent of people were diagnosed with food poisoning due to the worst practices in food processing (WHO, 2003). For example, in 2008, the Chinese melamine incident made the world much more aware of the situation in relation to the manufacture of baby dairy products (Branigan, 2008; Loretta and Jason, 2009).

## **2.8. Global food industry and application of QMS**

Food quality is an important aspect of the food and beverage industry. As consumers are becoming more aware of food quality and the consequences of consuming unsafe food, companies in the food sector are taking extra care with their production processes (Luning et al., 2005). Unsafe and poor quality food is responsible for consumer mistrust. To overcome this problem, companies have realised that they need to invest in QMS (Fisher and Niar, 2009).

Food quality can be defined in terms of four overall features that identify it: dietary value, sensory value, the ease of availability and safe production (Sikora and Strada, 2004). These features define the food quality in terms of its safety (including preservatives, its value for health and the way it is packaged). For Sikora and Strada, the two most important out of the four factors are the safe production of food and its nutritional value. If the food has no nutritional value, the quality goes down. Similarly, with regard to health and safety – if the chemicals used in producing the food are not healthy or safe for human consumption, then consumers will not accept its poor quality. The main features of quality according to Sikora and Strada are depicted in Figure 2.6.

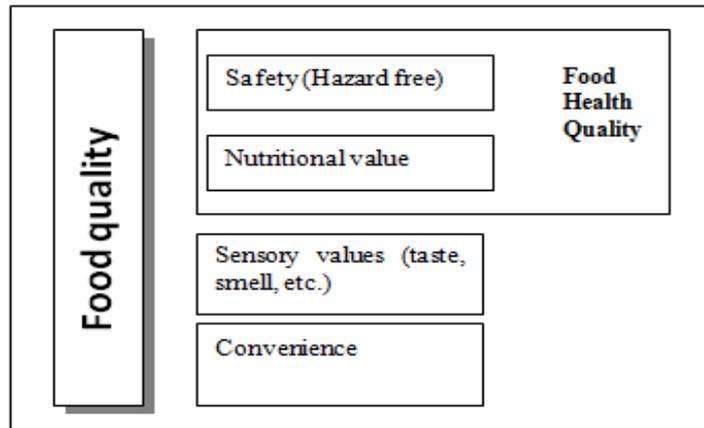


Figure 2.6: Food quality.  
 (Source: Sikora and Strada, 2004.)

In Figure 2.6, food quality includes every aspect – the fact that it should be produced safely, its dietary value, sensory values and its availability (Jaap, 2006). To ensure the inclusion of the quality-related features of food, it is imperative that food companies comply with various laws, regulations and standards in relation to QMS (Bisgaard and Mast, 2006). Some of these laws, regulations and standards are mandatory and some are voluntary, chosen by the companies to suit their own situations (Fisher, Cribb and Peacock, 2008).

Mandatory regulations include GMP, Good Hygiene Practice (GHP) and HACCP (specifically for food safety). Voluntary regulations and standards are Quality Assurance Control Point (QACP), ISO 9000, ISO 14000 and various others for quality of food (Sikora and Strada, 2004). The safety assurance systems (includes GMP, GHP and HACCP) and the QMS that ensure quality within the production and distribution cycle of the product require coordination in order to complete the full circle of quality. QMS work within an organisation and beyond to ensure both the safety and quality of the products (Fisher, Cribb and Peacock, 2008).

### 2.9. Quality standards for food industry

As mentioned previously, there are many quality standards which are specific to the food industry. Due to nature of food industry, the production of processed foods requires the utmost care in the selection of raw materials, processes and the chemicals required to maintain food safety and the taste of food. Food processing is a sensitive issue

because of hazards involved that can impact directly upon the health and safety of consumers (Surak, 2005). These hazards are the result of all types of risk, such as the biochemical risk of disease (Surak, 2007). To ensure quality management and hazard control in food manufacturing and processing, standards from organisations such as the British Retail Consortium (BRC), the Safe Quality Food programme (SQF) and Global Food Safety Initiatives (GFSI) have been introduced. Organisations such as Coca Cola, WalMart, Denizen, Cargill and other big giants, either retailers or companies, follow these standards in production and retailing (Clute, 2008). The standards help companies to maintain the standard and quality of the food they produce and address consumers' concerns with regard to producing food in a way that is not harmful to health (Rogers, 2011).

The food industry is highly competitive and requires companies to be efficient in regulating food safety in order to gain maximum profit and market share. As a result, they take the necessary steps to ensure they remain competitive, such as food analysis before, during and after processing (McClements, 2005). Other things they do to this end include employee training and skills development in particular aspects of food processing to ensure consistency and improved quality at every turn. (McClements, 2009). These measures are being taken by food processing companies to ensure that quality is maintained and no ingredient is being used that will harm consumer health (Narayanan, 2010). Some organisations that do not follow these guidelines are often dropped from the supply chain and lose market share in the long run. The QMS that food companies implement relates to two important standards, GMP and HACCP (Poza et al., 2009).

Table 2.5: Food safety standards.

Food safety management system (FSMS)			
	Quality management systems applied to food safety		Prerequisite Programmes (GMP)
HACCP system	Quality assurance (management requirements)	Quality control (operational requirements)	Premises
	Management commitment	Incoming materials	Facilities
	Organisational structure	Product realisation	Services
	Resources	Measurements	Maintenance
	Documentation	Traceability	Cleaning and disinfection
	Communication	Non-conformities	Personal hygiene

Table 2.5 depicts the food safety management system and the way it works. The main aim of the system is to identify those factors that create problems by applying the hazard control system (Clute, 2008). When quality management is applied to food safety it indicates that certain requirements regarding the implementation and running of such a system have been met. These requirements include documentation, resources, communication, and organisational structure, the traceability of a problem, product realisation and quality control of the raw materials. A quality management system also verifies the suitability of prerequisites, such as premises, facilities and arrangements for personal hygiene (McClements, 2005). So, a food safety management system helps in determining important details regarding the problem areas of production so they can be improved. The food processing industry must comply with the quality standards and must also apply TQM in so doing (Bisgard and Mast, 2006).

## 2.10. Some important regulations

### 2.10.1. Food safety regulations

According to Friedman and Van Camp (2016), the contemporary food safety regulations were formed on logical scientific standards for protecting consumers from illness and death due to foodborne diseases. In the contemporary information age where

people are highly involved in using social media, the change in expectations is the result of experiences 100 years ago. Nowadays, consumers are aware of incidents concerning food safety that happen very suddenly, sometimes even before companies get the information. The importance of food safety regulations has increased dramatically over the years (Matthews, 2016).

Knezevic (2016) states that food is represented as one of the most-traded global products and can cause a major risk with respect to safety if it is not controlled properly. With increased globalisation, careful monitoring of the supply chain needs to take place in order to ensure that food safety standards are properly met. All around the world, governments are acting swiftly to update and modernise their legislation. Marks (2016) highlights the fact that on the basis of increased adoption of industry-leading practices, regulations relating to food safety have become outcome based and transparent. Governments are also searching for ways of harmonising their regulations about food safety across borders in order to keep the flow of products moving seamlessly with the help of the supply chain.

As explained by Li et al. (2016), food safety in China is controlled by the China Food and Drug Administration (CFDA), rebranded in 2013 from the former State Food and Drug Administration (SFDA). A large number of overlapping regulators have been replaced by the CFDA with a remit similar to the US Food and Drug Administration (FDA), to streamline processes of regulation to ensure the safety of food and drugs. The State Council of the People's Republic of China (State Council) has control over the CFDA and it is considered to be a competent authority.

### **2.10.2. Food safety law in China**

In 2015, China's 2009 Food Safety Law was revised by the Standing Committee of the National People's Congress. After the revised Food Safety Law was introduced, stricter controls were imposed on the production and management of food. It is important for the regulatory bodies to review food safety practices for ensuring compliance with the law and for companies to do the same voluntarily in order to limit their exposure to compulsory enforcement by the regulatory authorities which would result in lower

profitability (Roberts and Lin, 2016).

Some draft amendments to the Implementing Regulations of the Food Safety Law were published by the CFDA on 9 December 2015 for public consultation. These draft amendments provided insights into the way the government was intending to implement and enforce the new Food Safety Law (10 chapters and 154 articles).

The main points of the changes are as follows:

- 1) Record-keeping and registration mechanisms for food producers and importers: Basic enforcement powers for safety of food are to be divided among various agencies. Since 2013 the State Council has initiated an organised adjustment in order to establish a centralised system. This centralised system is explicitly given under the revised law. A record system is required to be maintained by food producers for recording the supply and evaluation of food ingredients and products related to food. This kind of record has to be kept for a six-month period after the expiry date of food items (Xiao and Gao, 2017)
- 2) Online food platforms: Ordering food online is a global trend and a number of issues have been raised regarding the safety of food bought over the Internet. According to the revised law, providers of third party online food trading platforms need to review traders' permits and the real identity of traders is required to be registered properly. If the provider of the platform is made aware of violations of food safety, then these kinds of illegal activities must immediately be stopped by the company. In the case of serious violations, the internet platform itself must be shut down immediately by the provider. If consumers suffer harm from food items bought through online trading platforms, then damages can be demanded by the consumer from the food trader (Sim & Yang, 2016).
- 3) Health foods: Health foods are divided into two categories, dietary supplements and function health foods. As per the new China Food Safety Law, those health foods that include unapproved ingredients should be registered with the CFDA. The CFDA record is also needed for health food items in either category that are imported for the first time. In addition to this, records of other healthy food items

must be kept with provincial-level FDAs. From the draft Implementing Regulations, it has been proposed that the recording must be done within three months of import (HFG, 2016).

- 4) Baby Foods: The revised law contains stricter rules for infant formula food. A complete record of ingredients, formula, food additives and labels in relation to baby formula food should be kept with provincial-level FDAs and, in addition, formulas for baby milk must be registered with the CFDA. Reports and other documentation describing the process of development and the protection of the formula must be submitted. Infant formula milk that is produced internationally and imported to China must not be repackaged (Xiao and Gao, 2017).
- 5) Genetically modified (GM) foods: Standards have been introduced in relation to GM foods and proper requirements with regard to packaging have been introduced. It has been proposed by the draft Implementing Regulations that the words ‘non-genetically modified’ cannot be utilised on GM foods or GM raw materials that have not been accepted by the authorities (Kwan and Lam, 2016).
- 6) Foods for special medical purposes: Formula foods designed to meet particular medical objectives must be registered with the CFDA. Information required for registration is: the formula of the product; the technology used for production; content of labels and other materials depicting the safety and nutritional appropriateness of the product; and the clinical impact of its particular medical use (BRILL, 2016).
- 7) Increased sanctions: In comparison to its last version, stricter sanctions on violations of food safety are imposed by the new law. Engaging in the production of foods without a proper permit would be subject to an administrative fine (Clever, 2015).

According to the Chemical Inspection and Regulation Service (2016), the revised law is considered to be the strictest food safety law in the history of China. It illustrates the proactive behaviour of the Chinese government in cracking down on scandals related to food that have had an impact on the country during the past few years and which

have also led to consumers having little confidence in local products. As highlighted by Kwan and Lam (2016), the revised law puts more emphasis on supervision and control of each step involved in the production, distribution and sale of food products. Different provisions are set for food products that have been highlighted in incidents relating to safety during the last few years, particularly health foods and infant formula milk. Meanwhile, new kinds of activities for trading food have also been taken into account in the revised law, including selling of food on a third-party Internet trading platform and food that is imported with the help of e-commerce channels.

It can be summarised that the new Food Safety Law is important for China as its revisions will help in improving the quality of food products and should enhance public confidence in China's food industry. It contains many provisions that serve to clarify, consolidate and expand pre-existing restrictions in relation to the safety of food under particular regulations for different categories of product, but with high penalties for non-compliance. The revised law gives more authority to regulatory bodies and it also imposes strict guidelines for the manufacturing of consumer products; penalties for non-compliance are strict too.

### **2.10.3. HACCP**

The HACCP standard was developed by an independent body, the Codex Alimentarius Commission. HACCP is a proper methodology that enables the management system of a company to ensure quality in food processing. Through HACCP the company can conduct an analysis of food safety in terms of hazard (Martha, 2004). HACCP helps in various tasks: first, identification of the critical control points in the organisation; second, establishing critical limits for each critical control point; and third, monitoring the critical control points by developing various procedures. HACCP not only develops, but also designs the remedial actions to rectify the critical limit defilements (Riley, 2012). This standard also requires documentation in the form of record keeping to ensure the formal implementation of the system. Finally, it helps in the validation and verification of the QMS. The outbreak of salmonella in low-moisture food items has been a new concern among US citizens (Lee et al., 2011). The years 2007 and 2009 saw

the biggest incidences of the virus. This resulted in the Grocery Companies Association (GMA) implementing HACCP to validate and verify (through the collection of a variety of data – including scientific, historical and technical information) the processes through which such products are packaged in order to resolve the problem (Bozdogan, 2010). Designated plant employees review the records before the release of the product and verification of the critical control points is done in order to control parameters (Aljendro, 2010).

#### **2.10.4. GMP**

According to Alsuliman et al. (2016), GMP is the acronym for Good Manufacturing Practice. It includes the regulations issued by the US Food and Drug Administration in accordance with the federal Food, Drug, and Cosmetic Act. Such regulations impose certain responsibilities on companies as well as packagers of drugs, food and cosmetics, along with companies that package blood, to take practical measures for ensuring that the goods or items are safe, clean and fit for use. These are the standards which apply to the procedures used in the manufacturing of food items and must be followed in order to ensure best quality practices both in relation to the construction of the plant and the operations to make sure that the food produced is safe to eat and healthy (Charisis, 2004). This standard also includes the rules with regard to the hygiene and sanitary requirements for the workforces involved, for the facilities, and for the utensils and equipment used. Food processing supplies and checking procedures are also covered (Hyder, 2006).

Abdellah, Noordin and Ismail (2015) highlighted the fact that the rules and regulations included in GMP require a quality approach to production with the intention of making companies capable of reducing or finding out incidences of defects, mix-ups and faults. In addition, these regulations protect buyers from buying an item that may be dangerous. Those companies that fail to comply with the regulations included in the GMP will have fines imposed upon them. Lawsuits can be brought against them and the management can even be jailed.

Cusato et al. (2014) state that the regulations included in the GMP discuss problems in

relation to record-keeping, workers' qualifications, hygiene, tidiness, tools authentication, procedure justification and complaint management. Furthermore, the majority of the GMP requirements are flexible and easy to understand, enabling each company to make confident decisions about which essential controls to implement. An important point to mention is that GMP is, at times called 'cGMP'. The 'c' stands for 'current', and reminds companies about the requirement to use updated and upgraded technologies as well as systems (Ahmed, 2015). In addition, GMP is intended to reduce the risks associated with the production of pharmaceutical goods (Osman, 2016).

#### **2.10.5. BRC food standard**

The BRC food standard was introduced in 1998 for assessing the companies supplying retailers' own-brand food items (British Retail Consortium, 2015). The BRC standard requires companies to use HACCP, which contains best practices for the food sector (Fernie and Sparks, 2014) and is not applicable to companies in other sectors (British Retail Consortium, 2013). In addition, this standard is not only used in the UK but internationally too, and it is accepted globally. It works on the basis of companies producing evaluation programmes for suppliers (Bar and Zheng, 2016).

This standard is for consumer food products – their manufacture, packaging, storage and distribution (Bonn et al., 2003) and is used by most of the companies in the industry. British Retail Consortium certification helps different brands to fulfil their lawful duties in protecting consumers' health. The main benefit of this certificate is that it can help suppliers to reach the UK, French and German markets (Bozdogan, 2010).

#### **2.10.6. FSSC 22000**

According to Soares, Martins and Vicente (2016), a framework for efficient management of an organisation's food safety responsibilities is provided by FSSC 22000. FSSC 22000 is recognised by the benchmarking body for the harmonisation of international food safety standards as being on a par with the ISO 9001 and ISO 14001 standards. It indicates whether or not the business concern has a strong and efficient FSMS for fulfilling the requirements of regulators and customers.

FSSC 22000 is fully recognised by the Global Food Safety Initiative (GFSI) and is based on existing ISO Standards. It was established for meeting the requirements of the food division at an international level. Different international standards, including ISO 22000 as well as ISO 22003, are the foundations for FSSC 22000. The primary version of FSSC was created in 2009. Since then and until October 2016, more than 13,000 organisations have been certified (Hofstede, 2016).

According to Street (2015), it is essential to understand that FSSC 22000 is an entire certification scheme for food safety management systems and the entire food supply chain can use this model, including those sectors that need more technical specifications. Documentation for the scheme asks why an organisation needs to attain the certificate and it is expected that the documentation will be used by organisations for assessing their own systems prior to necessary improvements being made. Completed documentation acts as a reference for a company's certification (Von Hagen, Wozniak and Lamolle, 2014). The certification body can use the documents as a reference for evaluating the ongoing compliance of the food safety management system of the candidate company (D'Souza, 2014). The benefits of this certification include reduced operating costs, improved customer satisfaction, improved relationships with stakeholders, improvements to the legal framework, improvements to risk management procedures and a clear ability (due to compliance) to win more business (Morton, 2008).

#### **2.10.7. Other regulations**

Other regulations include those of the GFSI, which was established in May 2000 (Muse, 2005). This is a network of about 176 retailers and about the same number of suppliers from 50 countries (Charisis, 2004). In 2002, German retailers working together on the quality assurance board of the EHI Retail Institute developed the International Food Standard in European Agribusiness (IFS), its purpose being to ensure food safety and quality management from the point of view of retailers. It is similar in content to the BRC standard but has a scoring system (Riley, 2012). Finally, SQF is a standard that is specifically oriented to the dairy industry, and also includes fish, eggs, fruit, vegetables and meat processing in its remit. In addition, this standard focuses on the storage and

distribution of such items (Mark, 2008).

### **2.11. Concern of companies regarding the supply chain for baby dairy products**

With regard to baby dairy product companies, several concerns are present in relation to the production of safe milk. Most of these concerns are related to the supply chain of Chinese companies (Blanc, 2011).

#### **1) Weak regulation and enforcement:**

Without enforcement of the law the supply chain cannot be managed. The melamine incident in China was proof of weak monitoring (Bozdogan, 2010). If the manufactured products are not rigorously checked at all stages of the manufacturing process, the safety of the product cannot be maintained.

#### **2) Cheap and worthless substitutes:**

Product safety is of the utmost importance, especially where baby dairy products are concerned. In order to maximise their profits, the milk companies adulterated the milk, causing harm to the consumers. This was not a very ethical practice either (Magnus, 2012). Substitution and adulteration can only be controlled by monitoring.

#### **3) Uneducated/untrained workers:**

Most of the dairy farms are located in rural areas, where most of the workers are either uneducated or unskilled (Wang, 2013) and are hired by the companies to save costs. These employees have no training, no skills and no knowledge of health and safety issues (Magnus, 2012) and many contaminate the milk without realising it.

#### **4) Limited availability of relevant information:**

The milk from various sources that is collected for processing is mixed together at various collection points and the source cannot be determined. This is not a very desirable state of affairs and can cause health problems with contaminated milk getting into the mix (Bozdogan, 2010). The documentation on the milk collected from various farmers is limited and so a correct picture cannot be formed which, again, causes problems.

## 2.12. Summary

To summarise, it can be said that there are two perspectives of quality, one is related to consumers and the other is related to companies. From a consumer's perspective, quality is defined as being perceived by the look of a product and how it is used (Chin et al., 2001). Singhal (2012) defined the company perspective as meeting standards which conform to the expectations of consumers. In order to analyse the implementation of QMS in the Chinese baby dairy product industry in depth, it is important to first understand the meaning behind quality management. Quality management is a continuous process, and by implementing it organisations manage certain activities by employing guidance, monitoring and direction in relation to quality activities and, furthermore, it applies to the management of the whole supply chain (Kapoor, 2007; Chowdhary, 2005). Many other definitions also exist but this definition is more relevant to the present research. However, there is no single definition of quality (Greaves, 2006) and various scholars have defined the concept in a different manner (Deming, 1986; Crosby, 1979; Juran and Godfrey, 1999). The importance of an organisation implementing quality is that it allows the company to remove defects and also helps to achieve organisational goals (Tanner, 2004). It helps in fulfilling consumers' expectations and is a potential source of competitive advantage for a company (Yiming, 2012b). All that has been said indicates that quality is a major concern for consumers and companies should keep improving quality in order to ensure satisfied consumers.

The necessary elements of quality have been identified in the literature, namely customers, employees and process (Chin et al, 2001; Crosby, 1979; Boon and Kurtz, 2006; Singhal, 2012; Corbett, 2007). When all of these elements are addressed, the quality concept in total will have been embraced by an organisation and, hence, there will be no defects in products. Organisations manufacture products and provide services for customers and it is important to fulfil their needs. Employees are the people who carry out the production processes and they need to be trained. End products are manufactured using processes. The whole supply chain management process should

adhere to the quality concept and this includes all the different stakeholders involved.

There are different laws, regulations and standards with regard to managing quality, such as the ISO 9000 series of standards, HACCP, GMP and TQM. The ISO standards, for example, ensure that products and services are safe, reliable and of good quality. However, many organisations rely on informal ways to manage quality (Nanda, 2016). This means that quality work is dependent upon the staff, not the systems or processes because these are the people who have to implement the systems and streamline the processes. But when employees are mainly responsible for quality, this can lead to a problem if the employee who has assumed responsibility for quality issues leaves the company, because this will result in disruption in the implementation of QMS (Chang, 2009). Such a way of working is not considered to be an integrated system. The above-mentioned standards deal with the achievement of quality at all levels and include all business processes (Emiliani, 2003). TQM is based on 4 steps: inspection, quality control, quality assurance and total quality control. These are all interrelated and all need to be applied in order to control quality. Achievement of quality is a continuous process (Harry, 2000).

After discussing the importance of quality management (e.g. fewer quality problems, enhanced customer satisfaction and enhanced revenues) in Chinese companies, it is important to remember the incidents that took place in Chinese baby dairy product companies that gave rise to the need for implementation of QMS. The key drivers for and barriers to implementation of QMS have been considered, as has the role of the government in this process. According to the literature review, Chinese companies in all industries have undergone dramatic changes with respect to quality management and they are still reforming their QMS. In 1985, 39,000 Chinese companies implemented quality measures (Sun, 2000). By the end of 1997, 12,839,000 companies had registered for some kind of quality certification (Sun, 2000). Indeed, many companies already had QMS to some extent, but now these were endorsed by compliance with laws, regulations and standards. This indicated that the government was now exerting pressure on companies to apply quality standards in their daily activities.

## **Chapter 3: The Implementation of QMS in China**

This chapter specifically focuses on the implementation of QMS with special emphasis on external pressures and the roles that they play in this process. This chapter reviews the quality management especially in context of China. Moreover, second objective of this research is to review the recognition and awareness of external issues (the part played by the Chinese government, legislation, corruption, economic pressures) that are influencing the actions of selected companies involved in baby dairy product manufacture. This chapter examines the external issues influencing the QMS in China.

### **3.1. Development of QMS in the global market and in China**

Recently, QMS have become the main focus of majority of successful organisation. Customers have now more awareness of and accessibility to products and services all over the world (Elliot et al., 2010). This has caused organisations to take a lot more interest in quality issues and improve their processes. At first, organisations only worked on developing quality management in one department (Jaap, 2006). This more or less served as the department for control rather than quality. It has recently been accepted by practitioners and researchers that every process and department must be involved in maintaining the overall quality of the products (Mitra, 2016; Cooper, 2016). Evolution is the key to everything, so quality management is also evolving and taking on new dimensions in its overall framework.

#### **3.1.1. Developments in quality management practices**

Quality is not now seen as being the sole premise of the quality assurance/control/inspection department. It has been integrated into all of a company's systems rather than being a standalone department and it has also been integrated into the way everyone works at a particular organisation. Quality, as perceived by many organisations, consists of the implementation of quality standards, and monitoring of these by a company's own quality assurance/control/inspection department as well as by the appropriate government departments. In reality, as has been argued by modern day management theorists (Ren et al., 2010; Yvonne, 2008), quality management is

defined by its application to everything related to the organisation – products, services, processes and the employees.

### **3.1.2. Quality management in China**

At first, quality systems were adopted on a temporary basis and in an inconsistent way that varied from project to project. Recent developments in Chinese companies have led to change management and the system of profound knowledge (Lee et al., 2011). In the system of profound knowledge, organisations are more successful in transferring the knowledge of one resource to another. For example, this could mean employees working on a particular process showing new employees how it works (Shehane, Huan and Ali, 2011). This enables other employees to take on the same role without any problem. For organisations to be successful in implementing QMS, it is necessary to bring about cultural change. This refers to effecting a change in the way Chinese companies see production, i.e. keeping in mind the short-term profits (Middler, 2009). This type of cultural change can also be achieved by government intervention where they are in position to enforce such standards and legislations which are useful for quality management. The results can be seen in Western countries with better implementation of quality management principles through government directives and a competitive environment (Zou and Lee, 2010). Market competition induces companies to introduce practices that will help retain customers in the long term. In the same way, Chinese companies must also be motivated to understand the implications of substandard production. Most of the Chinese baby dairy product companies, after rejection of their products, now understand the implications of using ingredients that can harm human health (Shehane, Huan and Ali, 2011). From this, it can be analysed that even without government intervention, this cultural change could be accomplished where companies have self-realised the need for improving quality as they understood that with substandard products they cannot compete in this competitive environment.

### **3.2. Implementation of QMS**

In a study conducted by Shehane (2011) on the ‘strategic framework for Chinese quality management’ they discussed quality management in China from several angles. The

first was quality management programmes, including the recommendation that Chinese companies have realised that they had to establish some sort of quality presence in the countries they were exporting to. The export countries also became the focus of quality for Chinese companies (Davison and Ou, 2008). The second is the measurement of quality. In China the most important obstacle is the definition of the quality measurement parameters (Mitchell, 2013). When doing business in China, the cultural value of *Guanxi* should be taken into account. *Guanxi* refers to the use of social networks and influential relationship for business dealings (Shehane, 2011). Another point to consider in relation to quality measurement is that the quality management also needs the emphasis on vendor partners and any vendor partners, selection process of vendor partner must be transparent and proper documentation should be maintained so that record could be kept (Roth et al., 2007). The third point is that the contract is a very important aspect of Chinese business and if it involves a lot of legal requirements, then it is not undertaken. (Fermlin, 2008). The fourth point to consider is the decision support system, which is very important when considering the introduction of complicated QMS. The fifth point is continuous improvement of the system and the sixth is the knowledge management among all involved supply chain actors. After stringent QMS have been introduced and every effort made to ensure the systems are impregnable, loopholes may still occur through which faults can slip (examples include traces of the harmful chemical Flavacin M1 in products made by the Mengniu Dairy Company in China). After the melamine incident and other similar quality issues, people are reluctant to buy Chinese products because of quality concerns (Akgunes and Culpepper, 2011). Customers have developed the perception that Chinese products are of low quality and this needs to be changed (Sarwar et al., 2013). There is still conflict between theorists on issues relating to the implementation of QMS in Chinese companies (Elliott et al., 2010). According to Chua, 2012, China is actively involved in world trade, which has urged it to accept and implement Western values and expectations (Chua, 2012). A study conducted in 2001 by Pun and Ho suggested that there is no influence of values on quality programme acceptance and implementation (Pun and Ho, 2001). On the

other hand, theorists think that *Guanxi* (as already mentioned) is active in China, but it has a diminishing influence which will become even less in the future (Elliot et al., 2010).

### **3.3. TQM in Chinese companies**

TQM has been the way in which Western companies have ensured quality in their own organisations. The concept of TQM has been applied fully to Chinese companies and is actively promoted by the government in an effort to eradicate the dreadful impact of previous quality issues (Robitaille, 2006). TQM is about implementation of quality in the long term and Chinese companies have been applying its concepts to improve their QMS with the support of the government (Fermlin, 2008). A study was performed by a group of researchers with the aim of understanding how TQM is applied in Chinese companies and how it works to facilitate quality. They found that the first stage of implementing TQM was its acceptance by management and employees (Yusuf et al., 2007). This was monitored and assessed and the results from data that was collected from 120 companies showed that 72 per cent of Chinese companies understood TQM and were implementing it. The companies selected had started implementation 5 years ago. The second stage with regard to the implementation of TQM was the extent to which the QMS were being implemented and followed. It was found that 63 per cent of Chinese companies had implemented TQM fully and, in fact, no company claimed that the implementation of TQM had failed (Aquilani et al., 2017).

### **3.4. Impact of the melamine incident**

The melamine scandal damaged the total market share of Chinese baby dairy products in their own country and was the major reason why people in China distrusted the local products. Although the Chinese government did take the whole issue very seriously, the problems have still not been entirely solved (Chen, Zhang and Delaurentis, 2014). Chinese parents are now more interested in buying infant formula milk from what they consider to be much more reliable sources, foreign companies, such as Nestle, rather than from local ones, such as Sanlu (Gao, 2008).

There were two very important factors responsible for the melamine being added to milk and the resulting situation (Yusuf et al., 2007). First, the local Chinese companies tried to reduce their prices in order to compete with foreign infant formula milk brands. This was only possible by using cheaper raw materials, in this case, milk; local farmers mixed melamine and other harmful ingredients with the milk to raise the protein content, and companies sold the infant formula milk at lower prices (Fermlin, 2008). They wanted to gain more market share, but their actions led to exactly the opposite and their market share actually dropped dramatically. The farmers/companies that had adulterated the milk put the lives of children in danger. Second, the price of the infant formula milk became a challenging issue. Local companies tried to show the consumers that with more protein content the price of the infant formula milk had actually been reduced to a level where it was lower than that of foreign brands (Gao, 2008). The farmers/companies had been able to mix melamine and other harmful hormones into the raw milk because quality measures were non-existent. If such measures had been in place for the companies to comply with then the melamine situation would never have happened.

#### **3.4.1. Melamine contamination dilemma**

As highlighted by Yong-Ning et al., (2009), due to melamine found in the infant formula milk, six new-born babies died with kidney stones or kidney failure and the bulk of the blame was put on the company involved, Sanlu. Most of the samples taken from this company had positive melamine traces. Sanlu's products were mainly produced for middle-income Chinese consumers. This unfortunate situation shows how the vitally important aspect of quality management in the baby dairy product industry was neglected both by the companies involved and the government. Ignorance on the part of the companies was also a factor. Reports showed that the regulatory bodies had not played their part effectively and, as a result, quality procedures had not been followed (Yusuf et al., 2007).

Traces of Flavacin M1 (another harmful chemical) were found in the milk samples taken from another company, the Mengniu Dairy Company. It also tested positive for

melamine in its infant formula milk (Qiao, Guo and Klein, 2012). The Mengniu Dairy Company, which is based in Inner Mongolia and was established in 1999, is a company and distributor of dairy products under the Mengniu brand name (Spears, 2008; Wang, 2008b). At the time of the scandal, the company recalled its products and gave a public apology for the part it had played (Leuang and Benitez, 2008). Naturally, as a result, the reputation of the company was tarnished. Even the Chinese government removed the company from its status as China's national dairy.

The Mengniu Dairy Company was accused of something similar in 2009. This incident concerned traces of osteoblast milk protein (OMP) in the company's infant formula milk, the Mengniu Milk Deluxe brand. In order to try and clear its name, the company issued a statement pleading innocence. In this statement, the company blamed the feed given to cows instead of their own faulty QMS (Elliot et al., 2010).

In view of the above problems, the Chinese government passed a food safety law in February 2009, the purpose of which was to ensure maximum control over the quality of infant formula milk produced (Qiao, Guo and Klein, 2012). The major concern still remained, the fact that law enforcement was the main issue, not the legislation itself (Enderwick, 2009). The Chinese government also established a safety commission, the role of which was to ensure that the quality assurance regulatory departments operated effectively, bodies such as the Administration for Quality Supervision, Inspection and Quarantine (AQSIQ), the State Administration for Industry and Commerce (SAIC), the Ministry of Health (MOH) and the Food and Drug Administration (FDA). The new regulations increased penalties for those who did not comply with the new rules. Manufacturers were now going to have to bear full responsibility for problems arising during production and for non-compliance with the standards.

As said by Hembray (2008), the safety commission regulated the work of AQSIQ, SFDA, SAIC and MOH to ensure implementation of the new safety law. It has yet to be decided how effectively this is working because the effectiveness of the commission is in doubt due to its failure to carry out its duties properly in many situations which are

discussed below.

### **3.4.2. Other scandals and their consequences**

There have been several other infant formula milk scandals in China that have made Chinese parents very cautious about local products (McDonald, 2012).

Other scandals include: (1) The sale of out-of-date infant formula milk by a major Chinese company, the Xile Lier import and export company in Suzhou. Xile's director bought the infant formula from the Hero Group, a Swiss Manufacturer. Xile repackaged the infant formula milk, which has passed its use-by date, and sold it under the brand name of Hero Nutrdefense infant formula (Steger, 2013). (2) Presence of the cancer-causing toxin, aflatoxin, in infant formula milk (Astley, 2012) reported by the *International Tribune*. Health and safety officers checked 5 companies and their products and found an excessive amount of aflatoxin, one of the substances that can cause liver cancer, in infant formula milk under the brand name of Nanshan Bywise. Two companies found to be involved in this scandal were Bright Dairy and Hunan AVA Dairy. (3) High levels of mercury were found by Chinese inspectors in infant formula milk produced by Mongolia Yili. Moreover, the contaminations added during the production of milk at dairy farms are the reason of this high level of mercury. The blame of such quality issues is at the small farmers who did not take care of contaminated materials. The authorities forced the company to recall 6 months' worth of production and destroy it. Mongolia Yili was also involved in the 2008 melamine scandal (Warren, 2012).

The tainted infant formula milk has destroyed the reputation of the Chinese manufacturers who were producing it and Chinese products in this sector were rejected by consumers globally due to the various harmful substances that were found in certain of them: melamine, carcinogens, chloride, mercury and various other substances were found in more than 22 China based companies (Hatton, 2013). Melamine was even found in product samples that were taken from Chinese restaurants (Schelin, 2008) and China found that it was facing allegations from all over the world. Due to the scandal

that broke in the infant formula milk industry in China, the EU declared a ban on Chinese baby dairy products, and especially on infant formula milk, in September 2008 (McCartney, 2008). In the same year, the UK and France removed all such Chinese imported products from their shops. In November 2008, the FDA in the US issued a general warning against Chinese baby dairy products (Elliot, 2010). Hong Kong also put a ban on such products coming from China, as did Hungary, Finland, Iran, Lebanon and Japan (Hatton, 2013). Furthermore, Japan increased inspection of imports of baby dairy products coming from China (Warren, 2012).

In China, parents were, naturally, reluctant to buy the locally made infant formula milk and they either bought imported products or tried to smuggle them in. Parents who could not afford to pay higher prices for imported goods tried to smuggle in the formula milk from the US, Hong Kong, the UK and Australia (Astley, 2012). Because China had made it easier to visit Hong Kong, parents rushed over there to buy US manufactured formula milk that was cheaper because it was not heavily taxed (Hatton, 2013). The Hong Kong administration eventually took action and restricted the amount Chinese parents could buy two tins at a time.

The 20 per cent growth in the Chinese baby dairy product industry during the years before 2008 came to a stop. It had employed around 3 million people (Warren, 2012), most of whom were working for small milk companies who accounted for about 80 per cent of the total milk produced in mainland China (Hatton, 2013). All the scandals have pushed many companies to the brink of survival and jobs have been threatened.

The Chinese baby dairy product industry had been worth around GBP £19.73 million and was a major source of revenue for the Chinese economy. Unfortunately, due to all the scandals, it suffered a great deal (McDonald, 2012).

### **3.5. Reaction of the Chinese government**

The Chinese government reacted promptly to the melamine scandal, and it has tried to counter the problem in the most reasonable way by introducing stricter regulations for companies making baby dairy products. The companies concerned have to meet these

regulations before they can continue manufacturing (Warren, 2012; McDonald, 2012).

In 2006, China's domestic baby dairy product manufacturers faced tremendous competition from foreign companies, such as Nestle and Danone. This also put pressure on the price of the products. Small farmers in China provide the raw material (milk), to the companies of infant formula milk. These small dairy farmers are very poor and to obtain more profit they increased the milk supply by adding water to the milk (Steger, 2013). In addition, to increase the protein content of the milk so that it would be accepted for sale, the dairy farmers added melamine to it (Pei et al., 2011), because when the infant formula milk manufacturers buy the milk, they only check for the crude protein in it. Therefore, the fact that melamine has been added goes unnoticed because of the false increase in the milk's protein reading (Wang, 2013). The regulation amount of protein in infant formula milk is around 12 to 18 per cent. The milk that the baby dairy product manufacturers were obtaining from the small dairy farmers contained only 0.5 per cent protein. Melamine was, therefore, added to the milk to show a fake increase in its protein content (Mo et al., 2012). The dairy farmers were also suffering from high feed prices. As a result of all the problems they were experiencing only 30 per cent of them were breaking even and the rest were continuously losing money (Lu and Tao, 2009).

The government issued a notification that baby dairy products would be rigorously inspected at all stages before they reached the shelves (Greenspan, 2009). Due to this new rule, the Chinese government fired many officials who were suspected of negligence. The new Food Safety Law has been in place since 2009 and it has been seen as the ultimate quality control method. The law has instituted a system of risk evaluation that includes the monitoring of about 500,000 food production companies with no exceptions (Li et al., 2009).

The government has not only implemented regulations, but has also worked on gaining control over advertisements related to baby dairy products. By law, advertisements are not allowed to exaggerate the benefits of formula milk as a diet for infants (Olivier,

2013). The government is also playing an important role by increasing penalties for noncompliance. This is in addition to already existing regulations and standards issued by bodies such as AQSIQ, SFDA and SAIC. The Chinese government has also empowered consumers by giving them the right to claim 10 times the damage caused by the tainted products and this is in addition to the actual loss (O'Shea, 2008). The Chinese government has, therefore, taken plenty measures to try and ensure that a scandal such as the melamine one never happens again. However, there is still the question as to whether these measures have been effective and if they are beneficial for the baby dairy product industry.

### **3.6. Influences of the tainted milk situation**

In 2008, the melamine scandal in China sent a wave of deep concern all over the world. Not only Chinese parents, but parents all over the world were outraged because their children had been exposed to tainted formula milk (Gossner et al., 2009). Several infants died as a result and Chinese products lost their reputation in the global market (Greenspane, 2009). Concerns related to Chinese food safety and the implementation of QMS became a major issue for the government of China (Yousaf et al., 2007). The developing Chinese economy, market expansion and the entry of foreign players into the Chinese market also played significant roles in the scandal (Astley, 2012), which caused local companies to cut costs at the expense of the health and safety of the consumers (Leuang and Benitez, 2008). The whole episode became a big question for the Chinese economy in terms of safety, quality and finally ethics.

#### **3.6.1. Consequences of milk smuggling by Chinese parents**

The fact that Chinese parents were smuggling the infant formula milk made it difficult for parents in other countries to obtain it for their children (Yousaf et al., 2007). Another report by CCTV showed that foreign companies had gained more of a market share in China since the 2008 situation (Olivier, 2013). The market share of foreign companies, such as Nestle, Mead Johnson, Abbott Laboratories, Danone and Wyeth, grew from 39 per cent to around 50 per cent, despite the fact that their prices were higher (Xiaoxiao, 2012; Yousaf et al., 2007). The Chinese customs records show that the amount of infant

formula milk that was imported into China was around 570,000 tonnes in 2012, which is a record in itself (Petroff, 2013).

Due to this situation, a number of countries banned Chinese parents from buying infant formula milk. In the UK, they were rationed to buying 2 bottles a day (Astley, 2012) in order to restrict the illegal smuggling of it back to China.

Other freelancers on the Internet are providing infant formula milk to Chinese parents at double to treble the normal price (Chao, 2013). Sales of infant formula milk in China have grown by about 28 per cent, i.e. around GBP 12.73 billion. This is more than the size of the entire US market (Yousaf et al., 2007). No formal quality assurance system was in place; the quality assurance agencies were present, but they were very lax and, as a result, China is still facing quality issues after the melamine scandal in 2008 (Hatton, 2013). The continual resurfacing of problems and the distrust of Chinese parents have made it clear that China is unable to control the quality problem with regard to infant formula milk.

According to a report by the United Nations International Children's Emergency Fund (UNICEF), there are around 82 million Chinese children under the age of five. This is more than the entire population of France and, to be able to feed such a huge number, more infant formula milk is required. There have been many reports of gangs being arrested trying to smuggle infant formula milk into China from abroad. By the end of April 2013, around 880 people had been arrested for this activity, accounting for around 9,000 tonnes of infant formula milk that was seized from them (Aslam et al., 2014). The whole infant formula milk situation was very worrying for Chinese parents and it had arisen due to loopholes present in the Chinese QMS. If quality control methods using ISO standards, for example, had been applied and monitored then the system would have been better at the outset (Sarma, 2013).

### **3.6.2. Restrictions on Chinese people smuggling infant formula milk**

Many countries and regions, such as Hong Kong, the UK, Singapore, Germany and France restricted the amount of infant formula milk Chinese people could buy in order

to clamp down on the smuggling (Hui, 2013a). Chinese parents were draining the supply of infant formula milk from around the world because they did not consider local products to be safe for use (Petroff, 2013).

With regard to Hong Kong, infant formula milk is not taxed as it is in mainland China (Stegar, 2013). The number of Chinese mainland residents visiting Hong Kong for the purpose of buying infant formula milk grew considerably (Chao, 2013). The Hong Kong, government intervened and introduced a strict system of rationing with punishment for not abiding by the law (Sarma, 2013). This meant that Chinese buyers could only take up to 2 tins of milk from Hong Kong and if they defied the rules then they were sentenced to jail for up to 2 years with a fine of up to GBP 53,000 (Warren, 2012). In Britain, the same rules of rationing were applied. Even local customers could not buy more than 2 tins of infant formula milk a day from the supermarkets (Hui, 2013a). More Chinese suppliers have been arrested due to the milk trafficking than heroin smugglers. The British government found that there was not even enough infant formula milk for local customers (Olivier, 2013). The Dutch government was also concerned about persistent shortages of infant formula milk brands (Leuang and Benitez, 2008).

To add to all the other problems, supermarkets such as Sainsbury's, Morrisons and Tesco in the UK also put restrictions on the sale of certain brands of infant formula milk. This was done to cater for customer demand (Olivier, 2013). According to a report published by the BBC, Danone was planning to increase its production in China (Hui, 2013b). The company produces probably the two most famous brands, Aptamil and Cow & Gate and, when the panic was at its height, limited its sales to customers by only allowing them to purchase two tins of infant formula milk at any one time in the UK (Olivier, 2013).

### **3.7. Summary**

The infant formula milk industry in China has suffered a great deal due to melamine being found in the products made by local companies. Although the Chinese

government imposed restrictions and introduced quality standards, scandals kept on surfacing, making it difficult for the authorities to cope with the situation. Chinese parents distrusted local products and this became another issue. Customers in other countries became very concerned because the demand for infant formula milk began to outstrip supply and foreign governments were forced to impose restrictions on the amount people could buy (Chen, Zhang and Delaurentis, 2014). The situation became very serious as smuggling increased and retailers in China sold foreign brands of infant formula milk at extortionist prices. More effort is needed from the government in order to deal with the problem of quality control. Laws, regulations and standards help in introducing and maintaining quality and those companies that implement these are displaying the fact that their products are safe (Sarma, 2013).

It can also be seen that the lack of proper direction from the government and credit management institutions was seen as the main barrier to implementing QMS in Chinese baby dairy product companies. This and other barriers are further explored in chapter 4 of this dissertation. From the literature it has been identified that the largest baby dairy product companies were publicly owned (Gale and Hu, 2009), that they had more than half of the domestic market share (Guan et al., 2009) and that the role of the government in ensuring compliance with laws, standards and regulations and in monitoring is critical.

## **Chapter 4: Supply Chain Management – Barriers, Drivers and Other Issues in the Chinese Baby Dairy Product Industry**

The aim of this chapter is to review the complete supply chain management process of Chinese baby dairy companies and consider the barriers, drivers and issues pertaining to it in accordance with the previous literature.

The third objectives of this research is to identify key actors in the supply chain management process of Chinese baby dairy product companies from beginning to end. The section below, therefore, discusses the supply chain from the procurement of the raw materials to the end product.

### **4.1. The changings of Chinese baby dairy supply chain**

The Chinese beef cattle industry went through a period of rapid expansion during the 1990s, but then declined as farmers found new and more lucrative opportunities in other booming sectors of the economy. The beef cattle industry levelled out and become smaller and more specialised. The dairy cattle industry flourished on a small scale in the grasslands of northern China. With the establishment of the People's Republic of China in 1949, the state owned dairy farms provided both fresh milk for adults and for use in the baby dairy product industry (Fuller and Beghin, 2015). The industry eventually became independent and has been commercialised since the 1980s with both local and provincial governments contributing to its development. According to Lu (2009), with the use of a strong advertising campaign, baby dairy products were marketed as fresh, pure and healthy, and parents considered them to be a very important part of their children's nutrition (Fuller et al., 2006). Hence, most of the parents believed in the products regardless of knowing how they were actually made or being aware of quality issues. This was the situation when the melamine scandal blew up. After the melamine incident, however, the reality of what was really going on in the baby dairy product industry became clear and parents lost a great deal of trust in it.

2008 onwards was a very critical time for the Chinese baby dairy product industry and it has since seen some drastic changes. During a period of uncontrolled expansion of

this sector, companies neglected quality and, hence, the melamine incident occurred (Prakash, 2015). The large baby dairy product manufacturing companies now employ advanced equipment and have introduced rigorous QMS. These companies once had regional monopolies. With the expansion of the baby dairy product sector, other stakeholders have now entered the supply chain and the government has played its role in providing the necessary licences to the companies concerned.

Figure 4.1 illustrates the structure of Chinese baby dairy product industry supply chain, showing its complexity. The main participants in the supply chain are the dairy farmers, the milk collection stations and the manufacturing companies. However, other actors such as universities, research institutes, and the government and credit institutions are also involved in the whole process.

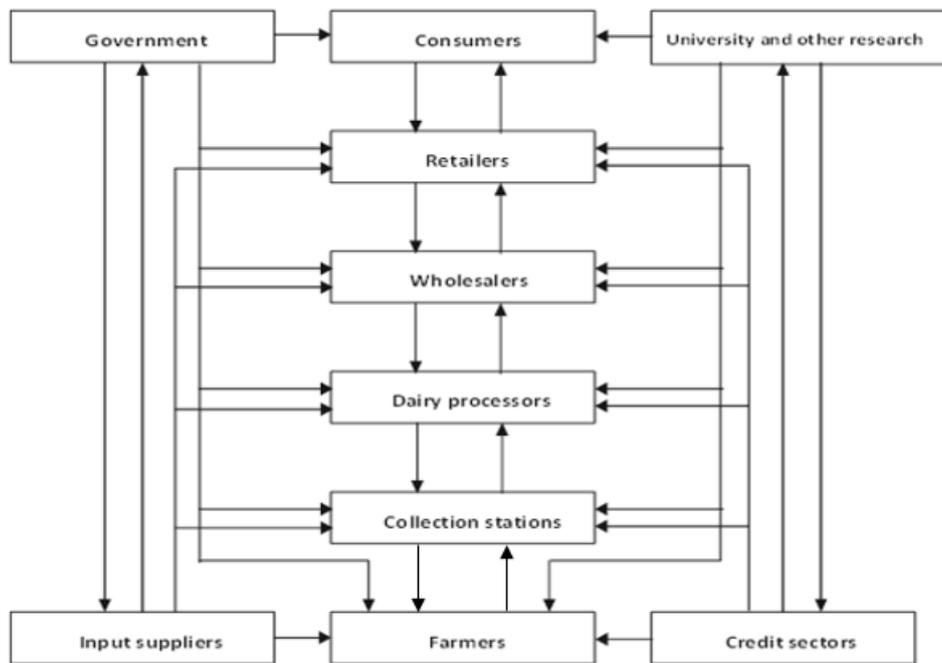


Figure 4.1: The structure of the dairy supply chain in China.

(Source: Adopted from Ayag et al., 2013.)

In Figure 4.1, input suppliers and credit sectors connect to the farmers because farmers are funded by these institutions. In addition to this, Figure 4.1 illustrates that the government has played a key role in supporting farmers as they, in turn, have supported the credit sectors. Universities and other research institutes are also backing the farmers

to contribute in improving QMS in this industry. Figure 4.1 also illustrates that the structure of the baby dairy product sector is a matrix, with every stakeholder connected to the others. These actors' roles in the melamine incident will be discussed in the following sections.

#### **4.1.1. Dairy farmers**

One aspect about pre-production stage is that most dairy farmers actually have experience of crop production, rather than dairy cattle husbandry. As soon as governmental policies with regard to small farmers were changed, the farmers started owning cattle with the help of the government by taking out loans at a reduced rate of interest from credit institutions. The government policies introduced loan schemes where farmers were able to get the credit on easy terms and conditions, and this helped in motivating them to start owning cattle. The Sanlu Group provided another method by which farmers could get started by providing them with cows. The farmers then paid the company back (Gale and Hu, 2009) and, in this case, were bound to Sanlu Group.

Other small farmers could sell their milk to several buyers and they had no input at all with regard to the quality of their milk and how this would impact on the final product. Put another way, they had no bargaining power in this respect (Ma et al., 2007). When sales of baby dairy products increased, farmers received no benefit in increased prices being paid for their milk between 2003 and 2006 (Gong, 2008) and they faced losses in the 2007–2008 financial crisis (Xiu, 2008). The Chinese government should have invested in herds of cows itself and, therefore, checked and controlled the milk quality. However, the government was far more interested in expanding the market rather than focusing on quality issues, as is suggested by Liu (2009).

#### **4.1.2. Milk collection stations**

These are the locations to which small dairy farmers move cows for milking. An ordinary milk collection station is one in which big-sheltered rooms have equipment for milking. These milk stations are set up on purpose for those farmers who are unable to establish milking systems. So with collaboration of companies or government, these

milk stations are developed. Once farmers milk their cows at these stations, it is sterilised and then respective companies approach these milk stations and take the milk for further processing. At these collection stations, only those farmers come for milking their cows, who intend to provide their milk to the dairy companies. Majorly, these collection stations are established by the dairy companies and they have invested significantly in them.

Quality inspection should be a part of this process but, according to Yan and Xiu (2009), it is not part of the daily activities. When a particular problem is identified at a milk collection station, then the milk is checked for quality. According to Xiu (2008) there are about 200 cows per milk collection station and huge costs are involved in setting them up and maintaining them. According to Yan and Xiu (2009), in the pre-production stage, large manufacturing companies have no control over the quality of milk supplied by these collection stations. It has already been mentioned that some processes, such as sterilisation, take place at the milk collection stations and, prior to 2008, no quality procedures were implemented and there was no regulated equipment for performing these operations

#### **4.1.3. Milk processing companies**

Milk processing companies convert raw milk and then package it into different products such as liquid milk, formula milk, ice cream, etc. Some of the large milk processing companies became privately owned so that they could trade shares in the open stock market. The majority, however, remained public companies owned by the Chinese government. The large companies had economies of scale and they pursued aggressive growth strategies. They had economic importance and the government was dependent on them for continuing profitability and growth, as mentioned before (KPMG, 2007). The milk processing companies were playing their own role in the supply chain.

The huge operations of large companies led to a revenue of GBP 4.11 billion from sales of 10 million tonnes of milk in 2007 (ibid). Before the melamine incident in 2008, Mongolia Yili and the Mengniu Dairy Company had about 16 per cent of the market

share, Bright Dairy had a market share of 8 per cent and Sanlu's was 5 per cent. There were another 700 small companies making up the rest of the market share (ibid). These percentages show that public limited companies had the major market share and that they had a monopoly over the privately owned companies. These were the companies that were making a lot of money, not just in the local market, but in the international market too. Because they were large companies and they had economies of scale, they were not regulated closely enough. Coming after the farmers in the supply chain process the milk processors played a significant role in the melamine incident because they were involved in processing the adulterated milk (Jiang, 2010).

#### **4.1.4. Retailers and wholesalers**

There are various modes of retailing which are adopted for dairy products in China. In the 1990s, the retail market was revolutionised, and regional and national supermarkets had appeared which has made this industry more concentrated (Fuller and Beghin, 2004). In 2007, nearly half of all baby dairy products were sold by the top 4 dairy companies: Mongolia Yili, the Mengniu Dairy Company, Bright Dairy and Sanlu (KPMG, 2007). The size of these companies and economies of scale allowed them to pursue the market further for profitability and growth because dairy farmers, milk collection stations and the government too, were dependent on them (Thompson and Oster, 2007).

The wholesaling function of Chinese baby dairy product companies was controlled by the large milk processing companies and the market was divided into several regional markets, e.g. central, north-eastern, southern and south-west China. Large numbers of marketing agents were employed so that they could establish their own wholesaling channels. This indicates that when the melamine incident was reported, there were many wholesaling channels through which products were delivered to the market and consumers and, therefore, the contaminated products were widely available (Qian et al., 2011).

#### **4.1.5. Research institutes, universities, input suppliers and government agencies**

In every industry, research institutes and universities are crucial for its further development. These supply chain actors keep on working on emerging issues and new findings are helpful for the whole industry. For example, before 2008, the emerging dairy industry in China was driven by profits. Compared to the agricultural sector it was very knowledge intensive. A large investment was required from a farmer in order to purchase a cow. According to the research work of Yan and Xiu (2009), the price of a pregnant cow is equal to the per capita net incomes of a maximum of 3 members of a farmer's family. Keeping a cow was a difficult and costly task. This finding is also reported by one of such research institutes. The whole supply chain gets benefit from the findings of such research studies. Research institutes, universities and input suppliers are also sources of identifying total funds, training and other aspects which are needed for this industry's development. Other than milk, there are also other ingredients which are to be used in the baby dairy product production. These are obtained from the suppliers and they also play an important role in the overall quality of the final product (Lim et al., 2014).

Similarly, a crucial role is performed by the Chinese government through various initiatives, programmes and policies which are important for well-being of this industry. For example, the Chinese government considers the baby dairy product industry important for contributing to the economy. Therefore, policies were developed in order to promote growth. Eight incentives were announced by the Chinese government on 23 September, 2007 (Zhao et al., 2009; Wang, 2008). These were as follows:

- 1) Subsidies for converting to better breeds;
- 2) Subsidies for increasing herd sizes;
- 3) Subsidies for purchase of machinery and equipment;
- 4) Subsidies for killing diseased cattle;
- 5) Subsidies for insuring animals;

- 6) Support for building standardised, large-scale dairy farms;
- 7) Credit support for dairy farmers;
- 8) Improvements in the industrial policies of the baby dairy product industry.

#### **4.2. Coordination and information sharing among supply chain actors**

In today's business environment it can be seen clearly that effective supply chain management is considered to be vitally important in today's global world (Wu, Chuang and Hsu, 2014). In the past, many companies did not deal in international markets and supply chain management was never accorded the importance it is nowadays. Today, companies need far more well-developed and well-managed supply chain management systems to ensure high profitability and success (Montoya-Torres and Ortiz-Vargas, 2014). The most significant factor that has enhanced the importance of effective supply chain management is the continuously increasing competition to which companies are constantly subjected. Furthermore, companies are now also affected by product diversity, advancements in technology and globalisation. These factors encourage companies to integrate with each other in a supply chain, so that maximum benefits can be gained by all (Patil and Kant, 2014). Since different companies are involved in a supply chain, it can help companies meet the needs of their customers only in a case where all partners of the supply chain work as a team with proper coordination (Stadtler, 2015). The analysis shows that the need for supply chain members to work together to add value and improve the performance of the supply chain is a driver for establishing integration (Özer, Zheng and Ren, 2014). Because supply chain members will have differences in their aims and interests, the overall performance of the supply chain is determined through the coordination of all the members (Beske, Land and Seuring, 2014).

Elaborating on the characteristics of coordination, it can be stated that coordination and integration in a supply chain include the process by which the current interdependencies can be put in a proper order (Daniel, 2016). In supply chain coordination, there is also an involvement of cooperation between organisations that share significant information

and knowledge with each other during the development, production and distribution of products and services to the end users. Coordination is also termed as a way of structuring the efforts of two or more supply chain drivers for achieving a better outcome and obtaining awareness about each other's activities while working in an independent way for achieving the actual set of objectives (Wu et al., 2014). However, the critical analysis shows that there is a lack of coordination and integration among supply chain members when there is a lack of sufficient information at each stage regarding the flow of items and finances. This results in a reduction in performance of the supply chain. Thus, coordination among a supply chain is considered to be absolutely crucial for achieving consensus at all levels, with two-way communication between various members along a supply chain taking place in an appropriate way (Patil and Kant, 2014; Stadtler, 2015).

#### **4.3. Use of technology in the baby dairy industry**

According to Dairy Australia (2014), different types of technologies are being used by the baby dairy industry. Such technologies are used to determine indicators for the extent to which automation is used to carry out responsibilities. These technologies are highly useful in increasing a company's efficiency as well as improving cattle management and they eventually improve the output and profitability of the company. There are different technologies that are applicable to both small and large dairy product manufacturers.

Damron (2013) also said that different types of technologies are used widely by the baby dairy product sector, including automated systems. These include Automatic Milking Systems (AMS) as well as automatic calf feeding systems along with cow activity and cogitation sensors. Most of these technologies are quite old and not novel. For example, automatic milking systems have been used in Europe for more than 20 years. Precision technologies are becoming popular in the baby dairy product industry and different types of devices and tools including smart phones, tablets, PCs and GPS tracking systems are being used by the sector (Barkema et al., 2015).

In 2013, more than 550 dairy farmers, teachers and scholars attended the Precision Dairy 2013 conference for sharing knowledge about various precision technologies. These are highly useful for determining physiological as well as behavioural indicators with regard to individual animals, along with manufacturing indicators. Such types of technologies are also created and used for improving labour efficiency, reducing environmental hazards and improving cows' health and the farm's performance. The majority of the technologies can be used by both small and large baby dairy product companies where they offer different types of advantages but, in spite of this, they have not been widely adopted. As per a study conducted by the University of Kentucky in 2008, the adoption rate of precision technologies is low for 3 basic reasons: managers' unfamiliarity with the technologies; low cost to benefit ratio; and unnecessary information being provided by the technology (Bewley, 2013). In addition, various other issues restricting the adoption of precision technology are: fear of the technology; poor technical support; and no time to work with the technology.

With AMS or robotic milking no human effort is exerted in actually milking the cow and such systems and technologies have been commercially available since the 1990s. The objective of such type of systems is to enable farmers to automate the milking process to cut labour costs and make it more efficient. AMS run with the help of special herd management software for PCs and/or smartphones (Tse et al., 2017).

Researchers have spent time, money and effort in finding ways of addressing time management issues in traditional dairy farming. In turn, AMS are also improved by research. Robotic, voluntary milking is a procedure that enables each cow to make the decision about what time it is milked and the gaps between milking. AMS need to be flexible because the cow might choose to be milked at any time in a 24-hour period (Helmreich et al., 2014). Cows can either be out at grass or kept inside permanently.

According to Weisbjerg et al. (2016), different components make up the robotic milking system. These include a milking machine, a laser as well as a robotic arm and a gate system for managing the cow traffic during the milking process. As explained by Tse (2016), when the cow chooses to go in to the milking parlour her identification tag is

read by the cow ID sensor and the information is sent to the control system. One of two things will happen. If too short a period of time has elapsed since the cow was last milked then it is sent out of the unit via the automatic gate system. Otherwise, the milking process will commence. The cows are provided with feed while they are being milked and the supply of feed is an encouragement for them to enter the parlour.

According to Spörndly et al. (2015), the milking parlour can be arranged for either forced or free cow traffic. In the case of forced cow traffic, the AMS is the only route from the lying area to the feeding area. An alternative is free cow traffic, where the cows can decide whether to visit the AMS or not.

The robotic manipulator arm is considered to be the creative main hub of an AMS system and it is designed carefully to obtain the best results. This robotic arm automatically performs functions such as attaching the pipes to the teats and teat cleaning. Such automatic functions reduce farmers' responsibilities because there is nothing to be done manually. However, human intervention will be necessary if a cow is not complying with the milking process or requires inspection (Schewe and Stuart, 2015).

Typical capacity for an AMS is 50–70 cows per milking unit. AMS usually achieve milking frequencies between 2 and 3 times daily, so a single milking unit handling 60 cows and milking each cow 3 times per day has a capacity of 7.5 cows per hour. (Watt et al., 2015). This is the capacity for a lower-cost robotic arm. However, the rotating stand is a new feature and this increases the capacity of the robotic arm (Tremblay et al., 2016).

According to Hills et al. (2014), sensors are now also used in the baby dairy industry. These are attached to cows and collect accurate information for each one, e.g. body temperature. This is why a farmer can easily handle large numbers of livestock and take steps for improving their health as well as the farm's performance (Steenefeld and Hogeveen, 2015).

Likewise, automated calf feeders are highly effective in reducing labour costs and

feeding time and a large numbers of dairies use these. However, there is still a question mark with regard to feeding processes for calves that improve their health as well as their rate of growth (Jorgensen, 2016). Furthermore, in-line parlour technologies are also used in the baby dairy industry. This is a complex term and it includes various advanced tools for dairy managers. Such types of technologies are highly useful in assessing and checking various elements of the manufacturing system. For example, specific milking equipment, cows' nutrition systems as well as individual cow testing are included in in-line parlour technologies (Frenken, 2014).

#### **4.4. Barriers to and drivers for QMS**

After reviewing the supply chain, this section now reviews the barriers to and drivers for the implementation of QMS in the Chinese baby dairy product industry, which is the third objective of this research. There are a number of barriers and drivers that have been examined at in previous research.

The transformation to an organisation that effectively implements QMS depends on the degree to which QMS are successfully implemented. The previous sections have thoroughly discussed the literature on QMS, including the work of renowned quality gurus. There are certain drivers that are necessary for the successful implementation of QMS: effective process management, quality data and analysis, leadership, training and manager–employee relationships. The present section reviews the drivers for QMS in greater detail. It is important to understand that these drivers are necessary but insufficient conditions for effective implementation of QMS, which means there are also certain barriers that have the potential to impede the implementation of QMS.

##### **4.4.1. Drivers for the implementation of QMS**

There are three essential aspects of QMS that should not be ignored and these are: commitment, continuous improvement and involvement. Commitment refers to taking responsibility for improving quality for customers. Involvement is about all employees working together for the purposes of achieving the goal of quality (Barnes et al., 2015). Continuous improvement refers to continuous detection of defects and errors and their

ongoing elimination. These three factors are important contributors to the successful implementation of QMS (Churchill and Paul, 1994). The support and commitment from top management act as significant drivers for the successful implementation of QMS (Schein, 1991). When top management is fully involved, this also drives the motivation and commitment from employees to take initiatives for making a success of the new programme too. According to Crosby (1979) and Deming (1986), QMS programmes can be effectively implemented and managed with employee empowerment and involvement along with an open cooperative culture. Gunasekaran (1999) mentions that there are certain benefits of quality programmes and that these act as drivers for the implementation of QMS. These benefits include market share improvement, greater customer loyalty, higher stock prices, higher prices, reduced complaints hence an improvement in customers' trust and greater productivity. There are different planning and quality control tools that can be used to manage quality, and these tools also play the role of drivers for implementing QMS (Grahn, 1995).

According to Crofton and Dale (1996), teamwork is important for implementing QMS. In a similar fashion, Kennerfal and Klefsjo (1995) stated that it is the involvement of employees that acts as the key driver/enabler of QMS. Moreover, it was further mentioned that clear focus, cultural change, a strategic partnership with suppliers and customers, along with employee ownership of the process, are important for implementing QMS (Gunasekaran, 1999).

Oakland and Waterworth (1995) highlighted the importance of training in the implementation of any quality programme. Quality management is not only about the installation of systems and procedures but it is a comprehensive process that involves cultural change. As in the words of Matta et al. (1996), to implement QMS demands a supportive culture that is about teamwork, continuous improvement, the empowerment and participation of employees, appropriate leadership and a customer focus. QMS have to be implemented throughout an organisation, otherwise the concept will be like another passing 'management fad'. The support of managers is also needed for successful implementation of QMS. Furthermore, expert knowledge and experience

along with a culture where individual creativity is encouraged are important (Feinberg, 1998). Everyone who is part of the company must participate in the quality programme. However, several researchers, such as Wilkinson et al. (1997) state that it is impossible to have participation from all levels, but such comprehensive participation has become quite important for the success of quality programmes. There must be a shared vision, mission and plan aimed at achieving continuous improvement. Hence, training in the necessary skills and knowledge should be provided. Employees need to be involved and they should be empowered to achieve success in the implementation of QMS (Gatchalian, 1997).

In the past, it has been proved that the success of any quality programme is not certain. Surveys have showed that the success rate of implementation of QMS is only 20–30 per cent. The approach to implementing QMS heavily depends on how effectively problems are identified and how well the system is designed in accordance with the requirements of the company concerned.

Further to this, higher management leadership is another driver for successful implementation of quality management. Many times, stakeholders also convince the organisations to implement quality (Gotzamani and Tsiotras, 2002). Moreover, Prajogo (2011) has told that measurement of quality outcomes, analysis of quality outcomes and management of new knowledge are also known to be the drivers of quality management. Tarí et al., (2014) said that customers also perform the role of drivers of quality management. It is due to demand and preference of the customers that an organisation is forced to introduce such products which are of superior quality. When organisations do not fulfil the quality related expectations and needs of the customers, it is more likely to result in the failure of the organisations (Nanda, 2016). When products and services are of superior quality, there will be error free interactions with the customers which are translated into few complaints. The implication of fewer complaints is that there is a need for lesser resources to be devoted to customer service. Hence, costs will be reduced and these resources can be utilised at some other place (Nair and Prajogo, 2009). Moreover, Prajogo (2011) said that improved customer satisfaction also means the

enhanced market share. Kannan and Tan (2005) said that the existing level of competition is another driver for quality management programs implementation. When competitors have a higher quality level of products, it becomes imperative for organisations to match the quality of products with the competitors hence they are also forced to implement QMS such that the product quality could be enhanced.

Flynn and Flynn (2005) said that management philosophy is also a driver of the implementing QMS, successfully. When management is internally motivated to have superior quality offerings, there are more chances that QMS will be managed in a better manner and there will be products of higher quality which will be offered.

Muruganantham et al., (2016) said that cost reduction is another driver which is at the backend of the implementing QMS successfully. Everyone knows that when QMS is implemented in a consistent manner, it will help in reducing the cost in the areas like reworking, warranty cost reduction, scrap and field services. With these cost reductions, profitability can increase. Therefore, this cost reduction aspect is another major driver of quality management. Mohammad Mosadegh Rad (2005) has said that defect reduction could be ensured with the quality management programs. The emphasis of QMS is mostly on improving the quality instead of only inspecting the process. By this, there are more chances to reduce the number of defects in the process. With reduced defects, the need for quality assurance team is also minimised. Talib et al., (2011) said that QMS needs the participation and involvement from all employees. This involvement of employees is related with the improved morale level of employees. This is also associated with reduced cost for hiring and training of employees. So the improved level of morale is an important driver for the quality management (Flynn and Flynn, 2005).

QMS programs need to use the proper evaluation techniques along with the better training of employees, and this can result in improved production. With the use of strict process control, less scrap and consistent performance could be ensured. There will be lesser problems in production process; hence this improved production process as a result of implementing the quality programs is another driver (Prajogo, 2011).

Sallis (2014) also mentioned that the need for less rework is another driver. When quality is managed in a continuous manner with the help of appropriate procedures, there is no or very minimum need for rework as warranty claims also reduce now. This can also be useful for customer confidence and increase in the business activity. Therefore, it could be said that when management know that there will be lesser rework demand, they are more likely to implement QMS.

Talib et al., (2011) said that increased financial performance is another driver for quality management. It is also proved by the research study of Huang and Xia (2001) that companies which get quality related certifications and comply with quality standards show improved financial performance as compared to other companies. With the help of QMS, internal communications could be improved as it focuses on the issues which are linked with the operations management. QMS encourages the frequent interaction between managers from different departments which promotes the harmony. Therefore, it could be said that this internal communication is another driver for implementation of QMS.

When QMS is implemented, it improves the credibility, reputation and brand image. This improved reputation and image could also be used for marketing of the business. Organisations know that implementing QMS will help them to develop better brand image and increase their credibility. Hence, this act as the driver for implementing QMS (Flynn and Flynn, 2005). Sallis (2014) said that continual improvement culture is needed for implementation of QMS. This culture is desired because it helps in improving the processes and output. Moreover, efficiencies and cost savings could also be ensured and problems could be reduced with such culture. There are many benefits of this culture which are based on continuous improvement. Therefore, desire for creating continual improvement culture is another driver for implementing QMS (Huang and Xia, 2001). Ross and Perry (1999) said that implementation of QMS results in engaged workforce which is more productive and efficient. This desire to have productive and efficient workforce also drives companies to implement QMS in their organisations.

#### **4.4.2. Barriers to implementing QMS**

There are many possible barriers that organisations have to face while implementing QMS. Sebastianelli and Tamimi's study (2003) used factor analysis where frequently cited barriers by managers were used as a means of investigation. The study reported five commonly cited barriers: lack of planning for quality; inadequate human resource management and development; lack of leadership; insufficient resources; and lack of customer focus. Other research by Nwabueze (2001) reported the contextual nature of QMS programmes. The author highlighted the fact that the implementation of QMS demands a consideration of both past history and current problems for designing the extensive cultural change necessary for implementing QMS successfully. When contextual factors are ignored, this results in a lack of concentration on strategy, market opportunities and future scenarios which, ultimately, do not allow the successful implementation of QMS. Likewise, Amar and Zain (2002) identified 5 top barriers to QMS: attitude towards quality; machines and equipment; raw materials; human resource issues; and quality-related information. Williams et al (2004) said that commitment of the CEO also matters a great deal and when the CEO and top management are not committed to QMS programmes, they cannot be implemented successfully. The commitment of the CEO is important because this helps in motivating employees and when this is lacking the success of quality programmes cannot be ensured. Moreover, it was highlighted that when managers are rewarded on the basis of short-term success which is measured in financial terms, this does not allow for promoting the value of quality to other employees; hence, this becomes a barrier for the successful implementation of QMS. Furthermore, top-down quality programmes influence the commitment of leaders first, and they are then unable to bring about the necessary commitment from employees if they have not been influenced positively. Likewise, when managers have no knowledge about what it takes to implement QMS successfully, then this also becomes a reason for failure (Beer, 2003).

According to Tamimi and Sebastianelli's study (1998), the most significant barrier that impedes the successful implementation of QMS is managers' compensation not being

linked to the achievement of quality goals. Through tying compensation to specific and measurable quality goals, such as cycle time reduction, reduction in the number of customer complaints and reduction in failure-related costs, it can be demonstrated that top management is truly committed to quality and becomes the means by which the quality initiatives are monitored. Training is also very important for successful implementation of QMS. It is not wise to assume that employees have all those skills and abilities which are needed for managing and implementing the QMS. The process of implementing QMS needs particular skills and these need to be provided to all employees who are responsible for this process. Therefore, training cannot be ignored for successful implementation of QMS. The success of QMS heavily depends on the skills, competencies and knowledge of the employees. With the necessary skill, competencies and knowledge, the success rate of QMS implementation increases significantly. That is why training is considered a pre-requisite for implementing QMS. When training related to quality programmes, e.g. in the form of group discussions explaining the changes that are going to be taking place and inviting a two-way dialogue, and in the form of effective communication and problem solving techniques, is not provided, it becomes a barrier to the successful implementation of QMS. Another barrier that was investigated in the survey was 'employees' resistance to change'. Indeed, this is a possible consequence when no training is provided for employees. Quality programmes demand a transformation to a quality culture.

Every quality improvement process is based on the 'quality culture' which is about the mindset of employees and other related people to integrate quality throughout the system. Organisational culture is about the shared values, beliefs, behaviour and attitude of organisational members, so those organisations who intend to improve quality of its products and processes must have to ensure that quality is integrated into its culture. Therefore, healthy quality culture is also needed for successfully implementing quality related movements and programs. This quality culture needs to be promoted the mentality that every member of organisation and supply chain needs to work together for maintaining and improving quality. The culture must foster the

open and honest communication for ensuring that quality problems are listened by everyone, hence a better solution could be provided. In the quality culture, information sharing is critical hence the information accessibility is the critical characteristic of this culture. Moreover, this culture asks to focus on processes instead of persons for fixing all quality related problems. Most importantly, this culture highlights that all success or failure experiences should be considered as the learning experience from which every employee/manager/supply chain actor should learn something. QMS implementation is a changing process. It is viewed with scepticism, because employees usually have a tendency to resist change and challenges. When full support and commitment from the entire workforce is not being provided, QMS cannot be implemented effectively. Moreover, when benchmarking practices are not clearly understood by the organisation in question, this also becomes a barrier. It has become mandatory to use best practice as a benchmark and strategic tool for the identification of weaknesses and strengths and compare them with the best practice that exists. When organisations do not have business experience and knowledge related to quality management, this becomes a barrier to the implementation of QMS. Similarly, financial and human resources are very important and when organisations lack these, this becomes yet another barrier to the successful implementation of QMS (Wu et al., 1997).

Sallis (2014) told that many times bad attitudes of management are responsible for poor implementation of any QMS. Due to lower expectations from QMS and higher costs associated with its management, managers demonstrate unhealthy and unproductive. When no one takes the responsibility of managing it and such attitude is showed that if something is wrong, there is no need to fix it until it is not needed. Most of the times, there exists perception that whatever is said by the management is right and employees have to obey the orders of managers. In such situation, when management is going on the wrong side and employees keep following them it results in failure of successful implementation of QMS (Huang and Xia, 2001). Ross and Perry (1999) said that this lethargy is further enhanced when management puts no efforts to training the employees which is sort of mandatory for implementing QMS in a successful manner. There are

certain basic critical aspects of QMS which must be learned by all employees; examples include teamwork and problem solving. Training for such fundamentals must be provided and when this is not offered, it becomes a barrier for its successful implementation.

Mohammad (2005) identified that lack of leadership is another barrier for successful implementation of QMS. When there are excess layers of management, it only leads towards duplication of responsibility, duties and resources. This signals the lower level employees that implementation of QMS has nothing to do with them and it is only the top management who has to take necessary measures for its implementation. When top management and employees do not work on QMS as the joint responsibility, it is a barrier for its implementation. Newton (2002) said that in few organisations it is believed that managers are infallible hence they are always right; this notion force the employees to take the peripheral role in implementation of QMS. Consequently, the employees who are responsible for production and delivery do not get involved with full dedication to enhance the quality level of offerings. Therefore, it can be said that when employees do not feel that they are an integral part of improving the quality in a continuous manner and they perform the critical role in it, their involvement and participation remains lower, hence, it becomes a barrier for implementation of QMS.

Mukhtar and Schiffauerova (2016) has highlighted that deficiency of cultural dynamism is another barrier for implementation of QMS. Every organisation has its own culture which defines the unique way of doing things in an organisation. Indeed, it is integral to success of the organisation that it should stick to its organisational culture which is based on its philosophy, mission and vision. On the other hand, it cannot be overlooked that cultural re-adjustments are necessary to be successful. In this dynamic environment, economic, political, technological and social realities keep on changing. Therefore, it becomes important to adjust the culture such that needs of the current environment could be fulfilled. With inadequate cultural dynamism, implementation of QMS becomes quite difficult hence this is also known to be one of the barriers (Sallis, 2014).

According to Muruganatham et al., (2016), when organisations do not add the aspect of quality in their strategic planning, there are very less resources which are available for implementation of QMS. Usually, organisations give most emphasis on the profit margins where they ignore what is demanded by the customers and what are the quality requirements from customers. This attitude also leads towards paltry budgetary allocation for training and development which is necessary. They believe that training will be an unnecessary cost which will only reduce the profit margin so they make efforts to avoid this cost. Such attitude of management where there are little financial and human resources which are available for implementation of QMS, is a barrier for the implementation of QMS (Flynn et al., 2016).

According to Khalid (2016), few organisations do not become customer focused and their mission and target are to increase their profits hence they follow the profit-oriented objectives instead of customer oriented objectives. They invest little in market research to investigate which level of quality is demanded by customers and how it can be improved. They believe that investing in such market surveys which are designed for being more customer focused are only an extra expense. This little concern for customers creates further problems for the implementation of QMS, hence, it is considered as another barrier.

Rogala (2016) said that poor planning leads towards the ineffective quality improvement. When there is a deficient in the original plan, it becomes a reason of greater level of chronic waste. It is highlighted by Nanda (2016) that many times quality assurance managers give lower priority to planning which makes them unable to implement QMS effectively. There is a need for extensive planning as this can help in developing right attitude and desired awareness level in the employees and managers. When this planning aspect is missing, it results in many problems at latter stages of implementing QMS.

According to Flynn et al., (2016), lack of commitment by management is another barrier to implementation of QMS. Any quality management program can become successful only if it has support by the top management. The success of quality

programs needs devotion and commitment by the top management so that they could dedicate the required financial and human resources. When this is missing, it becomes difficult to become successful in the process of implementing any QMS. Many times, top management does not show commitment towards quality management because they have short term profit orientation. Likewise, having limited experience in quality management and requirement of extensive training results in lower level of commitment. So until top management does not recognise the importance of QMS, it is not possible to implement it effectively (Nanda, 2016).

Muruganatham et al., (2016) said that many times workforce show unwillingness to embrace QMS. There could be many reasons of such resistance by the workforce. The absence of long term objectives, productive and cooperative relationship between management and non-management employees, employees' trust and understanding of objective are few of the reasons which results in resistance by the workforce. This resistance by the workforce is another major barrier for implementation of QMS.

#### **4.5. Challenges with regard to the implementation of QMS**

Other than barriers, certain challenges are also faced. Challenges differ from barriers as challenges can be coped up with the help of appropriate measures and initiatives easily, while barriers are more difficult to handle and impede the implementation of QMS in a severe manner. According to Nirmala and Faisal (2016), the process of implementing total quality is the same as the implementation of other decentralised control methods. For the development of QMS, organisations are required to have an understanding of the definition of quality according to consumers with regard to both products and services that are being offered by the company in question. If more attention is paid by the company to improvement of quality in the production processes, then there is less chance of issues occurring with the end product. Management has to make a commitment for measuring the performance of an item in relation to its quality with the help of surveys conducted with customers. This can help managers in identifying design faults, or faults in any other process that aims to improve quality and, therefore, gives the company an opportunity for ensuring continuous improvement. As said by Usrof

and Elmorsey (2016), while implementing quality management policies within an organisation, the management faces a number of obstacles, an obstacle being an item or a situation causing difficulty. Obstacles can be in any form – physical, economic, political or social. Following are some challenges that management may face while implementing QMS.

- 1) Contentious markets. According to Abdallah (2014), a competitive market is considered to be a major compelling force for, rather than a hindrance to quality. A competitive market has an impact in the form of lowering the standards of quality to the minimum level. It is normally viewed as a psychological hindrance. Unfortunately, in most organisations, management perceive that quality management is associated with high costs and they assume that they are unable to afford quality. According to Mohammad Mosadeghrad (2013), in order to achieve long-term success and profitability, management has to focus on looking at quality from a positive perspective. There is an aspect of quality in all functions of a company and managing quality should work by inspiring employees at each stage to continuously improve their performance. The competitive edge gained through effective quality management results in costs being controlled and an improvement in customer service (Pushkala, Sridhar and Kumar, 2016).
- 2) Unfavourable attitude of management. A highly competitive business environment, bad management practices and lack of higher expectations have resulted in unproductivity and bad attitudes within organisations. In a situation where management thinks that it is always right, employees tend to have negative attitudes and their performance is negatively affected too (Jain and Block, 2013). According to Rashid, Bin Taib and Hj Ahmad (2016), management should provide training to employees with regard to QMS by getting them involved in teams and addressing and resolving their issues. This type of training can bring about a significant improvement in employees' attitudes, enhancing their motivation and creativity. As a result, productivity is improved.
- 3) Lack of leadership with regard to QMS. Rokke, Yadav and Singh (2015) state that,

due to companies having too many layers of management, duplication of responsibility and duties often results. In addition, lower-level employees leave the work of implementing QMS to the top management. Moreover, implementation of quality is not considered to be the combined responsibility of management and employees, and employees have no motivation with regard to the incorporation of quality issues in their day-to-day work.

- 4) Deficiency of cultural dynamism. Every organisation has a different way of doing things that is termed the organisational culture. In order to deliver the mission of the organisation successfully, it is important to stick to the organisational culture. The implementation of QMS has become difficult because most members of top management is inflexible in their ways of carrying out activities (Alsughayir, 2014).
- 5) Lack of resources for implementation of QMS. Since quality does not appear in the strategic plans of most companies, so less attention is paid to the implementation of QMS in respect of human and financial resources. Management gives a lot less consideration to resource allocation for providing training to employees in relation to the implementation of QMS because such training is generally considered to be an unnecessary cost (Mosadeghrad and Ferlie, 2015).
- 6) Less focus on customers. In the strategic plans of most companies, the management does not focus primarily on customers. They tend to focus far more on enhancing profitability within a specific time period. Little market research is done for ascertaining the performance of a product or service in the market in relation to its quality (Alsughayir, 2014).
- 7) Lack of effective measurement of quality improvement. The focus on quality management means monitoring the employees and processes of an organisation and establishing objectives through which the needs of customers could be anticipated. This has resulted in the creation of many challenges for organisations. Issues in relation to measurement arise because objectives depend on previous standard performance and also because there is a lack of resources for effective measurement anyway (Aladwan and Forrester, 2016).

8) **Poor Planning.** Due to the absence of a sound strategy, QMS are not implemented effectively. According to Mohammad Mosadeghrad (2013), most companies show unwillingness to plan in an effective way for bringing about an improvement in quality. Although careful planning might be done before implementation of QMS is started, the necessary stages for its successful achievement are never identified.

#### **4.6. Role of top management in the implementation of QMS**

Oakland (2014) stated that for ensuring success in an organisation, top management has to readily accept that QMS need to be implemented. It is the responsibility of top management to convey its dedication and commitment to all members of the organisation. There is a need to set the policy for implementing and maintaining QMS in writing and incorporate it into the mission and objectives of the organisation. According to Mihalache et al. (2014), the key aspects of the role played by senior management in the implementation of QMS are the institutionalisation of the quality management structure as developed through stated objectives and formal standards and policies, and giving leadership.

As mentioned by Sallis (2014), it is important for top management to set organisational objectives and standards. There must be a continuation of processes used to set objectives and the subsequent allocation of authority and resources throughout the organisation. The aim of top management should be to enlist the support of employees by ensuring that they are aware of the priorities of the organisation and that they have the necessary knowledge for accomplishing the goals. Moreover, there is need to monitor progress on regular basis, in accordance with agreed criteria, and rewards should be provided to employees for achieving specific goals (Goetsch and Davis, 2014).

#### **4.7. The role of HRM in the implementation of QMS**

According to Sparrow, Brewster and Chung (2016), a vital role is played by HRM in organisations with regard to the implementation and maintenance of QMS. HR managers have a responsibility for recruiting skilled employees, developing

programmes of training for them and creating and maintaining the systems of rewards. Thus, quality control processes in HR are considered to be highly important in order for an organisation to achieve the dramatic changes in organisational culture necessary for the successful implementation of QMS. Kern (2014) mentioned that it is important for HRM to tailor the quality management cultural development programme to the individual circumstances of a company in order to overcome resistance to change and to move beyond normal forms of compliance to total commitment to quality management.

Storey (2014) stated that HRM has the role of liaising between top management and employees and has different ways of establishing channels of communication between them. With the help of these channels, HRM can make sure that employees know how important their role is in the successful implementation of QMS. Through building trust with the help of an open exchange of concepts and ideas, fears can be allayed relating to any changes in work roles that will be required in the implementation of QMS. Riley (2014) explains that this can also form a basis for instituting training in order to get employees to consider their colleagues as internal customers. The analysis shows that HRM has the opportunity of emphasising the new outlook through exemplification of a customer-first orientation.

According to Kinicki et al. (2014), the functional expertise of HRM is its capability to monitor and survey the attitudes of employees. This skill is considered to be highly important for the successful management of quality, because if a new initiative is to get off to a good start then there must be information relating to current performance. Thus, a preparatory step is taken by administering a survey of employees that targets two basic concerns (Jain and Block, 2013). They say that the first necessary task is to identify troublesome areas in recent operations where a significant impact on the performance of a company can be seen through bringing about improvements in quality. The other important task is to determine perception, attitudes and beliefs of current employees towards quality as an important objective, so that there can be complete effectiveness in the implementation programme.

#### **4.8. Recognition and awareness of issues**

One of the objectives of this research is to review the awareness of external issues (government, legislation, corruption, economic pressures) that are influencing the actions of selected companies involved in the manufacture of baby dairy products. This section reviews the important external issues.

##### **4.8.1. The role of the Chinese government**

There are many ways in which the Chinese government responded to the melamine scandal as soon as it became evident. The scandal triggered significant concerns from the consumers as well as the manufacturers. For this reason, an announcement was made by the government's top leader, Prime Minister, Wen Jiabao, addressing the issue. In this announcement, the shortcomings of the government were discussed and the government promised to review policy in the affected area as a matter of urgency (Lu and Tao, 2009).

According to Xinhua News (2008a), the first step taken by the Chinese government was to restore a supply chain such that milk safe for consumption was delivered to the processing plants. On the milk procurement and milk delivery side several actions were taken, such as the development of supply chain management policies, including the upgrading of the milk collection stations. New production management policies were also introduced and, as a result of these, new production environments were developed. In addition, compensation payments were offered to small dairy farmers as part of new crisis income management policies. According to Xiu and Klein (2010), all of these policies were adopted by the government because it owned many of the large companies and shutting them down could have caused huge economic losses for the country. Previously, the government was busy expanding the baby dairy product industry in relation to profit only and no quality checks were carried out on the milk coming from dairy farmers. After the melamine incident, the government started to become active and introduced legislation to deal with the culprits.

#### **4.8.2. The Chinese regulatory system with regard to dairy farms: Legislation**

Reforms in Chinese food safety law were enacted after the melamine incident and the new Food Safety Law was officially implemented in June 2009. The new law embodies the ‘farm to fork’ food chain principles laid down by the EU regulatory framework which defines each and every step from procurement through to packaging and then to the final product. In implementing the new law, the Chinese government adopted Good Agricultural Practice (GAP) and GMP in the whole of the food sector, and at the company level it adopted HACCP (Aredy, 2009).

From 1995 to 2008, the food sector in China was administered by the Food Hygiene Law of the Peoples’ Republic of China, which set out the supervisory and institutional food controls necessary. According to Chang (2009) and Hays (2010), the Chinese food safety regime was affected by institutional fragmentation, putting responsibility on several ministries rather than one. The new law was put into practice so as to restructure the responsibilities and to also clearly separate the regulating bodies.

Under the previous regime where there had been no specific laws with regard to QMS and quality control, many large companies voluntarily gave permission for an inspection on the basis of their past performance and record in food safety. The food safety system was characterised by a lack of resources, insufficient coordination and a significant imbalance between the number of official controls used in rural as opposed to urban areas, according to a report generated by the United Nations (United Nations, 2008). According to Chang (2009), ‘China’s current food safety supervision system is doomed to making the supervision passive, leaving reparation as the only source of surviving in the industry.’

The economic development of the baby dairy product industry was a major concern for the Chinese government even before the melamine scandal occurred. Following this, the government focused on strengthening quality control and the regulatory framework, see Table 4.1. In the new Food Safety Law, introduced in 2009, as many as 104 rules

were added. The new law was aiming for better harmonisation between the provincial and national authorities and better monitoring by the government. It was modelled on the European Rapid Alert System for Food and Feed (RASFF) in which the major responsibility lies with the food companies. A loophole in the Chinese food safety system is the lack of skilled personnel which has been rectified by introducing training schemes (USDA, 2009).

Table 4.1: Responsibilities of China’s food regulatory agencies under the new Food Safety Law 2009.

Regulation	Main food safety problems addressed
New food safety commission under the State Council	Coordination and oversight of the new food supervision apparatus
MOH with the SFDA beneath	Assessment of food safety risk, setting of national standards for food safety, release of information relating to food safety, regulation of food safety testing and investigation of serious food safety incidents
Administration for quality, supervision inspection and quarantine (AQSIQ)	Supervision of food production and exports/imports
SAIC	Supervision of the domestic wholesale and retail food sectors
Ministry of Agriculture (MOA)	Responsibility for non-processed farm products

(Source: Pei et al., 2011.)

Table 4.1 illustrates the different administrative bodies and scope of their responsibilities. Under the new Food Safety Law 2009, a national food safety commission was established by China’s State Council whose responsibility was to oversee and coordinate the new food supervision apparatus. The MOH was to be held responsible for elaborating uniform national standards for food safety under which regular inspections would be made. Period checks as well as random checks would be conducted in relation to food safety and there were to be no exemptions from inspections. In the dairy sector in particular, the MOA and AQSIQ were to be held responsible for quality control. The MOA was to have jurisdiction over dairy farms and

AQSIQ was to have authority over food operators (Zhou and Wang, 2011).

#### **4.8.3. The impact of corruption and economic pressures**

The melamine incident happened because of the lack of legislation and non-implementation of policy. This indicates that corruption existed in this respect because of the self-interest of the government. In the 4 largest companies (Mongolia Yili, the Mengniu Dairy Company, Bright Dairy and Sanlu), there were no checks on them from government. The EU regulatory framework, implemented on paper, was not adhered to in practice (Hays, 2010).

Due to the melamine scandal, the baby dairy product industry in China faced tremendous losses; the volume of infant formula milk sold fell to its lowest ever. Companies were pressurised to recall their products (Xinhua, 2008c) and approximately 8311.7 tonnes of baby dairy products were removed from the market. Furthermore, Sanlu went bankrupt because the company had to pay compensation. Mengniu, the largest baby dairy product company claimed its losses reached CNY 900 million (equivalent to GBP 107.96 million). The greatly reduced demand also affected farmers and 130 small dairy farms had gone out of business by 30 November 2008 (Xinhua, 2008e). In addition to this, the credibility of the baby dairy product sector was also lost. To regain the same level of trust, the companies still have a long way to go.

The melamine incident also affected Chinese exports. According to Zhu (2008a) exports of Chinese dairy food products fell by 92 per cent. An alert against Chinese food products, especially dairy products, was issued by many countries including Japan, many European nations and the US, and certain baby dairy products were banned from being sold.

A factor underlying corruption was weak oversight of the production of Chinese baby dairy products by the government which enabled local regulators as well as company management to indulge in corruption. According to DeLaurentis (2009), in one of the reports published in the *New York Times* in 2008 local regulators took bribes from the companies that were partially owned by the government not to carry out inspections.

As stated in a blog, the victims accused the local authorities and the baby dairy product companies of being involved in corruption (Zhuang, 2008). This analysis has deduced that the local authorities, the government of the time and company management were all involved in corruption.

#### **4.9. Summary of issues**

Pressure from customers is an important driver in the implementation of QMS. Although food safety law was already present in China, it was not strictly enforced (Enderwick, 2009). There were many barriers to implementing QMS and adhering to relevant laws, regulations and standards. The literature review has discussed these barriers in detail. To briefly summarise, the literature stated that the barriers include pressure from competitive markets, management orientation, leadership ineffectiveness, inadequate resources, ineffective QMS (especially ineffective planning) and the costs associated with the implementation of QMS (Sallis, 2014; Oakland, 2014; Heras-Saizarbitoria and Boiral, 2013; Goetsch and Davis 2014; Eldh et al., 2014). The successful implementation of QMS depends on how effectively the quality system is maintained and established, and how effectively the government enforces the appropriate quality legislation (Douglas and Judge, 2001). The proper integration of QMS within other systems also plays a critical role in the success of their implementation (Gratwohl et al., 2011). Moreover, training of employees is also crucial. Along with commitment from top management, there must also be an effective leadership style (Parzinger and Nath, 2000).

After the melamine scandal, the role of the government with regard to quality control in the baby dairy product industry has been strengthened. The government introduced legislation and practices, such as GAP and GMP which were applied by the food sector. Food safety law was also reformed in relation to those aspects concerning quality (Chang, 2009). In addition, in order to investigate and apportion responsibility for the baby dairy product scandals, the government set up a special investigation and exposed the illegal benefit relationship (involving corruption) between government officials and the baby dairy product companies. Here, the government played the role of a driver for

QMS in the sector. Prior to the melamine scandal, it was because of the government that QMS legislation was not enforced. After the melamine incident, the government started acting as an enabler for QMS by enforcing quality legislation in a proper manner. Consumer trust in the Chinese baby dairy product industry declined significantly due to melamine being found in the products. However, there is still very much a demand for these products as consumers relied heavily on them, and it is expected that sales will increase by 69 per cent between 2012 and 2017 (Euromonitor, 2013). The government now has full authority to check for quality in the baby dairy product industry. In addition, credit management institutions focused on the economic expansion of the industry so that the licences and financial aid were issued far too easily without checking the existence of companies' QMS. After the melamine incident occurred and customer awareness was heightened, these main drivers have drawn attention to the implementation of QMS (Gossner et al., 2009).

From the literature review chapters, it can be seen that significant research work has been undertaken on QMS. There were a number of existing laws (e.g. Food Safety Law, and Food Additive Law), regulations (e.g. Food Production License and Food Safety National Standards) and standards (e.g. ISO 9001, HACCP, GMP and FSSC 22000), but these were not used effectively by Chinese companies. It has been identified in the literature review section that there are certain barriers to implementing QMS, e.g. inadequate resources, the orientation of management and resistance from employees. As mentioned previously, the melamine incident and customer awareness are the major drivers that have drawn attention to the implementation of QMS. The literature has reported that external factors, including customers and the government, are motivating baby dairy product companies to implement QMS. This study will further examine the drivers for QMS in the Chinese baby dairy product industry later on. To summarise the whole literature review section, it can be said that previous studies about the implementation of QMS, the key actors in the supply chain, barriers to and drivers for the implementation of QMS, and about the awareness of other significant issues relating to the implementation of QMS, have been reviewed. The current literature does not

specifically address issues relating to supply chain actors or consider the barriers to and drivers for QMS specifically with respect to Chinese baby dairy product companies. Nor does it examine significant external issues and challenges that are specific to the industry. Hence, this study looks at these. The literature has identified that the Chinese baby dairy product industry faced a complete transformation after the melamine incident in 2008. However, there has not yet been a comprehensive and critical analysis of the implementation of QMS here. It seems that the government played the most critical role, but this has yet to be explored in a detailed and analytical manner. Furthermore, it is not yet known how the supply chain actors in the Chinese baby dairy product industry are involved in the implementation of QMS. In addition, the barriers to and drivers for implementation of QMS in the industry and significant external issues and challenges that are specific to it are not known. Hence, these identified gaps are addressed in the next chapters of this research study.

## Chapter 5: Research Methodology

### 5.1. Introduction

This chapter provides the explanation and justification of the research methods that have been selected for this study. The research was divided into 2 phases: MPhil (Phase1) and PhD (Phase 2). This chapter presents the methods that were used for meeting the research objectives of both phases. All the stages of the research work are shown in the following flowchart:

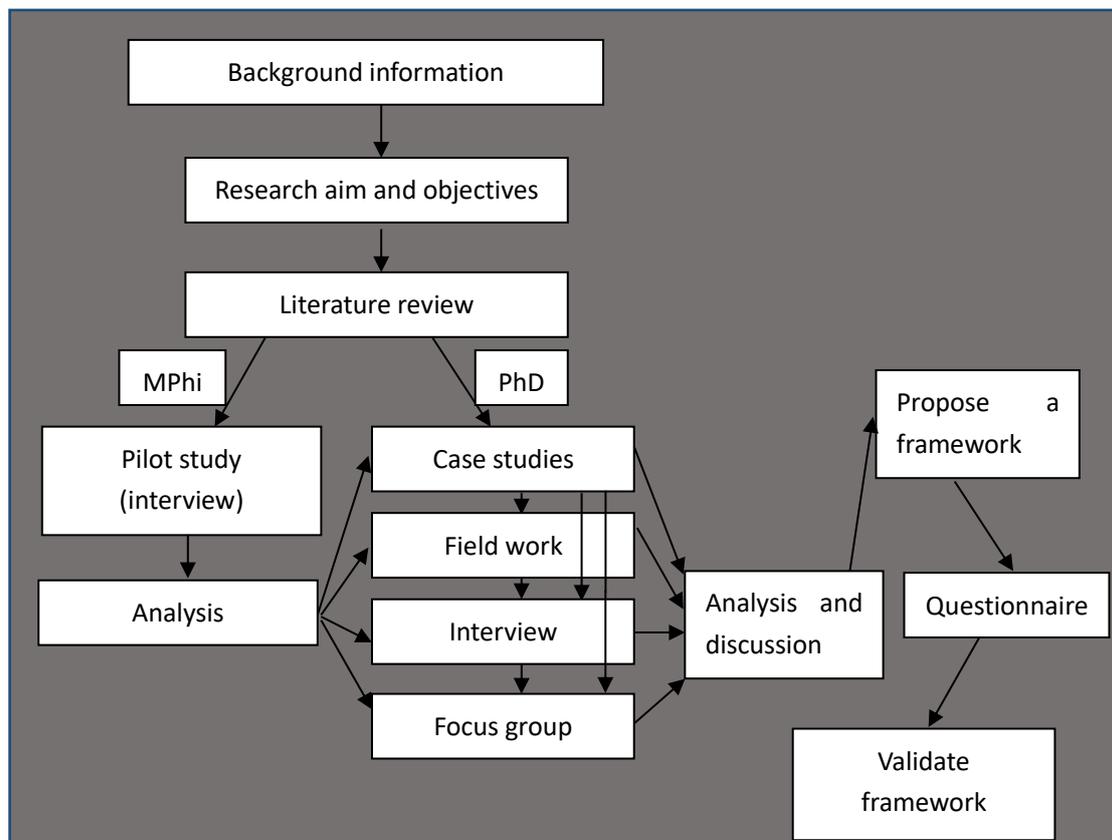


Figure 5.1: Research flowchart.

### 5.2. Research philosophy

This study explores the impact of QMS on the Chinese baby dairy product industry. Consistent with the ninth objective of this research, it analyses companies manufacturing baby dairy products from two countries – China and the UK – in order to compare best practice. After discovering what best practice is, a framework for the implementation of QMS is proposed. The research carried out was based on the

philosophy of pragmatism. Pragmatism relies on using a combination of different research methods and analysis techniques and is a combination of positivism and interpretivism (Feilzer, 2010).

According to this research philosophy, only those concepts are considered relevant which can support the action. It is clearly recognised in this research that there are various distinct ways for interpreting this world and completing a research study, there is no single perspective or point of view which could be adopted for getting the entire picture and there are multiple realities which exist (Creswell and Poth, 2017). Usually, positivism and interpretivism are the extremes of paradigms which are known to be mutually exclusive. Many of the research studies select one of these two paradigms, but there is also a distinct need in some studies which requires the researchers to change their philosophical assumptions over a period of time, hence they move to a new position on the continuum. This view of adopting varying philosophies as per the need of time and this research is known as pragmatism research philosophy (Robson and McCartan, 2016). Basically, at initial stages, interpretivism philosophical assumptions are followed by the researcher where interviews and focus group discussions are organised. At latter stages, after presenting the framework, questionnaire technique is used for validation of the framework and this validation process has used the positivism philosophical assumptions (Johnson et al., 2016). For this philosophy, as said by Shusterman (2016), it is the only research question or objective which determines which research philosophy should be adopted. Therefore, when it was needed by the nature of the objective to adopt positivism research philosophy, researcher left the interpretivism view of this world, and adopted the positivism research philosophy for validation of the framework. Being specific about the research approach, pragmatism research philosophy allows to select either deductive or inductive approach. The ontology of the research could be objective or subjective, axiology is value-free and biased and research strategy could be quantitative or qualitative over the time period for completing the research study (Baskerville and Wood-Harper, 2016).

Interpretivism is related to qualitative research, in which data are collected with the

help of interviews and observations. Positivism is a philosophy that is used in quantitative research. Using the pragmatism paradigm, a combination of methods, i.e. focus group discussions and interviews, as well as a questionnaire with closed-ended questions, are used in this research to explore the implementation of QMS in a socially useful manner. The rationales for selecting this particular paradigm over others were as follows. First, it helps in identifying underlying facts about the research problem (Lin, 2005). Secondly, it improves the accuracy of the data collected for the empirical results. Thirdly, it helps the researcher to provide a complete picture through the use of information collected from complementary sources (Rorty, 1982). Fourthly it helps in avoiding the inherent weaknesses of the interpretivism and positivism paradigms when used singly (Goldkuhl, 2012). And finally, the pragmatism paradigm helps the researcher to reveal more information by using mixed methods. It was, therefore, considered to be the most suitable philosophy for achieving the objectives set for this research (Rorty, 2013).

### **5.3. Research approach**

The methodology chosen for the research is the mixed methods approach, i.e. both qualitative and quantitative methods (Patton, 2002). The mixed methods approach allows for exploring the research issues through qualitative methods and validating the findings through quantitative methods, which enhances the accuracy of the results. Additionally, this method allows for a broader perspective, the collection of reliable and valid data and reduces personal bias. As mentioned by Sheperis et al., (2016), mixing both quantitative and qualitative methods enable the researcher to ensure that there is breadth and depth in the findings of the research. Moreover, this approach has helped to offset the inherent weaknesses of both approaches i.e. quantitative and qualitative. Dörnyei (2007) said that the most important benefit of mixed method research is the possibility of triangulation through which the researcher can combine several methods and data sources for fulfilling the aim and objectives. Creswell and Clark (2007) said that the aspects of a phenomenon could be identified more accurately when there are different methods or techniques which are used for analysing the same research

problem.

Johnson and Onwuegbuzie (2004) identified certain conditions in which it is recommended to use the mixed methods approach. Most commonly, it is preferred to be used for validation of the results which are obtained from the other methods. Tashakkori and Teddlie (2010) said that mixed methods could be used when one method has to inform another method. For example, in certain cases, there is little known about certain research issue so it is important to first explore the research issue with the help qualitative method. Once main variables are identified through qualitative methods, these are studied in a quantitative manner on large sample size. Johnson et al., (2007) said mixed methods could work well when there is a need to explore the research question from different angles to clarify the unexpected findings. Creswell et al., (2003) told that mixed methods could also be used when a research intends to develop and test the theory in the same research. The qualitative methods help to develop the theory (e.g. framework) while quantitative methods are used for testing the theory. Teddlie and Yu (2007) said that this could also be used for generalizing the research findings which are obtained from the qualitative research.

The mixed methods approach was selected so as to gain as much information as possible from the companies about their QMS. The qualitative data were gathered in the form of interviews and focus group discussions with managers from various different departments in the selected Chinese manufacturers of baby dairy products, with government officials and also with managers working in selected UK companies of baby dairy products. The quantitative data were gathered from managers of companies manufacturing baby dairy products by questionnaire. As a rule, the qualitative data were collected first, then the quantitative data. To summarise, the qualitative data explores the research problem and then the quantitative data validates the findings.

#### **5.4. Research strategy**

This research follows the case study strategy which can be explained as an in-depth and detailed examination of the selected case considering the contextual conditions (Mills et al., 2010). The case study is “an empirical inquiry that investigates a contemporary phenomenon within its real-life context, when the boundaries between phenomenon and context are not clearly evident” (Yin, 1989). The selected strategy is collective and instrumental, and involves studying more than one case in order to gain an in-depth view of the research issue. Moreover, this strategy has the potential to optimise a detailed understanding about the research issue instead of only a general understanding (Stake, 2000). This strategy has been growing in popularity over the last few decades for the investigation of trends and situational contexts and it is also used for testing theoretical models in real situations. It is the most commonly used strategy in business and management research (Ghauri, 2004). The reason for selecting this strategy is that it permits a narrowing down of the broad research issues into more manageable areas of study. Moreover, case study research design allows for more realistic responses to the research questions, as compared to other strategies. The nature of the current research is such that the case study strategy is more appropriate because it means that new and unexpected results can be explored, which can often give a new research direction to the study in question.

The case study strategy has the potential to bring about a deeper understanding of the implementation of QMS and the barriers and drivers pertaining to this (Yin, 2013). It can also take into account supply chain management processes, a significant related issue. Another rationale for selecting the case study strategy is that it allows in-depth analysis on the basis of multiple methods, sources and data collection techniques (Silverman, 2004), also known as triangulation (Jick, 1979). Triangulation improves the rigour of the research as it ensures validity (Marshall and Rossman, 1989) and overcomes the issue of partiality which may occur due to the researcher’s reliance on a single source.

### **5.5. Unit of analysis**

The unit of analysis is companies of baby dairy products where four companies in China and two in the UK were selected. A baby dairy company is defined as a business association which works on commercial goals in the industry of baby milk production. As the focus of this research is on pre-production stage, the supply chain actors, which are part of the selected case studies, are also considered in analysis. Hakim (1987) suggested that when the research issues are complex, it is more appropriate to have more actors in the case study research design. It was, therefore, feasible to use multiple cases for presenting the empirical findings with regard to the implementation of QMS because it involves many actors, roles and interactions. Companies of baby dairy products were selected because the impact of the melamine incident on QMS is most relevant to the baby dairy product industry in China. Multiple cases are selected to create divergence and theory-driven variance in the data collected (Pauwels and Matthyssens, 2004). Companies in both countries were selected in order to compare both groups and to find best practices for quality management in the chosen industry. One of the most important decisions made was about the unit of analysis. This research contends that it is more productive to analyse the implementation of QMS at macro level, i.e. company level, instead of narrowing it down further to the individual products of the companies selected. The rationale for avoiding individual product implementation of QMS is that it might prevent new insights into the implementation process and it may also be insufficient to capture the process properly.

### **5.6. Case study - Sample selection**

The purpose of empirical and qualitative inquiries is to analyse the meaning of a particular phenomenon using the participants' perspectives, hence it is important to select a sample that will allow for the most learning (Merriam, 2002). The present study selected the different case studies using a non-probability sampling method, namely purposive sampling (Yin, 2013). It is a non-probability sampling technique in which sample is selected on the basis of characteristics of the population along with the research objectives. The judgment and subjective selection of the researcher is used for

selecting the sample in a manner that such participants could be selected which could provide rich data about the research issue. The underlying rationale of this sampling technique is that for gaining insight and a greater depth of understanding, and for eliciting greater detail, the researcher selected the sample that had potential to provide the richer information (Merriam, 1988). It is, of course, permitted to select those cases that are information rich and can answer the research questions in a satisfactory manner (Patton, 1990). The companies selected are using one method or another to control quality.

After the melamine incident in China, the government requested legal bodies to revise quality management policies and the baby dairy product manufacturing companies have complied with these new and revised quality management laws. Another main reason for the selection of these companies is that, as highlighted by Fuller and Beghin (2015), their whole supply chain management process has been affected by the changed government policies and practices. QMS were the main point at issue in these companies and revising them was, according to the managers, a long and expensive process.

With regard specifically to the sample of companies from China's baby dairy product industry, the market capital of these selected companies is influential as, together, they account for 49 per cent of the market share and are regarded as the most well-known companies in this sector (Yu, 2012). The four companies have been selected from three different Chinese provinces: Inner Mongolia, Beijing and Shanghai and they are represented by four different letters: A, B, C and D.

With regard specifically to the sample from the UK baby dairy product industry, two companies have been selected. These companies are represented by the letters E and F.

The selection of these companies is based on the purposive sampling technique as per suggestion of Yin (2013), the researcher selected such baby dairy product companies which could provide relevant data for fulfilling aim and objectives. Further to this, the access to organisations was also considered while selecting them. Those organisations

were selected in which the researcher could have access, in an easier manner.

The research is about various aspects of QMS implementation, ranging from implementation of QMS and standards implementation, influence of recognition and awareness of external issues, supply chain management, barriers, drivers and challenges, investigation of QMS implementation, critical evaluation of standards and legislations related to QMS to the framework for implementing QMS. Following the purposive sampling technique for six companies, these objectives were considered and the researcher filtered the companies to investigate whether or not the relevant information could be accessed. Other than accessibility of these companies, through secondary research (i.e. official website analysis) and initial phone call discussion with managers, it was figured out whether or not these companies have potential to provide relevant data for this research study. These six companies were selected after it was found that they meet the initial criteria of the selection i.e. ability to provide relevant information about the research aim and objectives. For example, during the initial screening, two Chinese companies were accessible to the researcher, but it was found that their QMS was not at the implementation stage and they were only planning to implement it in next few months. Hence, those companies were excluded from the sample.

Information about the selected companies is given below:

Table 5.1: Information on sample case study companies.

Companies	Country	Category	Area	Ownership	Market Capital – Year 2015 (billion)
Company A	China	Liquid milk, milk powder	Hohhot, Inner Mongolia	State-owned	CNY 81.67 (GBP 9.19)
Company B	China	Milk powder, milk beverage	Beijing	State-owned	CNY 19.6 (GBP 2.18)
Company C	China	Yoghourt, liquid milk, milk powder	Inner Mongolia	Private	CNY 71.2 (GBP 7.94)

Company D	China	Milk, milk powder	Shanghai	Diversified ownership shareholding	CNY 21.68 (GBP 2.42)
Company E	UK	Infant formulas and foods	Cumbria	Private	Unknown
Company F	UK	Specialised in advanced baby milk formulas	London	Private	Unknown

### 5.7. Data collection: Interviews

The primary data were gathered from these six companies. Interviews were conducted with the managers of all those departments that were concerned with quality as it has been mentioned in the literature that QMS do not only deal just with the actual manufacture of the product, but also involve input from other departments. The interviews were conducted by telephone and video calls, and face to face. For Phase 1 (MPhil stage), telephone and video calls were used for conducting the interviews while for Phase 2 (PhD stage) face-to-face interviews were conducted. In both stages of the research, interviews were the main method used for collecting data. The reason for selecting interviews was that these are useful for exploratory studies and help to find new concepts and issues which have not been thought of previously (Daniels and Cannice, 2004). The level of rapport that can be developed with participants is higher in interviews than with a questionnaire. The preliminary interviews also confirmed that a relationship of trust developed during interviews with the government officials, ensuring accurate and honest information from participants.

Before conducting the interviews, interview guides/questions (Appendices A, B, C and E), participant information sheets (Appendices G and H) and consent forms (Appendices I and J) were developed for the participants: the managers and government officials. In all interviews, the researcher first introduced himself and explained the aim and objectives of the research and the interview itself. The researcher adhered to all academic research guidelines and, therefore, it was ensured that every interviewee was fully aware of the aims of the research. The interview questions reflected the research questions and the aim of the research, and that care was taken to ensure that only

relevant questions serving the research purpose were posed to the interviewees. The ordering and sequence of questions was on the basis of themes to ensure a logical sequence and all of the interview questions were clear and easy to understand. Even though the interviewees were selected on the basis of purposive sampling and it was assumed that they were sufficiently knowledgeable about the implementation of QMS, the researcher tried to use minimal jargon to keep the interviews as simple and straightforward as possible. There were no leading questions in the interviews in order to minimise the researcher's bias (McLellan et al., 2003).

Most importantly, the interviews were semi-structured. In addition, unconventional views/concerns of the participants in relation to QMS were also incorporated into the research in order to ensure an in-depth understanding of the research issue. In the collection of data, quality assurance/control/inspection managers, production managers, procurement managers and operations managers were interviewed. For each company, care was taken to interview the people who were most knowledgeable about QMS. Before selecting the interviewees, a brief telephone conversation was conducted with the top management of each company. The purpose of this was to inform the management about the aim of the study and obtain their approval. In this conversation, top management was asked for suggestions of those managers who could provide the best and most relevant information about the research issue. Hence, the criterion for selecting interviewees was their knowledge and understanding of quality management.

The following checklist was provided to six companies and only those managers were selected for interviews which fulfilled these criteria.

- At least 5 years' experience in quality management;
- At least 2 years' experience in baby dairy product company;
- Professional knowledge about quality management legislations;
- Directly involved in implementation of quality standards;
- Ability to provide relevant and reliable information.

All of the selected managers have rich experiences in quality management areas, so it

can be assumed that they provided directly relevant information which is close to reality.

With regard to the format of interview questions, these were open-ended so that participants would be able to say what they wanted. Care was taken to avoid such wording as could influence the answers of participants; hence, neutral questions were asked. One question was asked at a time and they were clearly worded (Turner III, 2010). The questions were written in simple English; however, a translation was also attached. As English was not the first language of the participants, questions were translated into Chinese during the interviews. The interviews were recorded in order to ensure that the researcher could give full attention to the participants while interviewing was taking place, although the researcher did take notes during the interviews as well. Participants were asked to consent to recordings being made. Later on, the interview records were transcribed and translated into English (Appleton, 1995; Warren, 2002).

The interviews included managers from the selected case study companies and government officials.

- 1) Interview with managers: The interviewees were senior level managers from the selected four Chinese and two UK companies. They were from quality assurance/control/inspection departments, production departments and procurement departments and were not the same people who attended the focus group discussions. Different people were selected to obtain diverse views. The number of interviewees was twelve in China, i.e. three managers from each Chinese company were selected (PhD stage). The interview questions were designed using the themes emerging from the literature review, and data relating to the implementation of QMS in companies manufacturing baby dairy products were collected. The selection of the managers from the companies was purely based on the nature of their work and experience, there was no intervention of any government official. The desire was to collect rich data, therefore, the researcher wanted to develop a good rapport with interviewees. The researcher aimed to start an open conversation with the participants whereby they were encouraged to discuss the many different issues pertaining to QMS in the baby

dairy product industry in China. The researcher directed the interview as per the responses of the interviewees and did not only ask the pre-defined questions in order to ensure the best possible data was obtained. The interview questions that were posed to managers from Chinese companies of baby dairy products can be found in Appendices A and B while the interview questions that were posed to managers from UK companies of baby dairy products can be found in Appendix E. As the main focus of this research is on Chinese baby dairy industry, UK baby dairy industry would be regarded to complement the research findings and extensive data was not collected from the UK managers.

- 2) Interview with government officials: Government officials from the Guangdong Food and Drug Administration (GDFDA), the CFDA and the Institute of Product Quality Supervision and Inspection were interviewed. There were two governmental officials in MPhil stage and three in PhD stage who were interviewed. The government officials were more knowledgeable about legislation; hence, the aspects of this research concerning legislation were explored through these interviews. The interview questions that were posed to officials can be found in Appendix C.

### **5.8. Triangulation in Data collection**

Other than primary data obtained through interviews and focus groups, secondary sources, i.e. third party published reports, official websites, annual reports and articles were also used for data collection. The rationale for using secondary data were that as Jick (1979) said, it is a standard approach in qualitative case studies. The researcher recognised that every method has its own limitations; thus, to avoid the inherent bias of one single method, a variety of methods were used for data collection (Creswell, 2003). As has already been stated, in addition to interviews with managers from the case study companies, interviews with government officials were also conducted. The rationale for interviewing government officials as well was that multi-actor viewpoints ensure internal validity and improve the credibility of the research findings. This approach is also known as triangulation (Lincoln and Guba, 1985; Merriam, 2002).

It became apparent from the initial interviews conducted in Phase 1 (MPhil stage) that interviewees were reluctant to share information. However, with the help of the government officials from the GDFDA, the problems of accessing in-depth data were resolved, and the interviewees even invited the researcher to visit their production plant in order to help him obtain the best information. Therefore, multiple sources for data collection were used in Phase 2 (PhD stage). As a result, triangulation was employed and this helped in unveiling issues on a broader scale. The research did not only collect data from four companies in China manufacturing baby dairy products, but it also collected data from two companies in the UK manufacturing the same. The implementation of QMS in companies in two different countries in this sector could, therefore, be analysed and compared. From the analysis, best practice emerges, which has helped in presenting the framework for the implementation of QMS. Government officials were also selected as interviewees for collecting primary data. The rationale behind adding government officials as participants of this study is to obtain a holistic view of QMS in the Chinese baby dairy product industry.

### **5.9. Data collection - Focus group**

In order to verify and validate the information from the interviewees, the focus group strategy was used in Phase 2 (PhD stage). Guba and Lincoln (1994) state that a focus group is a form of research in which a group of people are asked about their perceptions, opinions, beliefs and attitudes about any research issue. Questions are asked in an interactive group setting where participants are free to talk with each other (Morgan, 1998). The rationale for selecting focus group discussions is that they are useful for generating an in-depth understanding of participants' experiences and beliefs (Bloor et al., 2001). For this study, focus groups were used for generating information on the implementation of QMS in Chinese companies manufacturing baby dairy products. The participants for the focus group discussion were recruited carefully where it was ensured that selected focus group members are knowledgeable and experienced about the quality management (Morgan, 1986) and the focus group consisted of six people: four managers from the baby dairy product industry and two government officials who

were responsible for quality management regulation, legislation and standards.

In addition, there was a moderator. The researcher maintained a comfortable and friendly environment and participants sat around a table. The moderator, a retired government official who had worked in the General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China (AQSIQ), was selected on the basis that he was skilful in group discussion and able to establish a productive environment. According to Henderson's recommendation (1995), the moderator asked pre-determined questions of the group and the discussion was conducted using Krueger's suggestions (1997). Krueger (1997) has recommended that there should be only 6 to 8 participants in the focus group and the environment should be comfortable and tape/note recorded. The moderator should use the pre-determined questions and moderator should develop permissive environment. The author also recommended that focus group analysis must be systematic and verifiable procedures of analysis should be used for collected data. The author also recommended dividing the focus group in three parts hence there were three parts to the focus group stage of data collection and further details are provided below.

#### **5.9.1. Before the focus group:**

In this phase, a research plan was first distributed to all members of the group. Before discussions can start, the agreement of all participants is necessary; hence, their consent was obtained. It is important to define the purpose and objective of a focus group. Therefore, at this stage, a clear objective and purpose were set. Parker and Tritter (2006) suggest that when there is clarity in purpose and objective, this aids easy collection of data. The timeline of the focus group also has to be set. Experts state that planning for it can take several weeks, during which participants, questions, invitations and other details have to be decided. In this research, therefore, the planning started in October 2015. It was decided that the participants would be four managers and two government officials. The managers were quite high ranking. Hyde et al. (2005) suggest that when there are fewer than six participants, it limits the discussion, so it was ensured that the number of participants was not fewer than six. According to Edmund (2000), focus

group discussions are conducted most effectively when the number of participants is between six and eight; six participants was, therefore, thought to be a suitable number for this particular group. The participants had certain key attributes which it is worth mentioning:

- 1) they had a clear conceptual understanding of QMS;
- 2) they had worked in QMS for at least 5 years;
- 3) they were knowledgeable enough to provide necessary information;
- 4) they understood the key terminologies used in the focus group discussion;
- 5) they were directly or indirectly concerned with the implementation of QMS system.

These attributes were discussed with the top management of each company selected to be a case study so that suitable managerial candidates could be identified. The participants were then invited to the focus group discussion via a professional email and a telephone call. The managers taking part were from the quality assurance/control/inspection departments of their companies and the government officials were from the Institute of Product Quality Supervision and Inspection and the GDFDA.

In the planning phase, the focus group questions had to be prepared. The focus group discussion usually lasts for between one to two hours, so the number of questions could not exceed seven. (Appendix D). As per the suggestion of Kitzinger (1995), these questions were open-ended. After designing the questions for the focus group, they were cross-checked with the research aims and objectives to ensure that each question helped in achieving these, and any unnecessary questions were eliminated. Some rewriting took place to ensure that the questions were clear and understandable. The ordering of questions was such that they moved from general to specific, as is recommended by Sim (1998).

Once the questions were constructed, the researcher moved to the development of a script that had to be delivered in the time frame of one hour. Clear opening and closing

remarks were necessary and these took some time to word. Broadly, there were three parts to the focus group session. In the first part, the moderator welcomed the participants and explained the context and purpose of the focus group. In the question and answer part, the chosen questions about the implementation of QMS were asked. In the final part, some closing remarks were made and an opportunity was given to all participants to add anything else of importance that had not been discussed. The participants were thanked and it was explained to them how the data gathered was going to be used in the research. They were also told when the research was expected to be completed.

As suggested by Von Seggern and Young (2003), it is important to have a moderator who can deal tactfully with any very outspoken participants of a focus group discussion. The moderator chosen should have a working knowledge about the research issue in question and needs to be adept at putting participants at their ease. He/she needs to be able to keep the discussion on the track and ensure that every participant can put forward their views. In this research, the focus group discussion was facilitated by a retired government official from the AQSIQ who was personally invited by the researcher.

With regard to the venue, it was necessary to ensure that participants could express their feelings and opinions in a relaxed and comfortable environment. A conference room in a hotel in Guangzhou was thought to be suitable. The message communicated by the venue was that the event in question was a corporate and formal one. It was expected that the conference room setting would encourage discussion between the participants because the eight people (moderator, participants and researcher) were accommodated very easily face to face around a table.

### **5.9.2. Conducting the focus group**

The focus group discussion was held in January 2016 in the aforementioned conference room of a hotel in Guangzhou. The purpose of data collection through this focus group was to gather the opinions, attitudes and beliefs of managerial employees in the baby

dairy product industry in China along with those of other key actors (i.e. government officials). As the research explores the implementation of QMS in this industry, the focus of the discussion was, therefore, on issues related to this.

The materials required for this stage were pencils and notepads, markers, name tags, a laptop computer, the focus group script and a watch. It was agreed that the moderator would be at the venue before the participants arrived to make sure that everything was in order. The moderator welcomed the participants and hosted the meeting. A brief introduction was provided and the moderator explained how the session was going to be recorded. The focus group carried out their discussion as per the script and plan. The moderator made sure there was room for spontaneity where probing questions were asked about the implementation of QMS.

During the focus group discussion, the moderator ensured that an encouraging tone was adopted and that every participant was drawn into the discussion. Those who were a little more reticent were encouraged to speak up. The moderator ensured that the discussion was kept on track, that the time frame was adhered to and that all questions were effectively answered in as much detail as possible. Care was taken to see that written notes made during the discussion were clarified.

### **5.9.3. After the focus group**

In this phase, the interpretation and reporting of the results was carried out. First of all, the whole session was reviewed and summarised. The notes were, then, transcribed in a clearer manner aiding the researcher to capture as much as possible. After this, the transcribed notes were analysed. First, the transcription was read as a whole. The researcher examined into the trends and patterns of the data along with any unexpected comments, but ones that were worth noting. On the basis of this analysis, the findings and analysis chapter was written in order to answer the research questions of this study.

### **5.10. Data collection: Questionnaire**

Along with interviews and a focus group discussion, this research used a questionnaire survey (Appendix F) with managers working in companies manufacturing baby dairy

products. The questionnaires were sent through online survey software such as Survey Monkey, or by email. The participants (the managers in the selected Chinese companies) of questionnaire and interview were same. One of the objectives of this research was to present a framework for the implementation of QMS in companies manufacturing baby dairy products. Once the framework was developed from both qualitative interviews in four Chinese and two UK companies and a focus group discussion with managers and government officials, the information was validated through quantitative data. The chosen sample of 12 managers from the baby dairy product industry in China provided this quantitative data for validation of the framework from the closed-ended questionnaire. The sample was selected on the basis of purposive sampling as this method allows the researcher to choose participants as per some predefined criteria and all of the managers from Chinese baby dairy industry who were being interviewed were also selected as the participants for questionnaire (Saunders, 2012). Moreover, this data collection technique is more practical and it has made the research more scientific and objective. Hence, the limitation of the subjectivity of the focus group and interview data collection is balanced out with triangulation (Lincoln and Guba, 1985) which makes the research findings more credible and trustworthy.

### **5.11. Data analysis**

Once the interview and focus group transcriptions were completed, it was possible to start analysing the qualitative data. From every transcript, key points, themes and quotes were extracted and used to answer the research questions. In analysing the interview data, the thematic analysis technique was used. This highlights, examines and records patterns of themes from the qualitative data (Daly, Kellehear and Gliksman, 1997). Themes are emerging patterns across the collected data that describe the research issue in a systematic manner and answer the research questions (Fereday and Muir-Cochrane, 2006). The quantitative data collected through the questionnaire was analysed using the descriptive analysis technique which utilises tables and graphs to interpret the data.

### **5.12. Ethical consideration**

Ethical approval is considered because selected companies and stakeholders are

involved. There are many stakeholders involved in the research, including the selected company managers and government officials. Ethical approval involves reserving the right of the companies, managers and government officials to anonymity. This is of considerable importance because the data collected will be used for research purposes only and the researcher needs to confirm that individual companies will not be identified. Ethics approval was obtained for both research stages i.e. MPhil and PhD (Appendix K and L).

### 5.13. Summary of research methods

There were two phases of this research: MPhil (Phase 1) and PhD (Phase 2). The summary of the complete process of the methodology is illustrated in Figure 5.2:

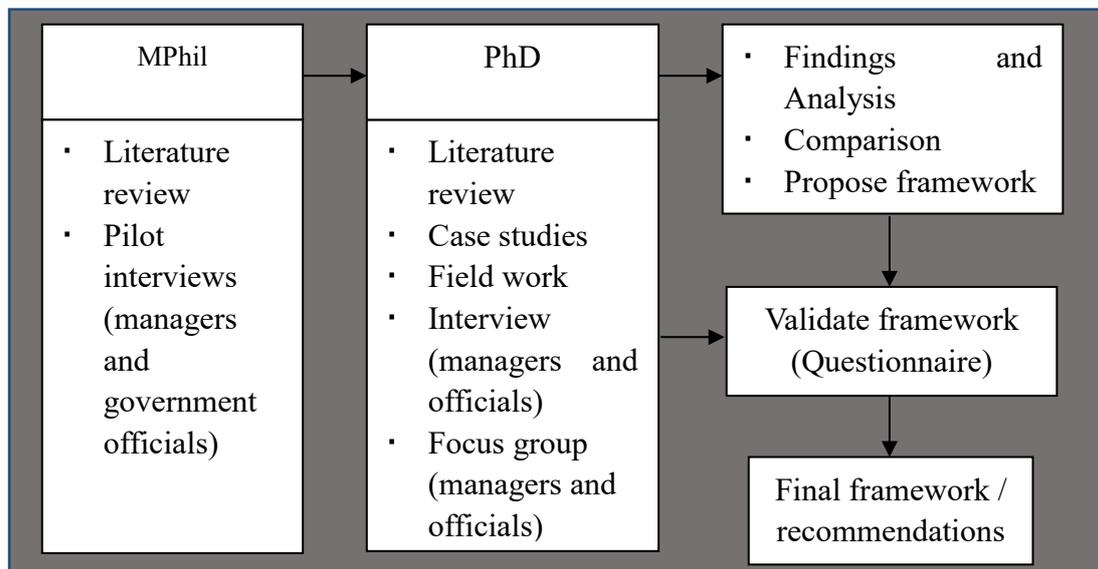


Figure 5.2: Summary of methodology.

#### 5.13.1. Phase 1 - MPhil stage

In Phase 1, a pilot study was conducted. A pilot study is a small-scale, preliminary study carried out in order to assess the feasibility of the planned full-scale empirical study. The preliminary data analysis was conducted via telephone and video calls in order to interview managers working in the quality assurance/control/inspection, production and procurement departments of their respective companies. All of these managers have the role of supervisor and each was the main leader in their own department. Thematic analysis was conducted to analyse these interviews. In the preliminary research, ten

interview questions were pre-planned and designed by the researcher. They were designed to check company intervention policy with regard to the implementation of QMS, and the measures and steps taken after the melamine incident. The questions were designed to be revealing and to identify the research objectives (Appendix A).

### **5.13.2. Phase 2 – PhD stage**

During Phase 2, both qualitative and quantitative research approaches were used in a sequential manner. First, the qualitative approach explored the research issue through interviews, a focus group discussion and field work. The interviews were conducted with managers working in both the Chinese and UK baby dairy product industry and, in the case of China, with government officials too. Managers and government officials were also selected to be the participants in a focus group discussion. On the basis of the qualitative data, a framework for the implementation of QMS in companies manufacturing baby dairy products was proposed. The quantitative approach then helped in validating the framework and has provided objective findings. The quantitative data were collected through a questionnaire sent to managers working in companies manufacturing baby dairy products in China who were selected as the sample for this study. The combination of quantitative and qualitative data is necessary to ensure triangulation. The main advantage of triangulation methodology is that it helps in revealing critical aspects of the problems being investigated, seeking out and then investigating any hidden and potential problems in depth, in this case, issues pertaining to QMS and their implementation that the selected companies had to deal with.

## Chapter 6: Preliminary Data Analysis

### 6.1. Introduction

A preliminary analysis of the data or, in other words, a pilot study, was conducted for the research in order to reveal any errors in the questionnaires, data analysis techniques or methodological options (Sekaran, 2003). Pretesting allows the researcher to validate the instrument he intends to use, and in exploratory studies pilot testing is very important (Sekaran and Bougie, 2009). In the preliminary data analysis, the researcher reviewed the questions that had been designed before the interviews with the managers from the selected companies were conducted via telephone or video calls. The Chinese companies selected are designated as follows: Company A, Company B, Company C and Company D. This section presents the results of the preliminary research.

Figure 6.1 shows the whole process of the preliminary research.

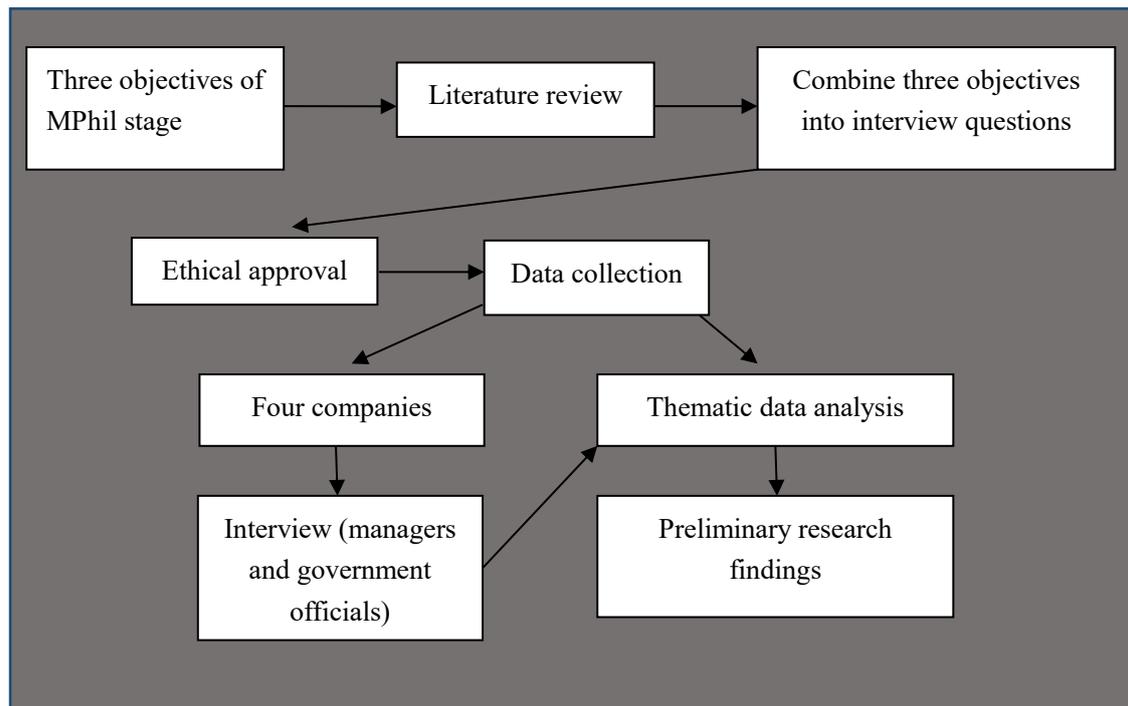


Figure 6.1: MPhil stage and preliminary data analysis.

### 6.2. Details about Instrument

Ten questions were designed for use in the preliminary data analysis, keeping in mind the objectives of the research and the literature review. Interviews were conducted via telephone and video calls with the quality assurance/control/inspection manager,

operations manager and production manager from the selected companies. These particular managers were selected because they were directly involved in the production process and had responsibility for QMS in their respective companies. Once the interviews had taken place, they were then summarised in order to analyse the responses given in relation to the implementation of QMS.

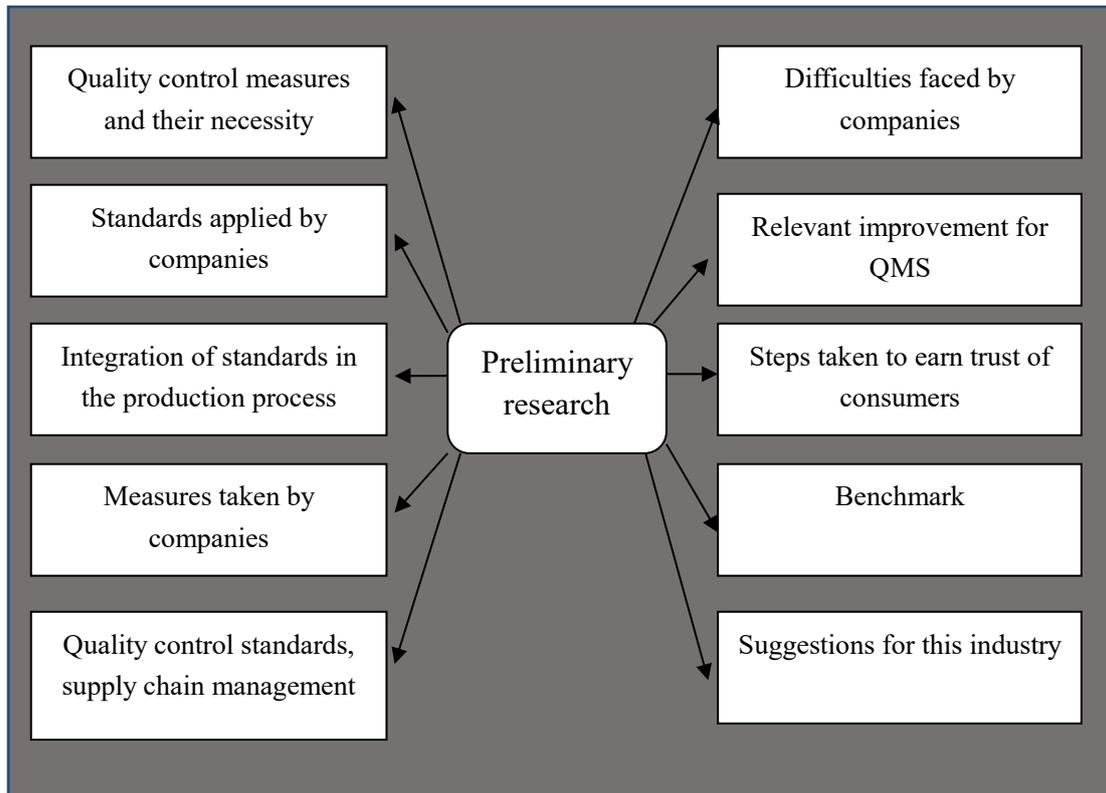


Figure 6.2: Preliminary research link with the interview questions.

The literature review helped in designing the interview questions for the pilot study because the main themes were identified from this. The aims and objectives of the study were also taken into account. The interview questions (Appendix A) were presented sequentially and the responses were then analysed through thematic analysis in which patterns and themes are identified from the collected data.

### 6.3. Sample size, target audience and type of interview

In the following table details about the sample are given.

Table 6.1: Sample information (China).

Company/Government official	Type of interview	Designation of interviewee	Time
Company A	Telephone interview	Operations manager	Two hours
Company B	Telephone interview	Quality assurance/control/inspection manager	Two hours
Company C	Telephone interview	Production manager	One hour
Company D	Video call	Quality assurance/control/inspection manager	One hour
Government official A	Telephone interview	Manager	Half an hour
Government official B	Telephone interview	Manager	Half an hour

### 6.4. Findings

The main findings from carrying out a systematic analysis of the implementation of QMS in the Chinese baby dairy product industry are summarised in this section under these headings: Implementation of QMS in the Chinese baby dairy product industry; Key actors in the supply chain management process; Barriers to implementing QMS faced by the Chinese baby dairy product industry; Drivers with regard to implementing QMS; Recognition and awareness of issues; and Measures taken by the Chinese baby dairy product industry for strengthening QMS. These headings were developed from the empirical data collected through interviews.

#### 6.4.1. Implementation of QMS

The findings revealed that different processes and techniques were used by the four companies in order to ensure quality control in the manufacture of their products. A summary of measures for quality control adopted by the Chinese baby dairy product

industry is shown in Figure 6.3 below.

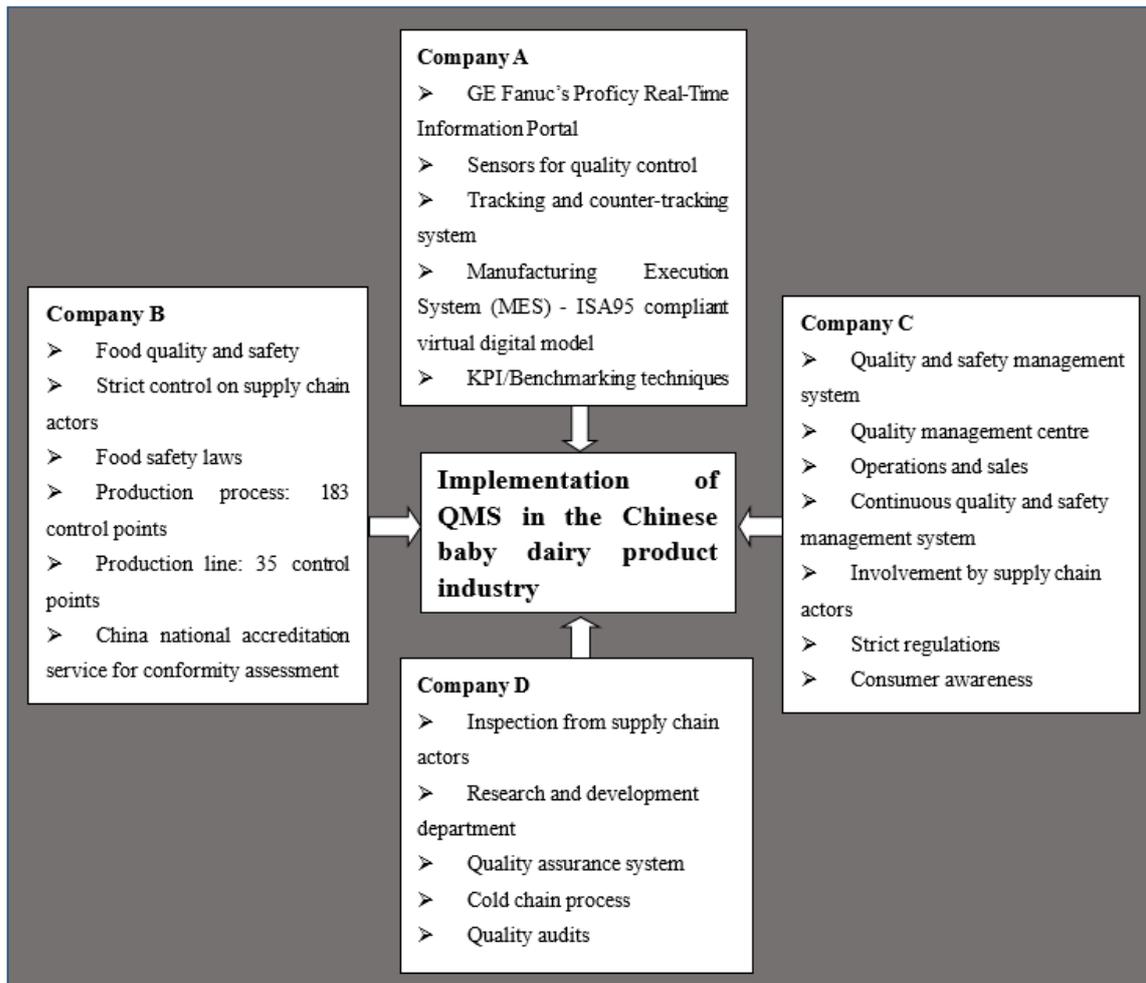


Figure 6.3: Implementation of QMS in the Chinese baby dairy product industry.

Company A was using the sensors for quality control, and KPI/Benchmarking techniques were implemented by this company for managing quality. Company B was using food quality and safety standards and laws. It was having critical control points for production process and production line and this was helping it to manage the quality. It also used China national accreditation service for conformity assessment. Company C also involved all supply chain actors and it had implemented quality and safety management system through its quality management centre. Its continuous quality checks helped it to manage the quality of its products. Company D was conducting inspections on all of the supply chain actors (i.e. farmers, raw material suppliers, transporters and distributors) and also organising quality audits for them. Its research and development department, cold chain processes and quality assurance system helped

it to achieve quality objectives.

The analysis of these four companies has led towards the conclusion that most of the companies had updated their QMS, which is evidenced in the Figure 6.3 where all companies have mentioned about implementation and improvement of QMS. Some of these standards, certifications and system improvements have international application and others have been developed by Chinese regulatory bodies. It is clear that the companies have upgraded their systems because, for example, among other tracking systems and models, Company A was using GE Fanuc's Proficy Real-Time Information Portal. This tracks the whole system for quality control from the cattle feed to the final product. This tracking system is not yet adopted by other companies and this differentiates this company from others. Company B was using guidance from the China national accreditation service for conformity assessment (CNAS), while Company C had focused on improving its management system for quality control. Company D was focusing on the cattle feed. The fact that the companies in question had upgraded their systems showed that they were working towards QMS, and they showed a positive response to government and legal authority actions. This was also necessary for their profitability as upgradation of QMS was a benchmark for their survival in industry. Moreover, European standards had also been implemented in order to ensure QMS. Here, the application and implementation of ISO standards showed that the companies were committed to providing quality products for consumers.

The interviewees stated that there were quality procedures and quality control measures that had been incorporated into the production processes so that quality was controlled and checked throughout, from milk procurement to the end product. The whole supply chain management process had been reviewed and the quality concept applied. A variety of different methods and measures had been adopted. One such measure was Key Performance Indicators (KPIs). Another measure which is adopted in baby dairy product companies was guidelines from the CNAS which provides 183 control points (all are related with various aspects of quality) through which quality is checked. This was used by one of the companies. Another company was using the cold chain process

in which employees are trained about quality processes. The companies in questions have utilised advanced technology and all the systems are currently automated.

#### **6.4.2. Key actors in the supply chain management process**

It was found that the quality of the raw materials was ensured through involvement of dairy farmers and strict controls on suppliers. One of the interviewees highlighted that since the procurement of milk is from dispersed locations, the feed that the farmers give to the cows is inspected by the research and development department of the company. Moreover, strict control on the raw materials and a strict set of standards for equipment as well as suppliers is needed.

Furthermore, some companies are directly linked with the suppliers; only company C outsourced milk from different companies. In both cases, care was taken to ensure that quality raw materials were used. It is the responsibility of the quality assurance/control/inspection managers to make sure that the raw materials are of good quality and they go through a number of checkpoints for quality control before reaching the company's premises. In addition to this, once the raw materials reach the warehouse, the quality is checked once again.

It was mentioned in the literature that there were many stakeholders involved in the whole supply chain management process in the baby dairy product sector. As a result, checking quality at absolutely every single step is not possible. This is why companies use the various quality control measures that they do and employ automated processing techniques in order to ensure that quality products are produced. It is found that control points throughout the whole process of production are used. This research found that the supply chain of the dairy companies starts from outsourcing the milk and does not finish until the end products are coming off the production line. It also includes delivery of the products whereby the company ensures that quality is provided.

Despite the fact that all the participants said that all supply chain actors were involved, no other evidence (apart from the above) was found. This is where the Chinese baby dairy product industry lags behind others. In point of fact, very few supply chain actors

have been involved in the QMS and they are not integrated into the quality management process. This needs to change. As identified from the literature, the key supply chain actors are the government, input suppliers, retailers, wholesalers, dairy processors, milk collecting stations, farmers, the credit sector and research universities. However, as things currently stand in the Chinese baby dairy product industry supply chain with regard to QMS, only the government, farmers and input suppliers are treated as key actors. Other supply chain actors are not being considered by the industry, which is resulting in problems with regard to quality management. Interviewees have mentioned that even though efforts are being made to involve all relevant supply chain actors, the most important role is performed by those supply chain actors (i.e. farmers, input suppliers, and milk station) which are at the pre-production stage. The efforts of companies are still not up to the required level to solve all quality related problems. These companies obtain milk from various dairy farms, and many of them are smaller ones. These smaller dairy farmers are unable to ensure the quality of milk at their dairy farms. So, even the larger companies put efforts for ensuring the superior quality of milk, smaller ones are unable to do this. This creates quality problems for dairy companies who take milk from them. Further to this, the problems could also occur at the stage of transporting milk from one place to another.

#### **6.4.3. Barriers to implementing QMS**

First, European standards have not been implemented successfully. One of the biggest barriers is loopholes found in the internal systems of the companies concerned. For example, the interviews showed that ISO certifications in Company C and D had been implemented, but their malfunctioning showed that there were still loopholes in the internal systems of the companies which meant that these standards had not been applied as successfully as they should have been.

Moreover, it was found that the Chinese baby dairy product industry was facing certain difficulties and the managers of the selected companies were in agreement as to what these were. The application of quality management processes was one of them. A participant said that the main issue lies with the application of quality management

processes which is a comprehensive process, demanding significant resources and investment. It was also revealed from the interviews that application of quality management processes was difficult, as the employees showed resistance to the new procedures. One of the participants remarked that the implementation of QMS is a change management process. Like all other changes, it involves resistance from employees. The resistance from employees is one of the biggest barriers for the implementation of QMS.

Another major barrier highlighted by the participants was the problem of management orientation. Unless and until top management realise the importance of QMS, it is not possible to implement them in an effective manner. The commitment from top management is also important because it is linked with the resources dedicated to QMS. Unless top management understands the importance of QMS, it does not provide access to the necessary and adequate resources for implementing it. Hence, lack of resources is another barrier and the interviewees mentioned that when there is lack of resources, this system can never be implemented. Moreover, it is found that the implementation of QMS is a costly procedure.

The standard procedures (e.g. observing, reporting and informal monitoring) that the companies in question were using needed to be revised and old and outdated equipment needed to be replaced. It became clear that the application of quality management tools and techniques and introducing new production strategies were costly processes. Changing the attitude of top management was also difficult. Upgrading machinery, adopting new methods to ensure quality, getting registered for different quality certifications and changing working practices according to new laws all posed difficulties in terms of finances and the workforce. When all of this had been done, consumer trust still had to be regained.

It can be analysed that these barriers do not allow the managers to implement QMS in an effective manner. As also found in the literature the orientation of management is critical and the management must prefer the process of implementing QMS. Instead of giving preferences to short term profit oriented objectives, management needs to

develop long term orientation where they must demonstrate positive attitude towards the implementation of QMS. This research has found that when management demonstrate negative attitude towards QMS, it is not possible to implement it in an effective manner. Further to this, it is analysed that leadership support was missing in these companies and this has stopped them to implement the QMS, successfully. Leaders can inspire their followers to develop commitment for quality programs but this was missing in these companies, hence QMS implementation had this barrier of ineffective leadership. Further analysis depicts that the resources, including financial and human, are critical for the success of QMS programs. Without these resources, companies cannot become successful and this is also observed in these companies that due to inadequate resources they faced problems in the quality programs implementation. It can be said that the current problems which are observed in the baby dairy product industry might be due to the fact that these companies have inadequate resources for the quality management. Without these resources, they are unable to ensure the successful implementation of QMS, hence facing quality problems in their offerings. The analysis also tells that costs, which are associated with the implementation, are quite significant due to the complexity of whole process (from milk source to end products). Even though these costs should be considered investment, the dairy companies have not reached the level where their managers could take these costs as investment. As per the current situation in the Chinese baby dairy product companies, the greater costs associated with the implementation of QMS are proved one of the barriers. From this, it is analysed that there is a need for change in the orientation and attitude of top management such that they become able to see these costs as the investment. There are numerous benefits, as outline in literature review chapters, of implementing QMS. To enjoy these benefits, investment in the system is mandatory. Once this investment will be done, this cost will be offset by a large number of advantages of QMS. Further to this, QMS implementation needs proper management including planning, implementation and monitoring of the process. Focusing on these barriers, the baby dairy product companies can solve the root causes of the problems in

quality of their products.

#### **6.4.4. Drivers with regard to implementing QMS**

One of the most significant drivers of QMS is the set of rules, laws and regulations that surround it. There are number of existing laws (e.g. Food Safety Law, and Food Additive Law), regulations (e.g. Food Production License and Food Safety National Standards) and standards (e.g. ISO 9001, HACCP, GMP and FSSC 22000) which have applicability to Chinese baby dairy industry. Food safety law is one of the most common groups of legislation regarding food hygiene and it is applied by all of the companies. Two companies – C and D – used third party auditors to help them fulfil the criteria for ISO 9000:2000 accreditation. The interview conducted with one of the government officials revealed that the government is enforcing certain laws which are acting as drivers for the implementation of QMS. In addition, international competition led the companies to further update their quality and hygiene control measures.

The findings showed that the melamine incident has impacted negatively on the companies' reputation and in order to show that they were aware how important quality is, they needed to take massive remedial steps. Each of the selected companies has, therefore, adopted different standards and regulations of their choice through which quality can be administered. So, it can be said that melamine incident has proved one of the drivers for the implementation of QMS.

Interviewees mentioned that market pressure has also become a driver for the implementation of QMS. This research found that now, it has become mandatory for companies to move to proper implementation of a quality management system. The competitors and customers are motivating these companies to implement QMS. Analysis of the empirical findings revealed that customers were one of the most critical drivers of the implementation of QMS. Following the melamine incident, customers have become more concerned about the quality of products offered by companies of baby dairy products. Such external social pressures are motivating the Chinese baby dairy product industry to implement QMS.

Moreover, from interview was found that top management has realised that there are benefits associated with the implementation of QMS. The interviewees mentioned that top management has understood that it is beneficial for the business, and this includes all stakeholders, to implement QMS in an appropriate manner. Hence, it can be said that along with external social pressures, economic and efficiency factors are also acting as drivers for the implementation of QMS. Along with these factors, the results showed that marketing advantages are also a driver for implementing QMS. The interview results showed that by implementing QMS, dairy companies are in a better condition to attract customers because they can demonstrate in their marketing campaigns how they are committed to quality assurance programmes.

Another driver for implementing QMS is the commitment of leadership and top management. The participants thought that with the commitment of leadership, more resources were dedicated to quality assurance programmes. Moreover, managers' philosophy, knowledge and education with regard to QMS are also important drivers for implementing it.

In terms of drivers for the implementation of QMS, it can be summarised that the external drivers include pressure from the government, customers and competitors. Internal drivers include economic efficiency factors, marketing advantages, leadership and the commitment of top management and managers' philosophy, knowledge and education in relation to QMS. Most importantly, the governmental bodies force the baby dairy product companies to comply with the legislation and regulations which are related with the quality management in baby dairy product industry. Nevertheless, at initial years, the pressure for compliance was lower, but as time is passing, the Chinese government is playing more proactive role in this aspect. The implementation process has become strong with the time and more measures and initiatives are introduced by the government for ensuring the quality. It is analysed that pressure from competitors and customers is high. When the level of quality is enhanced in the offerings of the competitors, companies are forced to enhance the level of quality of their products. Likewise, it is demanded by customers now to have quality products. With the increased

level of awareness, majority of customers have become quality conscious. This increased consciousness for quality is higher for food products because it is associated with their health and safety. So, there is also pressure from the customers to ensure that quality baby dairy products are offered by the companies. Other than these external factors, there are also few internal factors which are critical drivers of the quality management programs. When QMS is implemented, efficiency gains could be obtained with the help of reduced mistakes, lesser chances of rework and increased production volume. Knowing this that QMS implementation will enhance the economic efficiency, baby dairy product companies are motivated to implement the QMS. It is also analysed that companies could also use the implementation of QMS as a tool to improve their reputation, credibility and brand image. Therefore, they implement this system to get the marketing advantages through which they become better able to attract customers by claiming the quality of their offerings. The analysis tells that the role of leadership, top management commitment and philosophy is also critical for the successful implementation of QMS. Leaders are the ones who can inspire other employees as well to be involved in the process of implementing QMS. Likewise, management commitment and philosophy is also needed for managing the quality. It is with the help of commitment from the top management that they help all employees to implement QMS. They arrange the training for all employees and provide the necessary resources for its implementation. With their philosophy oriented towards quality management, they design such strategies and plans that are aligned with the quality management philosophy. Hence, the top management could perform the role of an important driver in the implementation of QMS. It is also analysed that those top managers who possess sufficient knowledge, understanding and experience regarding managing QMS are more likely to implement it, successfully. This knowledge, understanding and experience is the important driver of implementing QMS.

#### **6.4.5. Recognition and awareness of issues**

The interview findings revealed that in the past, food safety law and European guidelines offered companies' advice with regard to the implementation of QMS.

However, these laws, standards and certifications were not followed by companies because they were not actually forced to comply with them; the government was not inspected their operations positively. This indicates that corruption was the reason for ignorance of compliance with legislation.

After the melamine incident, the ability of companies to regulate the quality of baby dairy products was questioned. As a result, the government started being proactive and it took steps to ensure that corruption did not exist in any department. One of the government officials (i.e. government official B) remarked that a few years ago, the inspection and audit committee found many government officials had taken bribes for allowing companies to avoid complying with legislation.

However, the government then addressed this issue and, at this point in time, the companies have revisited and revised their QMS. As per the response of the government official, several negative incidents had appeared in baby dairy product industry, the government already took action to eliminate corruption and supervise all companies to compliance with legislation. All companies have also realised that they cannot take any such action now because corruption is stopped by setting heavy fines for both parties. These factors prompt companies to put efforts for complying with the legislation developed for quality management.

It has been stated before that there are different laws, certifications and procedures that have been applied by the selected companies. This indicates that the awareness level with regard to significant issues is improving in the Chinese baby dairy product industry. Not only have the companies adopted guidelines and legislation, but they have also changed their management practices by introducing new techniques, e.g. GMP and KPIs.

Previously, obtaining loans and licences was too easy, and this ultimately resulted in events such as the melamine incident. The government officials revealed that credit management institutions gave licences and financial aids to many companies without checking and supervising quality, before the melamine incident. However, later on the credit management institutions also realised the importance of QMS. As also said by

Christopher (2016), they therefore changed their criteria for lending and supplying to customers and provided financial help only to those companies that could demonstrate they were following quality standards. The fact that credit management institutions were aware of the advantages of QMS contributed positively to its implementation in the Chinese baby dairy product industry (Song et al., 2014).

The analysis tells that in the external issues, the role of government is the most important. Initially, quality related regulations and standards existed but problems occurred because of the lesser focus on compliance as mandatory. These regulations and standards were followed voluntarily, hence, this provided opportunity to small baby dairy product companies to abide by these quality related measures. Doing this, time came when the incident like melamine scandal took place. There was also a key role which was played by bribery and corruption at the end of governmental bodies. Further analysis reveal that when government realised the severity of such scandals and their associated problems, it has started to become more proactive where it is ensuring that all baby dairy product companies are following the relevant laws, standards and regulations which are important for quality management. Other than this, baby dairy product companies have also understood that such legislation, regulation and standards are critical for the successful implementation of QMS; therefore, they are also becoming more inclined towards its management. The role of other external parties like credit management institutions is also critical as they are the ones who help out the small farmers to obtain loans for becoming able to get necessary tools for implementing QMS. As it is found that it is the government which is most importantly influencing the QMS in baby dairy product companies, so the next chapter will have main emphasis on the governmental actions where legislations, standards and regulations introduced by the government of China are centre of discussion.

#### **6.4.6. Measures taken for strengthening QMS**

It was found that all the managers from the selected companies considered quality management as a particularly important activity of the company and that it needed to be addressed in order to ensure better and safer products. The interviews revealed that

there were different laws, standards and certifications which the case study companies used for strengthening QMS. In response to an interview question, the companies identified some of the ones they were using. These are listed below in Table 6.2.

Table 6.2: Quality management measures.

Company	Quality management measures
Company A	<ul style="list-style-type: none"> <li>• Food safety law</li> <li>• Assured food standards</li> <li>• Quality and safety (quality management certifications)</li> </ul>
Company B	<ul style="list-style-type: none"> <li>• Food safety law</li> <li>• SQF</li> </ul>
Company C	<ul style="list-style-type: none"> <li>• Food safety law</li> <li>• ISO 9001: 2008</li> </ul>
Company D	<ul style="list-style-type: none"> <li>• Food safety law</li> <li>• ISO 9001: 2008</li> </ul>

GMP, ISO 9001:2008, quality management certifications, KPIs, and training and development of employees are some of the basic laws, standards and certifications that were identified from the interviews. The melamine incident has impacted negatively on the companies' reputations and in order to show that they had a responsible attitude towards quality huge remedial steps needed to be taken. Therefore, each of the selected companies has adopted different standards and regulations of their choice through which quality can be administered. GMP and KPIs are the general techniques they have utilised in order to show that they are very committed to quality. Companies consider employees as important vehicles for delivering quality and so invest in training for their staff.

In addition, it was also found that for strengthening QMS the companies changed their production processes to accommodate quality control systems, the production processes were adjusted for managing the quality. The companies increased their marketing efforts, demonstrating that they were committed to quality assurance, and their supply chain management processes were improved. They introduced new management practices such as GMP and KPIs in order to control quality. The companies revealed

that from procurement to the end products, the implementation of their new procedures was transparent and that the steps they were taking to improve quality were visible to the consumers. In addition, the government also played a role in making consumers aware of which products should be used and which boycotted. This was all done to regain the trust of consumers, to bolster their faith in home-grown products against the international competition and to strengthen the implementation of QMS.

For the purpose of strengthening QMS, the practice of benchmarking is also used by the Chinese baby dairy product industry. The findings from interviews' analysis showed that different benchmarks were used by the 4 companies. The term benchmark is used to describe the performance metrics and best practices of other companies that are then used to compare another's business performance in order to identify areas where improvement can be made. One company said they used KPIs as the benchmark; another mentioned the training in QMS given to employees. The cold chain process has been employed as a benchmark in one company and TQM has been used in another. This shows that the selected companies are working towards stringent quality control. Moreover, benchmarking has helped in institutionalising the quality management interventions made during a company's day to day business.

The below figure summarises the measures that have been taken to strengthen QMS in the Chinese baby dairy product industry. The interviews, which were conducted with Chinese baby dairy product industry managers, are used for identifying these measures which are adopted for quality management. The figure has been constructed using the interview responses of managers. Now customers have become more aware and they demand companies to provide quality products, hence the companies have to start using QMS. Likewise, employees' education and awareness levels have also improved and now they are getting more training, which is proved useful.

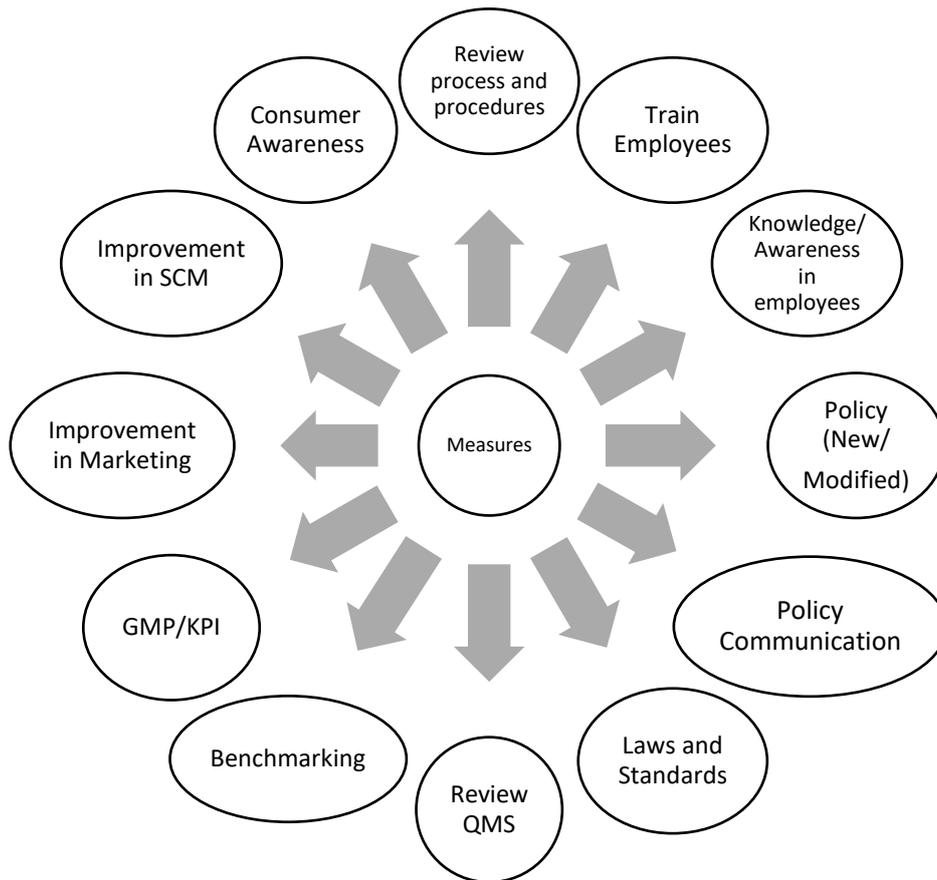


Figure 6.4: Measures taken for strengthening QMS in the Chinese baby dairy product industry.

From the above findings, it could be analysed that baby dairy product companies have implemented various measures now. These measures are helping the baby dairy product companies to become able to implement the quality system in a better manner. Nevertheless, these companies have faced quality issues previously, now they are taking such measures which are helping them to improve quality of their offerings. As part of preliminary findings, the measures which are currently introduced in these companies have been identified. The next chapters will critically analyse these measures where in-depth analysis will be performed. Other than the identification of these measures, it will be analysed why the quality problems occur and how these could be avoided.

### 6.5. Summary of preliminary data analysis

The analysis of the interview questions has revealed that the management of the selected companies has intervened to introduce QMS. The quality concept is now integrated into the operations of the companies and they have taken measures to

improve their processes and procedures, and improve the quality of their products. In the preliminary analysis, it is very evident that while all of the companies have transformed their processes and procedures, some of them are still not taking quality management as seriously as they should. The implementation of QMS, which involves upgrading processes, takes a long time and attention to detail is required.

The findings from the preliminary data analysis have identified that, although the selected companies are improving their processes and procedures, there is a need to work still more on the quality aspect in order to avoid another such situation that could result in the loss of consumer trust and many consumers switching to international food companies. These results are consistent with the research findings of Fuller and Beghin (2015), who discovered that, initially, the government was not forceful enough in making the companies follow quality guidelines and adhere to legislation. The melamine incident was what caused government interest in the development and expansion of the baby dairy product industry. Previously, when the government was not overseeing operations properly, there was room for corruption. However, with strict policies, regular inspections and audits from independent government organisations, the influence of corruption will be greatly reduced. As highlighted in the study of Aung and Chang (2014), proactive approach can help solve this corruption issue in this industry. As a consequence of the melamine incident, the government has put in a great deal of work to improve QMS in the baby dairy product industry.

In identifying key supply chain actors, it was found that a major problem lies in this area because companies are unable to involve each and every one of their supply chain partners in the quality management process. The main barriers to and drivers for implementation of QMS have also been identified in this section. Following on from this, there was a critical analysis of the recognition and awareness of significant issues pertaining to the implementation of QMS. The objectives of Phase 1 (MPhil stage) – preliminary data analysis – have been fulfilled by auditing the implementation of QMS in the case study companies by means of literature review and then by using interviews with company managers and government officials to obtain data.

## **Chapter 7: Findings and Analysis in Relation to the Chinese Baby Dairy Product Industry**

### **7.1. China's baby dairy product industry**

#### **7.1.1. Current market situation**

China has seen a 5 per cent increase in its birth rate as compared to other countries such as the US and the UK and this has been the main reason behind the increased demand for baby dairy products. Local Chinese companies (e.g. the Sanlu Group and Mongolia Yili) and foreign companies, such as Nestle and DANONE, considered this growth an opportunity to increase their share of the Chinese market. The Chinese government has taken many measures to introduce QMS and the draft amendments to the Implementing Regulations of the Food Safety Law are the steps taken by the Chinese government to regulate quality in the infant formula milk production sector (Wang, 2013; Niu et al., 2015).

The channels of distribution for foreign-made formula milk are Chinese marts and supermarkets. Some foreign companies, such as DANONE, choose online stores as a way to supply their formula milk to Chinese customers (Wang, 2013). Chinese customers did not buy from local companies as they mistrusted the production process and the ingredients used by the companies. (Wang, et al., 2008).

Table 7.1 gives the market share of baby dairy product companies operating in the Chinese market. The demand for baby dairy products will increase by 69 per cent from 2012 to 2017 (Datamonitor, 2012). This indicates a significant opportunity for local as well as foreign infant formula milk manufacturers to increase their production accordingly. The infant formula milk market is growing at an increasing rate. If the Chinese infant formula milk companies work on their quality issues and use healthy ingredients for the wellbeing of the customers, then they will be able to survive in a competitive market.

Table 7.1: The market share of companies operating in China from official company websites.

Name of company	Retail value in 2010 (%)	Retail value in 2011 (%)	Retail value in 2012 (%)
Mead Johnson	11	12	13
Mongolia Yili (China)	7.2	7.2	7.2
Shanghai Wyeth	6.7	6.8	6.9
Nestle (China)	3.7	3.5	3.2
Abbott Nutrition	3	3	3
Harbin Jinxing Dairy Group (China)	0.3	0.2	0.2

(Source: Datamonitor, 2013.)

Table 7.1 shows a significant difference between the local and international companies retailing infant formula milk in China. It also shows that the retail value of local infant formula milk is decreasing (Datamonitor, 2013).

The Chinese population is more than 1 billion, which means there are more babies to consume the infant formula milk (Magnus, 2012), and the birth rate steadily increasing (13 per cent) in 2012. Chinese mothers are looking for better foreign-made infant formula milk for their babies (Blanc, 2011) and this means increasing demand for infant formula milk in China. Baby dairy products are considered to be an essential part of the life of Chinese babies (Steger, 2013).

The Chinese business environment has changed ever since China's entry into the WTO in 2001 and the Chinese economy now embodies several different types of cultural differences. Chinese companies have started to implement more quality management techniques in their systems. Intervention by the government is, as yet, minimal because it is still more inclined towards fulfilling demand, which is fast exceeding supply (Elliot et al., 2010). It is a very well-known fact that, in 2007, the world saw the biggest recall ever of Chinese products (about 110 million), such as toys and food items, from the US market due to quality issues (Mihm, 2007). This led the Chinese government to focus on new advancements in QMS (Field, 2008). Companies are now directed to set up

safety management institutions with full-time safety staff. Infant formula milk production companies are asked to source and monitor their own milk instead of relying on third parties. To ensure quality a separate quality assurance and monitoring agency will survey the process and then submit the report (US–China Health Products Association, 2017)

### **7.1.2. Problems of Chinese baby dairy product industry**

Chinese baby dairy product industry, which is comprised of both state-owned and private companies, is developing in a more favourable direction. The advantage of the state-owned companies is that they are monitored by the government and, therefore, the behaviour of the company leaders is also monitored. As a result, the leaders and managers do not get involved in problems of food quality and security and do not have the power to develop products that are counterfeit, untested or full of security risks; thus, behaviours and decisions driven purely by profit are avoided. However, it cannot be ignored that there are still certain individual state-owned units that are involved in corruption and it is highly likely that their behaviour would have a negative influence on the quality of the products. Therefore, it is not entirely true to state that state-owned organisations are not involved in quality-related issues at all. Private companies, certainly, have their benefits too. They appear to be more proactive in establishing their brands and producing high-quality products so that they may gain larger market shares and earn greater profits. Therefore, both state-owned and private enterprises have their advantages and disadvantages. Profits are not the only driving force of either type of company, and both types have to adhere to strict rules and regulations with regard to food quality and security in order to successfully implement QMS.

Currently, Chinese consumers are not confident in general about food quality and safety in China. After the melamine incident in the baby dairy product industry, similar incidents occurred with regard to liquid milk, edible oil, chilli extract and Sudan red dye where quality problems were observed in these food products. Such incidents were happening one after the other and, during the time in question, the whole food industry was exposed to quality-related problems and viewed quite negatively. As a result,

Chinese consumers have become quite conscious about the quality of food they purchase. From the interviewees' responses, it could be deduced that many people now pay more attention to the food that they eat, focusing on both the quality and safety of products. Domestic dairy products now have an increased focus on safety. However, there are still a lot of consumers who worry about the quality of domestic baby dairy products, especially milk powder. No one is willing to pay for products that are untested; it is just too great a risk.

The Chinese baby dairy product industry is not at all like comparable industries in other countries. The interview findings lead to the argument that different ethnicities have different dietary requirements, so the technologies applied in manufacturing baby dairy products in China are different from those used in other countries. When it comes to formulating specific production criteria, the physique of Chinese babies must be taken into consideration, for example. It is not necessarily beneficial for Chinese mothers to buy imported milk powder for their babies without question and, in fact, the Chinese government does not encourage the launch of imported milk powder brands in China in order to protect the healthy development of babies (Xiu and Klein, 2010).

According to the interview results, imported milk for babies is not considered appropriate due to the difference in ethnicity between Chinese babies and those born to other ethnic groups (Wang et al., 2008). However, the researcher was unable to obtain strong evidence for these arguments as it is obvious that many foreign brands of milk powder are still doing well in the Chinese baby dairy product market. It can be said that the Chinese government does not appreciate the presence of foreign companies as they are very concerned about the quality and safety of products. Moreover, Chinese government also want to protect the market share of Chinese state-owned companies, therefore, foreign brands are not preferred equally. However, foreign brands such as Wyeth and Nutricia are encouraged. These have higher quality and safety ratings, and take the physique of Chinese babies into consideration too.

### **7.1.3. Laws, regulations and standards**

There are various laws, regulations and standards that have been implemented in the baby dairy product industry. The credibility of the production process improves with the enforcement of relevant standards. As found in focus group discussions, the acceptability of baby dairy product manufacturing procedures depends on how effectively these laws, regulations and standards have been implemented as this provides evidence for the credibility of the production process.

Companies are striving to implement the relevant quality laws, regulations and standards (i.e. ISO 9001, HACCP, GMP, FSSC 22000, Food Safety Law, Food Additive Laws, Food Production Licence, Food Safety National Standards) because this is not an era where consumers are looking for quantity-oriented production. Instead, they are looking for quality-oriented production of baby dairy products. Quality can only be ensured by complying with the laws, regulations and standards. From the focus group findings, one common factor was found in the responses of participants: consumer demand is changing. Consumers force companies to be responsible enough to implement laws, regulations and standards. When companies are ignorant of these, consumers hesitate to be the customers of such companies. Therefore, consumer pressure is enormous, and all companies need to take it into account. This leads to companies continually introducing measures that help them to adhere to laws, regulations and standards.

The national standard with regard to quality control in the baby dairy product industry is trying to match the international standard for the same. The fact that China's national standards are out of date and need to be improved is due to the local situation in China. National standards involve many factors that need to be considered. China has a vast territory and a large population. There are certain milk companies who are from less-developed areas of China and, currently, the government has set strict criteria for meeting the standard which means that not all milk companies are able to meet it. The manager from Company A said that companies in the south of China may be able to meet the requirements, but companies in the north would not be able to do so because

of the low level of economic conditions. As a result, the criteria for meeting the national standard have been relaxed in order to enable at least half of the companies to meet the requirements. This is also revealed from an interview with a Chinese government official; the current relaxation is in consideration of the fact that small milk companies do not have adequate capability to meet the strict standards. This was confirmed by the interviewee (government official B) during interview. To rectify this, the national standards, which are stricter than legislations, need to be enforced nationwide. By adhering to national legislation, the milk companies are only obliged to ensure that basic safety requirements are fulfilled. As long as this is done, and milk is not affecting consumers' health, national legislation does not question the quality of the milk.

#### **7.1.4. Role of melamine incident**

The melamine incident proved that quality issues were quite significant for the Chinese baby dairy product industry. Many people were affected by this incident and the manager from Company B said that, at the time, the number of people affected by the incident was certainly more than the official statistics, and involved especially babies from the north of the country. It was estimated that more than 300,000 children were affected by this incident.

Before the melamine incident occurred, the Chinese baby dairy product industry had developed well. All the companies in the sector enjoyed huge profits, and they were earning a good income. Milk was one of the basic necessities of the Chinese people, but there were only a very few companies selling the milk. Between 2004 and 2005, especially, there was only a handful of companies selling milk and, for this reason it was quite a prosperous business to be in. The interview findings showed that, in 2008, before the melamine incident, the industry had reached a peak of development. The consumption of baby dairy products was huge. However, after the melamine incident, consumers believed that it was unhealthy to drink milk because it contained harmful substances such as melamine, which causes kidney stones. Hence, consumers' trust was threatened by this incident. Government official A stated that the melamine incident was reported in the early stages, but that the government quashed its exposure. This

shows that when complaints were received, the government suppressed the reporting of this scandal in order to avoid the bad impact on the reputation and image of China. Therefore, the incident was suppressed until the end of Olympic Games in 2008. Once the Olympic Games were finished, the melamine incident was directly exposed to the public. From this, one important thing could be deduced: the government did not pay a great deal of attention or attach much importance to food safety issues. If the attitude of the government had been positive prior to the melamine scandal, then many quality problems could have had been resolved before the scandal of 2008 erupted. The government's attitude is visible in other industries as well; the participant gave the examples of the cooking oil scandal and the swill-cooked dirty oil incident (2011). The government and the relevant departments only paid attention to this incident after the media exposed it. Sadly, the person who reported this incident – Xiang Li – was assassinated on 18 September 2011.

In addition, the analysis revealed that there are many short-sighted companies who only focus on immediate financial gain regardless of the quality and safety of food. They make unhealthy food with various kinds of harmful substances which have an adverse effect on human health but no one stops them. Moreover, the interviews indicated another fact about milk production: if the protein in milk does not reach the required level for the dairy product in question, the government does not allow the company to sell the product. Raw milk is purchased from dairy farmers. In order to reach the required level of protein in the milk, they add certain substances, such as melamine, to it. This was the reason the melamine incident occurred. Three well-known milk companies, Sanlu, Mongolia Yili and Mengniu were involved in the melamine scandal due to this behaviour (Xiu and Klein, 2010). While shedding light on this scandal, interviewees discussed certain facts about Sanlu, which was the leading company of baby milk powder. The manager from Company B said that Sanlu was the leader in the baby dairy product and milk powder industry in the north of the Yangtze River. A lot of people were acting as agents (the 3rd party intermediate) for Sanlu; however, before the company could distribute the latest batch of products to the agents, the scandal was

exposed and many agents lost a lot of money.

#### **7.1.5. International brands**

Likewise, the manager from Company C explained that, later on, Sanlu was involved in commercial fraud. The company was acquired and controlled by a New Zealand company, after that, Sanlu was found that the milk powder contained melamine and encountered ensuing quality and safety issues. It was due to the irresponsible behaviour of government officials and managers of the company that this incident occurred. After the melamine incident, international brands entered the Chinese baby dairy product market and the market share of domestic companies declined rapidly. Influenced by the domestic environment, many Chinese customers rushed to purchase foreign milk powder after the melamine incident. According to the news from various sources at the time this incident happened, there was a surplus of dairy products in New Zealand and lots of them were sold to China in virtue of this incident.

The interview analysis showed that few international brands had made their way onto the Chinese baby dairy product market prior to the melamine scandal. When consumer trust in domestic companies was shattered, international ones could take their place in the Chinese baby dairy product market. Currently, there are 41 international companies in the Chinese baby dairy product industry (Wong, 2014), which has increased the level of competition in the market. China needs to open the milk powder market to the world since it is a member of the WTO. If China does not allow other countries to export products to China, its own products cannot be exported either. The manager from Company B mentioned that China has to make a compromise. When foreign products debut in the Chinese market, similar domestic products have to attract consumers with a competitive price in order to maintain their sales volume.

The analysis of interviews showed that every country prioritises its own brands with foreign brands not usually being encouraged, and the Chinese baby dairy product industry is no exception. However, there are still international brands that have entered the Chinese market. Only those Chinese baby dairy product companies, who are

capable to provide safe and healthy products, are able to compete with the international brands. Such successful companies attract their domestic customers by offering the same level of quality and safety of baby dairy products that is offered by international competitors. The Chinese baby dairy product industry does have companies that are actually ahead of the international competition in terms of advanced technology, but such companies are only few. These are the companies able to meet the quality and safety demands of Chinese customers as well.

#### **7.1.6. Role of government**

However, times are changing. Many of the government authorities have started to control and monitor food quality and safety. Due to the efforts of the government and the strict controls on quality, the safety coefficient of domestic milk powder has improved. As mentioned by one of the government officials during the interview, China has now released a policy enabling couples to have a second child and this will increase the number of babies and the demand for milk powder. The policy will have developmental impacts on many of the industries in China. The current level of economic development in China is much higher than before and, compared to a few years ago, aspects of food quality and safety have made great progress. China's new Food Safety Law came into effect on 1 June 2009 and it had been upgraded on 1 October 2015. The analysis of the primary data showed that with time, the monitoring process has improved and the Chinese government is taking steps to strengthen its quality management legislation. It is also strengthening organisation and management in the state owned companies to prevent corruption.

#### **7.1.7. Further impact of melamine incident**

Furthermore, it was analysed from the interviews and focus group data that the impact of the melamine incident on the baby dairy product industry spilled over to the whole dairy industry. In fact, it also had an impact on other industries. One interviewee stated that when the melamine incident occurred, many bread companies were banned from making their products because they and their chain stores cooperated with the milk companies and the harmful substances in the milk were also in the bread, so a large

number of affected products were sealed and banned from being sold. This quality and safety incident had an impact upon quality management in many industries in China, rather than just the baby dairy product industry on its own.

The analysis of interview findings depicted that the Chinese baby dairy product industry needs further development. In order for this to happen, there needs to be positive publicity, public opinion needs to be taken into account and consumer care needs to be paramount. As mentioned by one of the interviewees, China's public disclosure system is improving and developing, but due to the local situation in China, the complete disclosure of information is not possible. As per the local situation as described by a respondent, the information-sharing system is not strong and it is not easy for companies to share data in a quick and easy manner. It is even harder for the agro-industrial sector to share data.

As told by the government officials, the government is now playing an important role in planning, and a new development strategy has been proposed for the baby dairy product industry, focusing more on the top layer and adopting a top-down approach. However, after China entered the market economy, many local governments and stakeholders were only concerned about economic interest and development, which has led to the current situation. As per the current situation of other Chinese industries as well as the baby dairy product industry, a reasonable mechanism and monitoring system need to be designed for dealing with quality problems. Analysis found that currently, China has not reached the level of fully developed countries, and there is a need for an effective development process in order to further improve the economy and industry.

#### **7.1.8. Summary**

Overall, it can be summarised that in the Chinese baby dairy industry, infant formula milk triggered the outbreak of concerns with regard to food safety and this exposed a series of food quality and safety problems. Such problems often appear during the development of a country and society. It can be concluded that, with the occurrence and understanding of such problems and in finding a solution to them, the Chinese baby

dairy product industry is taking huge steps to further its development. Now, the engagement of stakeholders is needed, and this is further explored in this chapter.

## **7.2. Quality management system at Company A**

This company is executing the latest (2015) version of the ISO 9001 quality management standards. All the production processes have been automated with advanced machinery. Both the sterilisation and filling of the containers with milk powder are carried out in the same factory as production and these processes use automated, advanced machinery too. Once filling is completed, the milk powder is sent to the packaging area. At present, the main processes and production lines are well sealed, functionally perfected, and highly automated. Although advanced technology is being used, there is still room for improvement of efficiency. This indicates that the QMS need improvement such that efficiency of production is also improved. When quality improves, in most of the cases, efficiency decreases; therefore, it needs to be ensured that there exists balance among quality and efficiency. Technology does not only improve the quality but it also improves the efficiency. In this company, all the high-tech processing equipment is imported from abroad and is regularly inspected and maintained. It was mentioned by the company manager that all of its modern dairy farms have mechanical milkers. The use of these ensures that milk does not come into contact with the air. Furthermore, the mechanical milkers do away with the need for hands-on human contact and milk goes directly to the storage equipment through pipelines. Here, the milk is processed and cooled before being fed into tankers for delivery. In order to ensure the quality of the milk source, Company A started to introduce quality measures at dairy farms. For example, every dairy cow has an identifying mark and its condition and various indicators (e.g. mastitis, heat, timing of insemination) are tested by periodic sampling. If there is something wrong with a dairy cow, it will be examined and cured in isolation and will not continue to give milk until rehabilitation is complete. To prevent bad milk from being mixed with qualified milk, the dairy farms usually conduct effective management at source. The qualified material (raw milk) is put in the milk collection room. After the mixing and filtration processes,

the raw material is converted into semi-finished products. In this company, inspection by means of sampling accompanies the whole process of production; e.g. homogenisation, sterilisation, storage and filling are the processes which are sampled, and samples are taken every 10 minutes at all stages to check if there are any problems. The product is inspected at every stage, and only after a final inspection of the finished products, can they leave the factory for sale.

For production and inspection, the company uses imported, advanced equipment such as milk homogenisers, portable milkers, milk stirrers and cream separators. Foreign-made devices have higher stability due to the advanced nature of the technology. Every employee has his/her responsibilities at each stage of the production process. The quality assurance/control/inspection department runs quality tests and monitors the production process. The manager of this company stated that raw materials will not be used in the production process unless they pass quality tests (e.g. hygienic wholesomeness, bacteriological, and chemical quality and contamination level).

According to the interviewee from this company, it implements relevant standards for ensuring the quality of baby dairy products and has implemented ISO 22000 effectively. Efforts are being made to ensure quality management at all times. For example, there is a general rule for the sterile pack: a respondent stated that among one million boxes, only one is allowed to be defective. Whenever a sealing or machine fault occurs, the quality assurance/control/inspection department identifies the specific fault location and takes appropriate measures to deal with it and control future ones at an acceptably low level (KPI) as far as possible.

It was found that KPI is a target every company hopes to achieve and Company A tries to conduct quality control according to this KPI. Training needs to be given to staff and they need to accumulate experience before KPIs can be used effectively. This company is in a position to meet many international standards. Currently, it is adhering to HACCP and, therefore, critical points are set in accordance with HACCP from the very start of the production process. First of all, the critical point is set for raw materials

testing which comes under the responsibility of staff at the dairy farms. Following this, critical points are set for the disinfection and filling processes. Because the filling process is related to secondary pollution, it is important to ensure that no secondary pollution occurs during the process. After this, a critical point is decided for temperature control. The required cold storage temperature is below 6°C. Other than these critical points, it is important to make sure that no one apart from relevant personnel is present in the filling workshop. The rationale for this restriction is to maintain the desired level of cleanliness here. Furthermore, other protective measures, such as a space cleaning system, have been taken in this company. The control and monitoring procedures are also used for things other than the production system, the production environment and personnel. Because baby milk powder is a nourishing food, extra care has to be taken with the critical points. Otherwise, the quality of the milk will be adversely affected.

### **7.3. Quality management system at company B**

This company has obtained a food production licence, which helps this company to ensure the quality of its baby dairy products. The licence has made quality management easier for this company in a manner that with the repeated examination, the company produces absolutely qualified products. The internal standards at this company are stricter than the national standards for quality. It has also cooperated with a Swedish company for getting done its packaging. It uses Tetra Packs (from the Swedish company Tetra Pak) and other advanced equipment, buying this directly from abroad. With regard to training of personnel, the company sacks those who fail to match the development of the company. Previously, the focus on quality management was not as intense, but now it is far more so. The managers reported that, in the past, the quality assurance/control/inspection department had only been small having few people, but now, it is staffed with qualified, professional personnel and has advanced inspection equipment.

For ensuring quality, the company retains samples of finished goods. It is important to investigate these samples whenever any problem occurs with a product on the market.

Kindergartens are requested to keep samples of foods given to infants and children for 48 hours as well.

Furthermore, the CFDA continuously checks the quality of this company's products. Although it has its own quality assurance/control/inspection department, the company still asks other relevant authorities to inspect the quality of its products. Every year, an inspection is conducted by the National Quality Inspection Centre. After the melamine incident, samples are taken from the relevant departments. The inspectors often also purchase products from random shops for examination. If the products are qualified, there is nothing more to be done. If not, the whole batch of products would be sealed.

The company has also developed a sightseeing experience where visitors can watch what is happening inside the factory from behind a glass barrier so they do not have to wear protective clothing. The rationale for this initiative is to gain consumers' trust with regard to the quality of the company's baby dairy products. In relation to this initiative, one manager stated that if the company failed to make progress in the area of quality, it would no longer be viable. One of the company's strategies is all about ensuring that consumers are concern free. In order to gain the confidence of consumers, this company is willing to let them into the factory. With the help of the local government, it is trying to cultivate a strong brand image.

#### **7.4. Quality management system at Company C**

This company uses high-tech machinery at its dairy farms and in the milk production process and all processes are fully automated. As a result, workers only control the devices and machines, and they have little role to play in the production process. The company has its R&D (research and development) centre at its production facility and has hired experts from all over the world to carry out R&D. The results of the research showed that this company has invested significant money in looking after its milk source independently, and in R&D. Initially, it used to outsource its milk supply, but due to the influence of the melamine incident, it has invested in its own dairy farms, with the intention to ensure a safe milk source. This company has hired foreign experts

who provide guidance on dairy farming. It has also chosen some superior cattle breed suitable for high-yield milk production and the cows are imported from abroad. These cows are bred with a suitable breed of Chinese cow to ensure a uniform strain. The respondent mentioned that in order to ensure that the imported cows remained healthy, attention was given to the quality and composition of the pasture and other feed in order to offer the best and most appropriate nutrition.

After the melamine incident, this company introduced many measures in order to ensure that the source of milk was safe and attached great importance in general to product quality and safety. Investment has been made in a dairy farm and the cow resource has, therefore, been integrated into the whole production process. The farm is fully automated and there is very strict management of the milk source, including high-tech monitoring for the milk tankers and other transportation and storage devices. There is a separate finished product warehouse. The post-sales service is undertaken by personnel who are trained to be able to respond effectively to any problems with the quality of the product.

The products from this company are able to meet many national and international standards, and the State Administration for Industry and Commerce and the quality inspection bureaux of all the provinces are invited to test the quality of its products, which are exported to other countries. The quality of the product is tested again in the importing country. The government grants subsidies to this company in order to encourage it to maintain awareness of the importance of product quality and safety.

### **7.5. Quality management system at Company D**

This company is owned by the state. As most of the state-owned companies, it is responsible for its profit and loss, but is controlled and managed by the state. The melamine incident of 2008 reflected the distance between the dairy farms and the quality assurance/control/inspection department of the company. Therefore, this company now puts cattle breeding, processing of the milk, manufacture of the products and distribution together in one long process so that quality can be controlled

throughout. Once the cows have been milked, the milk is transferred to automated storage tanks on the farm where it is stored at 4°C. Currently, the milk coming from the farm does not go straight to the production plant, but goes to be tested first. The quality assurance/control/inspection department takes samples of the milk which are then inspected. The sample milk is put into a machine and is inspected for nutrient quality, colony count and for the presence of certain other substances. If there is no problem with the milk, it can be kept in storage tanks and await refrigerated transport to the production plant to be processed further. If the milk inspected has quality problems, then the whole batch would be frozen and then investigated as to the cause. In further processing, the milk is filtered in a high-pressure centrifugal purification process, then sterilised before moving towards milk powder production process. The process of milk powder production consists of further steps. The process of powder manufacturing is simple where water is removed from the milk under stringent hygiene conditions. In this process, all desirable properties of milk are retained and water is removed by boiling it under reduced pressure at low temperature. It is then sprayed in a fine mist into hot air for removing the moisture. Once the final powder is prepared, samples are taken again. If passed, it is further moved for final packaging. If there are no problems with the products, then they are ready to be sold on the market.

In addition, staff from the FDA regularly conducts inspections at this plant. They even visited the plant and done an inspection (including sampling) when the melamine incident occurred. As the participant said, melamine had never been found in the company's products.

It would be very serious if melamine was found in a company's products. However, this company was never involved in the melamine scandal and, therefore, when this incident occurred, its reputation was enhanced. Due to its QMS, the company was in a position to enhance both its market reputation and market share. As one of the interviewees highlighted, the number of outlets stocking its products exclusively increased from 150 to more than 600 after the scandal.

This company delivers baby dairy products to large companies and groups whose consumption is high, such as kindergartens. Moreover, for ensuring the quality of its products, as mentioned by a manager, it relies on professional drivers and not third party transportation for distribution. It thus takes every possible measure in order to ensure quality in absolutely every aspect of its business.

The company has tried hard to find eminently suitable locations for its dairy farms and to keep the costs down as much as possible. Only relevant staff from the company can visit the farms and outsiders are not allowed in at all without the company's permission. Anyone that does go on to a farm must wear protective clothing and take other precautions related to the spread of disease and safety in general. This helps to prevent both viral and bacterial infections in the cows. Furthermore, the company takes out insurance for whoever visits the dairy farms. It has also taken advice from appropriate professional sources in order to learn about cattle nutrition, and the cattle feed is imported. The way the cattle are fed is properly regulated, based on scientific knowledge. The company's storage depot has the capacity to store around 3,000 tonnes of feed, comprised of oat grass, corn, grass, straw and grain.

The cows are exercised on a daily basis if they are not out at grass. Certain cow breeds, i.e. the black and white cattle (Holstein Friesian dairy cattle), are not required to be out at grass in order to breed (raise). Proper monitoring of equipment is used for ensuring that there is no problem in them and there are no sudden breakdowns. One warehouse is used for feed fermentation while another is used for feed storage. There is also a warehouse that is used for waste. This company has obtained 3 quality certifications that require the preparation of product inspection reports. Such certifications help ensure that internal, local and international standards are adhered to. Staff from the regulatory authorities, namely the MOA and the CFDA visit the production plant to carry out regular inspections. In summary, it can be said that both the company and the government are introducing measures to manage the quality of the company's baby dairy products.

## **7.6. Importance of QMS in China's baby dairy product industry**

It is critically important to manage quality in the baby dairy product industry. Previously, there were fewer companies competing in this sector, but now there are many successful companies of baby dairy products. This means that the safety of products has to be ensured in a more systematic manner.

Chinese customers are quite conscious about food quality and safety in general. When it is clear that quality is being managed in a proper manner and quality products are seen to be available, consumer confidence and trust returns. In order to gain a lead position in the market, or at least increase their market share, companies have to develop better standards of technology, equipment and staff training with regard to QMS. To do this is challenging.

Customers will only accept quality products. They are very concerned about quality and do not wish to compromise on it in any way. If a product of poor quality is launched on to the market, the consequences for the company will be severe. After the melamine incident it became clear that safe, quality baby dairy products had to be offered. QMS help companies to compete in the fierce competition of the baby dairy product market and survive in it. The interview results showed that those companies who had effective quality control standards and were not involved in the melamine incident were able to assume leading positions in the market. As has already been said, Company D was never involved in the incident. It was, therefore, able to enhance its reputation and expand its market share.

There are various laws, regulations and standards that are related to QMS. The most commonly used of these are the ISO 9001, HACCP, GMP, FSSC 22000, Food Safety Law, Food Additive Laws, Food Production Licence, Food Safety National Standards. These laws, regulations and standards are advantageous for companies and should be implemented. Once these have been done, a company can gain many benefits due to the high quality of its products. The focus group results showed that there were numerous advantages of adhering to the relevant laws, regulations and standards: customers are

satisfied; production costs are reduced because there are fewer errors; and the company's resources are utilised more effectively. All stakeholders will get benefits. Costs occur by not pre-empting problems. For example, if Sanlu and other companies involved in the melamine scandal had adhered to the legislation, they would have avoided many costs. The purpose of laws, regulations and standards relating to quality is to solve those problems with regard to quality that are dangerous for all of a company's stakeholders. For example, every member of the supply chain can obtain benefits from the quality management legislation.

The findings from interviews and the focus group have led to the conclusion that with the implementation of relevant laws, regulations and standards, the quality of the final product is improved. When this is the case, Chinese brands of baby dairy products could make a good impression on the international market. Furthermore, after the melamine incident, it has been observed that many international brands are overtaking Chinese brands in the baby dairy sector. It has, therefore, become necessary for manufacturers of baby dairy products to improve their competitiveness, which they can do with the help of the appropriate legislation. This was borne out by a focus group member who said that if local brands started adhering to the legislation, their quality would increase automatically. Hence, they would have a chance of survival not only in the local market but also in the international market for baby dairy products.

With proper systems in place where QMS is effectively implemented, faulty products are identified before they reach the customers. Hence, customers only get quality products. When better products are offered to customers, they are more satisfied, and they stay loyal for longer. The laws, regulations and standards related to QMS are not only beneficial for the company but for the whole community as well. Ultimately, the products will be used by the community members; therefore, QMS are beneficial for everyone.

### **7.7. Challenges of implementing QMS in China**

There are various challenges which are faced by companies when they implement QMS.

This section reviews the challenges that are encountered in the baby dairy product industry. The Figure 7.1 presents the quick overview of these challenges and also clarifies from where the information is coming by specifying the participants.

Challenges	Participants																				
	A1	A2	A3	B1	B2	B3	C1	C2	C3	D1	D2	D3	F1	F2	F3	F4	F5	F6	G1	G2	G3
1. Personnel challenges	•		•		•			•		•	•		•			•			•		
2. Internal management	•	•				•						•	•	•				•			•
3. Source of milk		•	•		•		•		•		•	•			•		•		•	•	•
4. Production process		•	•			•	•			•	•				•						•
5. Distributors	•			•		•		•		•	•			•							•
6. Warehouse and transportation					•						•	•			•						•
7. Dairy farms management		•		•				•	•	•				•		•		•			
8. Roles of Stakeholders	•				•	•							•	•		•		•		•	•
9. Information-sharing technology		•					•			•				•				•	•	•	•
10. Cost of QMS			•		•			•		•			•			•	•		•		

Figure 7.1: Mapping diagram for challenges of implementing QMS in China.

Notes: A1-3 (Interviewees from company A); B1-3 (Interviewees from company B); C1-3 (Interviewees from company C); D1-3 (Interviewees from company D); F1-6 (Participants from focus group); G1-3 (Interviewees from government);

### 7.7.1. Personnel challenges

The attitude of employees is one of the biggest challenges faced when trying to implement QMS. The implementation of such systems requires bringing about a change in the attitude of employees, and this is particularly difficult. The attitude of employees determines their commitment, because a positive attitude can mean a higher level of commitment. The process of implementing QMS requires the commitment of both employees and managers. Without top management being committed, it often becomes impossible to implement QMS effectively (Chen et al., 2008). As one of the focus group members said, when managers are unwilling to implement QMS, they do not develop the kinds of objectives and policies that are in favour of these systems. Willingness to implement QMS and adhere to the appropriate legislation is also important and managers need a positive view with regard to the benefits of doing so. In addition, as mentioned by the interviewees, managers often show an unwillingness to dedicate

resources for the implementation of QMS and, as a result, they cannot be implemented effectively. Those organisations where the management has a higher level of commitment are more likely to have more resources available for quality programmes. Therefore, it is analysed that the attitude of management often becomes a barrier to implementing QMS. For the implementation of QMS to be a success, the involvement and commitment of top management should be sought by all organisations.

Commitment is not only required from top management but also from employees at all levels (Latham, 2014). One of the members of the focus group stated that the psychological involvement of employees is critical in the implementation of QMS because when they are involved their commitment will remain higher, and this is very important for success. When employees do not have ownership of this process, it becomes difficult to implement.

Likewise, all people directly or indirectly related to a company must be committed to the implementation of QMS. Otherwise, it cannot be done effectively (Ferne and Sparks, 2014). It was further found from discussion in the focus group that people who are not directly associated with the production process also need to be committed. For example, the workers on the dairy farms are unlikely to have the required commitment for the implementation of QMS. So, the analysis shows that it becomes a difficult challenge to create a standard system for the involvement of everybody. Organisations need to find out ways of obtaining involvement and commitment from all relevant stakeholders. Everyone who is directly or indirectly related to the organisation is important, hence, their involvement is needed for the successful implementation of QMS.

### **7.7.2. Internal management of implementing QMS**

Implementing the relevant laws, regulations and standards is a long process which often involves going to the trouble of completing documentation. The documentation process often becomes a challenge for the implementation of QMS because small- and medium-sized enterprises (SMEs) often hesitate to apply for appropriate certifications because

of the documentation process (Schmitt et al., 2016). A manager from Company A said, and the researcher Hoyle (2007) agreed, that to apply for certification, the relevant staff need to be able to handle the documentation required and this can be a lengthy and complicated process.

Another challenging aspect as mentioned by the interviewee is that the implementation of QMS does not show results in the short term. It takes years for the results to become apparent. Certification does not mean immediate implementation of QMS in China. At initial stages, there is more investment needed to introduce the QMS. Moreover, to facilitate its implementation, system-wide changes are also needed like training all relevant employees. Doing so reduces the return on investment in initial years of its implementation, but in long run, its benefits will be obvious and tremendous. Likewise, when certifications are first applied for, there will be no immediate impact on the bottom line. They can, however, improve the commitment level, and the quality performance will start improving with the time. It is analysed that organisations need to remember that results will eventually come. In order to be able to meet this challenge, companies need to be able to view things in the long term; they cannot afford to be short sighted.

### **7.7.3. Source of milk**

When implementing QMS in the baby dairy product industry, the source of milk plays the most crucial role. The milk can be bought and collected from different farmers, but many of them ignore its quality. This carelessness can be seen in the fact that they do not implement the appropriate legislation (Fernie and Sparks, 2014). Focus group findings reveal that problems occurred because farmers were not willing to comply with the relevant standards. Currently, it is observed that baby dairy product companies are implementing the appropriate legislation. For their part, they are doing well. However, other parties such as farmers and additional suppliers of raw materials often do not understand the seriousness of this issue. It is considered that companies can implement the relevant legislation, but when people in the supply chain do not implement it, it then becomes difficult for everyone to comply.

Furthermore, for many companies, there is no single milk source and the milk comes from multiple dairy farms. The milk is stored together after it has been collected from the various farms, each with different levels of technology and safety and, as a result, the quality of the milk is uneven and each batch is likely to contaminate the other. Unqualified milk is barely tracked. Moreover, it is not possible to ensure that all dairy farms have the latest and safest technologies.

In addition, as mentioned by the interviewees, when the cows eat contaminated feed or other additives, the milk quality is certainly not guaranteed. It is important to ensure that the feed given to cows is not contaminated in any way. Good quality feed should be used and it must be stored in a place that is clean and where there are fewer chances of bacterial and fungal contamination. Contaminated feed can result in epidemic diseases in cows which are, of course, dangerous with regard to the quality of milk they produce. It is a natural result that contaminated milk leads to contaminated food.

According to information obtained from the interviews, many dairy farmers are reluctant to hand over their farms to third parties to manage and run. This is related to the overall situation in China, where there are many small milk processors who are part of the supply chain of this industry. It is harder to keep any check on these small milk processors as they are many and their orientation towards quality is not high. Under such conditions, it becomes more challenging to ensure the quality of the final baby dairy products.

#### **7.7.4. Production process**

It is important to have the most up-to-date machinery in order to ensure the successful implementation of QMS. When there are any problems with the equipment, the quality of products cannot be assured (Kern, 2014). Another challenge, therefore, as highlighted by one of the interviewees is to be able to have advanced machinery such as a high-speed rotary vacuum powder filling machine, a high-speed laser coding system and pre-gassing technology. The machinery used may occasionally cause some problems with regard to the quality of the products and, usually, it is the packaging

machinery that is at fault.

The importance of packaging was highlighted by a respondent who stated that it helps in protecting the milk from ultraviolet light emanating from fluorescent lighting. In baby dairy products, many problems could occur due to poor packaging; therefore, the role that this plays in QMS cannot be neglected. Packaging is important for ensuring the quality of milk by protecting it from outside elements that could alter its flavour.

The personal analysis tells that maintaining quality standards is a big challenge for baby dairy product companies and they do have to be extremely careful with the milk source and the packaging of the milk powder. Although companies are making continuous efforts, it is impossible to eradicate quality problems completely. However, companies will spare no efforts in trying to reduce the number of DPM (defects per million).

It is impossible to eliminate production problems completely. Every manufacturing company has to face this fact (Wang and Hao, 2012). It was found that the packaging material can present a challenge and the manager from Company A stated that this can cause quality problems, but that they are often ignored. Another challenge related to QMS is the nature of milk itself. If ever milk comes into contact with the air, it reproduces bacteria at an alarming rate. Milk companies do not use preservatives in the process of pouring milk into containers. Therefore, if ever the milk leaks from its package, the whole of the contents go bad and the package may look as if it is 'bulging'. A manager from Company D mentioned that this is similar to human milk. If human milk has not been drunk for a couple of hours since being expressed, then the bacteria in the milk will reproduce extremely quickly. In this situation, products such as Tetra Packs help in isolating milk from the bacteria outside. Therefore, the analysis tells that obtaining the correct quality of packaging material and ensuring that the packaging process meets quality standards are two other challenges for companies in the baby dairy product industry.

Furthermore, another participant highlighted the fact that the planning, implementation and control process with regard to QMS is also challenging. It demands planning of

each step as per the requirements of legislation and is a very time-consuming process. Sometimes, consultants have to be brought in to help implement the relevant legislation.

The analysis reveals that these are the common challenges which every industry has to face, including the baby dairy product sector. In order to deal with the problems, all 3 stages of baby dairy product manufacture (source, production and distribution) need to be managed in a detailed and sophisticated manner.

#### **7.7.5. Distributors**

Another challenge for the implementation of QMS in the baby dairy product industry is related to the contract distributors the companies use. Every distributor has its own storage facility. Therefore, it often becomes challenging to keep a check on the facilities belonging to contract distributors (Chen et al., 2016). The manager from Company B mentioned the example of an incident where the milk had actually deteriorated when stored in such a facility. The cold warehouse in question had had its power cut off. The caretaker, who displayed an irresponsible attitude, did not detect this and, as a result, the milk deteriorated as it was at a higher temperature for 3–4 hours. If milk is not stored between 0–6°C it soon deteriorates. As a result of this incident, eight children suffered mild diarrhoea. Nobody died, but the situation was still very serious. Thanks to the quick actions of the retailers involved, the children affected were sent to hospital immediately, the medical expenses being paid by the retailers. The parents were eventually compensated for their children having fallen ill through no fault of their own. While this incident was ongoing, the Chinese Centre for Disease Control and Prevention actively liaised between the retailers and the affected consumers. If the incident had involved more people and the products concerned had not been recalled in time, then the public would have been entitled to know through a report in the media. This analysis of this case revealed the fact that if distributors do not implement proper quality control procedures, then this is also a challenge in relation to the implementation of QMS in the baby dairy product industry.

#### **7.7.6. Warehouse and transport vehicles**

Milk has to be stored at a specific temperature and this needs to be provided at the warehouse. The number of transport vehicles is not always sufficient to transfer the milk and there is often a backlog of milk awaiting delivery and stockpiling in the warehouses. Overstocking here is another of the challenges the baby dairy product industry faces in the implementation of QMS (Zhou et al., 2001). As mentioned by the interviewees, to ensure quality, fluctuation in temperature in the warehouse is not permitted, but overstocking means that this is a possibility. Moreover, when the temperature of the delivery vehicles is not as per the requirements, this can also result in a deterioration of the milk quality. When discussing the challenges related to the transport and storage of milk, the researcher analysed that during the process of transferring milk, the protein in the product is not stable; it may produce some chemical reaction, and cause diarrhoea in children.

It is analysed that some baby dairy product companies do not store products in a proper way. They may be put into environments that are not up to standard because they are overcrowded. As a result, quality problems may appear before customers receive the products. Appropriate storage is of the utmost importance because if it does not receive the attention it merits, the quality of the products will be compromised.

#### **7.7.7. Dairy farms management**

The analysis from the data collected for this research shows that it is not possible for all baby dairy product companies to own their farms. This often becomes a challenge for them. In this situation, it becomes difficult for them to ensure good milk quality if there are no quality control procedures in place for the raw materials. As mentioned by the interviewees, according to state regulations, dairy products can be sold only when the percentage of protein is higher than a certain figure. Therefore, baby dairy product companies are required to ensure that the raw milk meets such standards. As a result, certain milk, which did not meet the standards, was mixed with melamine by dairy farmers in order to increase the percentage of protein. Some dairy farmers even added water as well as lots of melamine to the milk. Unfortunately, they were driven by profits,

because they would make more on the increased weight of the milk when they sold it to the companies. Water accounts for the most weight in the milk. Therefore, resulting the baby dairy products seemed to meet the national standards even although they had been adulterated with melamine and water. From the interviews, it was confirmed that this behaviour was common practice at the time.

The adulterated milk was collected by companies and then used in their manufacturing processes, which led to serious quality problems with the baby dairy products. It is a challenge for QMS in the baby dairy product industry that national standards do not actually prohibit the farmers from adding water and melamine, but if it is detected in the manufacturers' products, this will be questioned by the relevant regulatory authorities (Macdonald et al., 2015). This is the reason why baby dairy product manufacturers find it difficult to keep a check on the quality of the milk. Managing the source of their milk is a particularly challenging aspect for companies if they do not own their own dairy farms.

Fresh milk has to be conveyed by cold chain vehicles that provide the correct temperature for the milk. When milk has to be stored in being transferred from one place to another, it also needs to be kept at the right temperature. This enables the milk processors to maintain the quality level, but without the appropriate temperature, quality cannot be ensured. As the manager from Company D said, especially with regard to products with lactobacillus, if they are exposed at room temperature for half an hour, lactobacillus will die, which may cause a quality problem.

#### **7.7.8. Roles of stakeholders**

Another challenge for implementing QMS in the baby dairy product industry is that key stakeholders are not playing the desired role (Gale and Hu, 2009). For example, as one of the government officials said, the government is unable to monitor and regulate QMS in the baby dairy product industry diligently enough. Many aspects of the overall system are not handled well, and quality and safety issues need to be managed in a proper manner. There is little coordination which exists between small dairy farmers

and the large milk producers. The small dairy farmers are unable to adhere to standards in relation to the quality of milk. In addition, their economic capability does not permit them to have the advanced equipment necessary for ensuring the quality of their product. Moreover, the dairy farmers are using undesirable substances in the milk to satisfy the large production companies who buy it. The analysis shows that these problems in the system have created the difficulties for the whole baby dairy product industry. The problems could be solved through cooperative dairy farming and, therefore, the researcher recommends that dairy farmers set up cooperatives for large-scale operation. The above analysis shows that the key stakeholders, i.e. dairy farmers, baby dairy product companies and the government, all present problems with regard to the implementation of QMS. To address this, it is necessary for every stakeholder to take responsibility and be accountable for their specific roles.

#### **7.7.9. Information-sharing technology**

There is a need to establish a traceability system for the baby dairy product industry so that the quality problems can be traced to their root cause. Data sharing is the most important requirement of this traceability (Gadiesh et al., 2007). For example, the UK baby dairy product industry has a data sharing system whereby the actors in the supply chain share data on real-time basis, and they share it extensively, which helps them to examine the root cause of any quality problems. It could be said that it would not be difficult for UK milk companies to investigate an incident in which a number of substances have been added to the milk. However, it is harder for the agro-industrial sector to share data in China. Therefore, the analysis is telling that a weak information system is another challenge for the implementation of QMS in the Chinese baby dairy product industry.

An information-sharing system could help to reduce the quality-related problems in the Chinese baby dairy product industry. Currently, if there is a problem with the milk source it is not rectified and raw milk is simply delivered as usual to baby dairy product companies for processing (Zhou et al., 2001). As referred by the interviewee, unless a

company was to conduct an inspection of the milk, it could not know there was a problem with it. Staff at the company would have to be cognizant with numerous inspection tests for quality checking, and familiarisation with these procedures would take time and money. Furthermore, even if the milk is of satisfactory quality, the company would still have to perform numerous tests to analyse the level of different elements in the milk, such as proteins and vitamins. With the help of an information-sharing system, it becomes possible to find out every single detail about the milk from its ID or lot number. Similarly, an information-sharing system would also help companies to identify which cow any contaminated milk was from. With the help of an information-sharing system, the effectiveness of the overall quality management in the baby dairy product industry could be improved. It is not only recommended that information sharing takes place between farmers and companies, but that it also takes place between other stakeholders, such as distributors, suppliers of additional raw materials, warehouse managers, retailers and customers, who should be part of this process too. It is recommended that the whole supply chain of the baby dairy product industry shares information as widely as possible in order to solve quality-related problems.

#### **7.7.10. Cost of QMS**

Implementing QMS is quite expensive (Sekar, 2014). As told by the interviewees, another challenge is that dairy farmers do not have the economic capability to purchase and use advanced equipment. The cost factor is very important and costs increase with the intention to implement the legislation (Latham, 2014). Furthermore, standards often have requirements that staff need training for in order to be able to comply with them. In deciding on training, first it is necessary to identify exactly which skills require it, then trainers have to be found. Employees are unable to carry out their jobs during the time they are undergoing training. In this research, it was found that cost, skills and advanced equipment are challenges for the implementation of QMS. When some product units are rejected under quality inspection as required by legislation, they cannot be used and this also incurs costs for companies. In addition, implementation of

legislation often calls for advanced equipment which has to be sourced from abroad at a higher cost.

#### **7.7.11. Summary of challenges**

Those companies which control the whole production process from raw materials to the finished product are in a good position to prevent serious quality and safety problems. Therefore, in order to gain the trust and confidence of consumers, implementing effective QMS is necessary. The challenge is that these systems cannot be developed easily because they are too expensive. There are various stakeholders to be taken into account when developing QMS, i.e. dairy farmers, logistics companies, large-scale baby dairy product companies, warehouse handlers, distributors and retailers. It is a time-consuming process to develop QMS where the end product is indeed of a higher quality. There are two main challenges i.e. quality inertia due to poor animal husbandry and problems arising due to fraud of middleman. In conclusion, the challenge for the implementation of QMS is to bring about certain changes throughout the whole production system instead of targeting one supply chain actor or stakeholder.

#### **7.8. Critical evaluation of standards**

ISO/FSSC 22000 is for the food industry, HACCP is for the dairy industry and GMP is a system for ensuring that products are consistently produced and controlled according to quality standards. One universal standard for all industries is ISO 9001 (Luo and Wu, 2017). It is analysed that this is widely used and is considered to be one of the most important standards for ensuring quality. Other than these, there are many international and national standards for managing the quality of baby dairy products.

The importance of such quality standards (e.g. ISO 9001, HACCP, GMP, FSSC 22000) cannot be underestimated. As mentioned by the interviewees, with the liberalisation of global trade, consumers have become more demanding. They do not only want food that tastes good, is healthy and is as cheap as possible, but they also want food that is safe to eat. In addition, they want food that is produced ethically. This is the world of competition, in which manufacturers of baby dairy products need to rely on quality and

safety. Hence, it is vitally important that they adhere to the relevant laws, regulations and standards and apply for appropriate certifications. From the focus group discussion, it became evident that companies of baby dairy products are now operating in an era where consumers are looking at the quality aspect of these products. Quality can only be assured if companies comply with the laws, regulations and standards. The need to comply has become more and more important. In this day and age, many baby dairy product companies have opted for internationalisation. International customers are far more conscious of the quality aspects of products they purchase. Such an international focus has meant that baby dairy product companies have had to implement QMS and comply with laws, regulations and standards. Moreover, as highlighted by 1 focus group member, regulatory bodies put pressure on the companies to comply with the relevant legislation. If they are not prepared to do so, they have to be prepared for certain negative consequences.

Likewise, another focus group member explained that it was the wish to maintain a strong market presence that became a reason for complying with the laws, regulations and standards. Companies know that if they do not adhere to the legislation, it will become difficult for them to maintain a strong market presence. Similarly, companies also comply with the legislation in order to gain competitive advantage. Adhering to quality standards is of critical importance for the success of baby dairy product manufacturers.

The most commonly applied standard in the baby dairy product industry is ISO 9001 which was revised in September 2015 with amendments being made in certain areas (Zayas et al., 2016). Although there were no changes to the scope of the standard, the core terminology and structure were changed to allow it to integrate better with international management systems. The language was simplified and the format was made more user friendly. In applying quality standards, companies are able to manufacture products that can perform well in the international marketplace. The manager from Company A explained that complying with relevant standards can help bring a company's management and production more in line with international practice.

It is, therefore, better to implement such standards.

The analysis on the basis of primary data collected through interviews and focus group discussion shows that quality standards such as ISO 9001, HACCP, GMP and FSSC 22000 are integrated with the management system of the case study companies to improve the quality of their products. Large companies are showing increased willingness to comply with the quality standards; the problem lies with the attitude of small milk processors because dairy farmers are not willing to take steps to improve quality control. It was found that the production of baby dairy products is only subject to national standards. Baby dairy product companies also develop their own standards in order to address aspects that are not covered by the national standards. It was found that all 4 case study companies had their own standards, some of which were stricter than the national ones. This research has come to the conclusion that national standards are not strict enough. If they were stricter it would help to prevent events such as the melamine incident (Chen et al., 2014). Moreover, the manager from Company B said that many in-house standards were designed to operate at a higher level than national quality and safety ones. For example, 100 ml milk produced by this company has fewer bacteria than the national standard.

The above discussion shows that baby dairy product companies are setting themselves higher standards even than the national ones. The analysis on the basis of collected data, this highlights the weakness of national standards in that there is a need for internal ones as well. In addition, it was found that, currently, the four case study companies from the baby dairy product industry were using raw material of a higher quality than what was actually required by the relevant national standards.

The mandatory state instrument is the food production licence. The ISO standards are not mandatory, but they are recommended standards for the baby dairy product industry (Herrero et al., 2010). It was found that even when the national standards were implemented, there was no guarantee that the end product would be a quality one. There is, therefore, a need to introduce a mechanism which would ensure that the

implementation of national standards leads incontrovertibly towards quality products and bottom line will also improve with these standards.

As highlighted by the interviewees, one of the reasons for the weaknesses of the national standards relating to the quality of baby dairy products is that the government had to ensure that both weak and strong producers could meet the criteria. This is related to China's pledge to protect small dairy farmers. These farmers are protected because they help meet the domestic demand for milk in China. There are many small dairy farmers in the north of China who have low economic and technical capability and so they have no way of checking (or complying with) the various indices of milk quality. The analysis tells that it is important that the national standard achieves a balance between small, low-technology companies and large, fully automated dairy farms with all the latest technological monitoring equipment. However, if this is done then, unfortunately, the Chinese national standards are not strict enough to match the international standards. It is becoming difficult to devise national standards that actually address the problems of quality.

It is a fact that the importance of such small milk companies cannot be denied because they are helping to meet the demands of Chinese domestic consumers. The manager from Company A said that, looking at the prevailing situation in China, if most companies that could not produce milk in accordance with the international standard were closed down, the supply would not be able to match customer demand. From this response, it can be deduced that the problem seems difficult to solve. However, a solution is provided in the framework which is presented in chapter 10 of the thesis.

The national standard contains guidance provided by the relevant international organisations. Therefore, it can be said that the national standards rely on international standards, which are expected to be rigorous and comprehensive, and so these qualities should appear in national standards too. However, as was explained above, forcing companies in China to comply with the standard is not always possible by any means. Events like the melamine incident could be stopped if stricter quality standards were

rigorously enforced. Stricter penalties need to be imposed for non-compliance with the standards. Moreover, the government should also cancel the production licence of baby dairy product companies if they do not comply with the laws, regulations and standards.

The manager from Company A emphasised that the application of standards such as FSSC 22000, HACCP and GMP is good for the development of effective QMS. Applying international standards such as these in the Chinese baby dairy product industry would help the companies involved, and their supply chain partners too, gain prominent positions in the international market. The majority of participants in this research said that meeting international standards is regarded more highly than meeting national ones. However, currently, small milk companies are unable to meet even the national standard.

One important fact that should be mentioned is that the details of companies' own internal standards could not be obtained from the interviews as their contents are never made public. The manager from Company A said that no company makes its internal standard public since it is a trade secret. To see the differences in national and internal standards, nutrition labelling can be analysed. For instance, the analysis shows that there is a difference between the national standard and internal standards set by each company with regard to the amount of protein and other relevant substances present in the milk. There is, in fact, a huge difference between the amounts.

While evaluating the standards, it was also found that requirement for selecting imported cows in China was higher than the standards of animals used in other countries. Other countries select cows based on their genetic traits; e.g. those animals with a relatively high immunity to disease would be selected for high-yield milk production (Zayas et al., 2016). Moreover, it is also important to ensure that those cows are selected which could fit in natural climate and environment of China. The standards of the imported cows that Company D uses is higher than that of animals in the European Union, New Zealand and other countries too. As per the EU Directive on Dairy Cow Welfare, good feeding is necessary. Few foreign countries have China's standards with

regard to controlling bacteria in baby dairy products and many of the baby dairy manufacturing companies are in a position to comply with these tough standards which, in this respect, are even better than the international standards. However, it is necessary to remember what was said previously, which was that national standards also have certain weaknesses. It is analysed that at the time of the melamine incident, China did not have a relevant standard in relation to melamine, let alone a standard in relation to melamine in baby dairy products. When the melamine incident occurred, all products containing melamine were regarded as unsecured products. This shows that there is a need for national standards for the various substances that can be added to milk. Moreover, situation will improve remarkably if there is transparency in the system. As a result, transparency is much needed.

An important aspect of international standards is that their application involves huge costs, in both time and money. The cost factor often becomes a hindrance for baby dairy product companies with regard to implementing such standards and, therefore, companies often hesitate before proceeding, if they do at all. Funds have to be available, and time has to be found for preparing documentation and seeking registration. Many companies end up simply relying on their internal standards (Wu et al., 2014).

However, it must be emphasised that in the current market environment where incidents relating to poor quality have already occurred, many consumers do not care about the price of the products they buy, but are far more concerned about its absolute safety. Premium baby dairy products are known to be safer and of higher quality. Buying milk powder is not considered to be a price-driven purchasing decision, Chinese consumers being far more concerned about the quality and safety of the products offered. Therefore, irrespective of the fact that prices may rise, there are always customers who are ready to purchase products that will not be harmful to their health.

### **7.9. Critical analysis and evaluation of legislation**

The purpose of this section is to analyse and evaluate the legislation that has been specifically introduced to manage the quality of baby dairy products. In the past many

problems have occurred due to the lack of effective quality-related legislation; its existence now, therefore, is very significant for China's baby dairy product industry. Countries that have strict legislation with regard to quality control are better able to meet the quality needs of the consumers (Tashakkori and Teddlie, 2010). One example is the UK baby dairy product industry, which is analysed in depth in subsequent chapters. As referred by the interviewees, with the help of legislation, quality errors can be reduced and it becomes possible for all stakeholders to ensure that they play their desired role in meeting the quality requirements. With the enforcement of quality-related laws, all stakeholders in the baby dairy product industry could gain significant benefits. For example: customers would be able to get quality milk powder for their children; companies would be able to manage the quality of their products in a manner such that the end product is matched with the criteria specified by the regulatory bodies; farmers would be able to ensure that they provided good quality milk to dairy companies; and intermediate parties could also ensure that their functions and activities were aligned with the needs of the overall system. The analysis tells that critical to the success of the overall system is the enforcement of the laws, regulations and standards.

In China, there are many laws, regulations and standards. Many of these are specific to the powder milk industry. The most basic and latest safety law for food items in China is the new Food Safety Law (Jia and Jukes, 2013). With regard to food additives, there are numerous regulations which specify what kind of additives should be added to baby dairy products and at what level. The design and implementation of legislation related to food quality and safety is improving (Qian et al., 2011). Government Official A mentioned that, compared to a few years ago, aspects of food quality and safety have made great progress. Legislation is one the important components of the whole Chinese system, and China's new Food Safety Law has now been officially released. In order to establish QMS, there is a need for changes in the whole system. Legislation will help in implementing QMS and its importance should be emphasised.

The interviewees stated that regarding the implementation of the relevant laws, regulations and standards, which is being done gradually, there are still problems that

need to be addressed. The national standards implemented in the baby dairy product industry will be reviewed every 6 to 7 years. In 2015, the laws, regulations and standards were revised, and major changes were made. The national standards do have certain weaknesses that need to be considered. The majority of interviewees mentioned that the national standard may well not be the highest one and that international standards are comparatively more complete and standardised. Currently, the existing standards in China are approaching the rigour of international ones, because they are based on these standards, e.g. on the ISO 9001 system. In the preparation of national standards foreign criteria were adopted. It should be said that it was not always necessary for national standards to be as rigorous as the international ones. The analysis reveals that a blind copying of standards could have led to poor results, such as a product not corresponding to what was actually required, or its cost rising sharply, resulting in consumers changing their buying behaviour. A needs analysis should be conducted and national standards adjusted according to the local Chinese situation. For solving these problems, these methods (i.e. centralised extractors, fewer middlemen and open competition in the market) also should be considered.

As mentioned in the previous section, national standards have to consider all stakeholders. If strict regulations are introduced, then many of small milk processors will go out of business (Johnson et al., 2007). As long as products are not harming consumers' health, they are considered legitimately safe. The rationale for such relaxation in quality management regulation is that strict criteria might reduce the milk supply and the Chinese domestic demand for milk could not be fulfilled. Considering the 'social stability', the Chinese government does not force the milk companies to follow the international standards which are stricter. From this, it can be deduced that there is a need for maintaining the balance between quality and quantity; the Chinese government must take certain steps which would ensure that all companies, small and large, could produce milk efficiently by following the national standards. The framework presented in chapter 10 considers how this could be achieved.

As highlighted by the interviewees, one weakness of state regulation is that it does not

actually prohibit dairy farmers from adding melamine and water to milk and this is why small milk processors do add melamine to increase the amount of protein in the milk, and water too, to increase the quantity of the milk. According to state regulations, baby dairy products can be sold only when the percentage of protein is higher than a certain figure. Therefore, baby dairy product companies would require raw milk to meet such standards. As a result, certain milk, which could not meet the standards, would have melamine added to it by dairy farmers in order to increase the percentage of protein.

The interviewees mentioned that when compared with international legislation, it is found that there is a further problem with the comparable Chinese legislation. Foreign countries usually have stringent mechanisms for preventing epidemics, and serious punishments if procedures are contravened. Compared with foreign countries, Chinese law is relatively weak and the punishments are not hard enough. Many food companies and heads of relevant government departments think that illegal activities pay with higher profits and, thus, driven by profits, they engage without scruple in illegal activities. Similar analysis was also mentioned by Trienekens and Beulens (2001).

It must be noted that regulatory authorities, such as the CFDA, play an effective role. This institution is responsible for drafting laws, regulations and standards for supervising food safety. It helps companies to develop definitive documents that help in facilitating the implementation of QMS in the baby dairy product industry (Jia and Jukes, 2013). By helping companies to develop such definitive documents, providing guidance on implementing QMS and inspecting the quality of products, this regulatory authority plays a critical role in the implementation of QMS in China's baby dairy product sector (Wise, 2013). It was also found that, currently, the operation of the CFDA is quite strict as it examines the quality of products through random inspections and take serious actions if production does not meet the criteria. Companies are, therefore, kept on high alert and put quality and security of products first as well. Likewise, other regulatory authorities, namely the MOA and the inspection department of the FDA are also playing their part, but to a lesser extent. For example, they will come to production plants and take random samples of the milk.

The implementation of the national standard is done through a detailed process which involves working systematically through a number of steps, each of which must be executed in accordance with what is required (Fuller et al., 2007).

As said by the interviewees, when international standards and regulations are introduced in China, there are certain changes that have to be made as per the Chinese context. The national standards are revised synchronously with the international ones. China has an accreditation and recognition council located in Beijing. This is a department affiliated with the General Administration of Quality Supervision, Inspection and Quarantine. Lots of international standards are converted into national standards (according to the Chinese local situation) before they are introduced into China. For example, after being introduced into China, ISO 9001 became GB/T 19001 (which had been considered and revised on the basis of Chinese local situation, it would be less strict than international one).

As it is important to analyse how the international version of the standard, ISO 9001, differs from the national version, GB/T19001, interviewees were asked to highlight the differences between the two. Actually, they were identical to each other; English is translated into Chinese and then the corresponding standard is changed into the standard for China (with some modifications according to the local context). In the next few years, more international standards will be introduced and transferred.

From the interviews and the focus group, it was found that before 2008, HACCP had not been implemented in the Chinese baby dairy product industry. This was particularly mentioned by the manager from Company A. HACCP is an important standard especially for dairy products and is applied internationally in food production. After the melamine incident this standard was highly recommended for companies of baby dairy products.

It is analysed that the rationale for its recommendation only for the baby dairy product industry was that its application to the procurement of raw materials was more suited to the realities of the Chinese baby dairy product industry than the general principles of

food hygiene. One of the interviewees said that the contents of this standard needed to be adjusted according to Chinese local conditions, and this seems logical. After the melamine incident, measures were taken to adopt HACCP in the baby dairy product industry. Hence, as one interviewee stated, the scandal gave rise to making HACCP a mandatory standard for baby dairy product manufacturers.

The government has a substantial role to play in the implementation of QMS in the Chinese baby dairy product industry (Yu and Abler, 2009). For national policy formulation and implementation, there is a need for professionals at the national level. Supervision from the government should be effective. However, it was found that there were few professionals engaged in national policy formulation and that supervision was not perfect. Similarly, it was found the current laws, regulations and standards were not strict enough to stop events like the melamine incident. The analysis highlights discrepancies in the laws, regulations and standards relating to baby dairy products. One respondent said that as far as the laws, regulations and standards in operation at the time of the melamine scandal in 2008 were concerned, and with regard to the penalties that should have taken place, something had gone very wrong.

It can be seen that the huge weaknesses of national regulations in relation to quality management were highlighted when the melamine incident occurred in 2008. It is analysed that the penalties for those involved were not sufficient enough to stop them from doing it again (Qiao, Guo and Klein, 2012). The punishment was far less than the loss that would have been incurred had the product not been sold due to the quality problems which led to the melamine being added to the product. The company involved, the Sanlu Group, only had to pay a fine of CNY 20 million (equivalent to GBP 2.25 million) for causing so many deaths (Gossner et al., 2009). As mentioned by the government officials in the focus group discussion, if the legislation were to enforce far stricter penalties, such a situation could be avoided in future. From the responses of the participants in the focus group, the interesting thing found was that the penalty for not implementing the regulation was less than the cost of implementing it. Obviously, companies are not going to implement the legislation if this is the case. It is analysed

from the primary data that the melamine incident actually occurred due to the fact that staff in the company concerned knew that it would not cost them dearly if they did not implement the legislation. Many companies do not implement the legislation because of the low cost that is associated with not doing so. They prefer to use corruption to avoid compliance.

It is important to mention that, on the one hand, complying with legislation incurs costs but, on the other hand, it does also bring benefits, even though the direct costs of not complying with the law may be rather less (Fuller et al., 2004). Although there may be indirect costs, the direct costs are at such a low level that it does not make a significant difference if there is non-compliance with the law. Some of the indirect costs could be: customers' loss of trust; bad reputation; and low employee morale. There will be many others. Hence, the situation where companies are motivated by low direct costs to ignore the law needs to be changed. However, it is analysed that it takes time to effect an improvement. It is important to mention that, to a certain extent, the Chinese government is aware of such discrepancies. Therefore, in recent years, improvements have been made. When the new president took office, it was realised that many food products were imported from other countries. Therefore, the government further strengthened its power to manage the baby dairy product industry by developing a national strategy (Xiaojing, 2011). However, as found from the interviews with the managers of baby dairy product companies, Chinese consumers still faced the problem of food safety. Nevertheless, the government has taken a firm stance, and considerable importance has been placed on preventing corruption. Many other remedial steps are being taken. For example, as explained by the manager from Company C, the government has strengthened quality safety testing. Every year, it grants a fixed sum of money to test products sold in the market. Without notifying the companies, it examines the samples randomly. If a problem was detected, the company would be investigated and banned from selling the product in question. The analysis of the research tells that although the government has certainly taken measure to improve the situation, there is still a need for it to make further improvements to completely solve the quality

problems in the baby dairy product industry.

Furthermore, it is considered that there needs to be a greater focus on the implementation process. When quality standards and legislation are introduced, the most important expectation is that these will be implemented effectively and that companies will comply with them. Company managers need to show commitment to successful implementation and, in addition, for implementation to be effective, adequate resources (i.e. financial, human and technological) should also be dedicated to the process.

### 7.10. Significant factors related to quality

This section presents and analyses those factors which are important for managing the quality in baby dairy product industry of China. The Figure 7.2 presents quick overview of the factors as these were highlighted by participants of this research.

Significant factors	Participants																					
	A1	A2	A3	B1	B2	B3	C1	C2	C3	D1	D2	D3	F1	F2	F3	F4	F5	F6	G1	G2	G3	
1. Breeding, feeding and development of cows				•		•		•		•	•	•				•				•		•
2. Source of milk		•	•		•		•		•		•	•			•		•			•	•	•
3. Production process of milk	•		•			•	•			•	•				•		•			•	•	
4. Involvement of stakeholders in QMS	•				•	•								•		•				•	•	•
5. Improvements in standards for QMS			•		•	•	•							•	•					•	•	
6. Quality assurance/quality inspection department				•						•				•		•	•		•	•	•	•
7. Employees and managers		•							•						•	•		•	•		•	

Figure 7.2: Mapping diagram for significant factors related to quality.

#### 7.10.1. Breeding, feeding and development of cows

This part of the research focuses on the source of the milk. Cows, naturally, are the core source of milk. Hence, significant attention has been paid to taking care of the source. This section specifies the factors that are important for managing the breeding and development of cows. It reviews the best practices of the case study companies, and these will also be added to the proposed framework.

On dairy farms, animal management practices are very important and various measures need to be put into place so that the cows are cared for effectively (Bergman et al., 2014). Interviewee mentioned that the sheds in which the cows live have fans installed and these cool the temperature to an appropriate level: between 5–21°C is an appropriate temperature for cows to live and the optimum temperature for cows to produce milk is between 10–15°C. The beds (mattresses) on which the cows lie are specially manufactured to an optimum size and they provide protection for the cows' udders in order to minimise the risk of inflammation and/or injury. The manager from Company D also explained that there is machinery to clean up the sheds automatically every hour and dispose the waste every 24 hours. In addition, the cows have scratching machines. Parasites and waste matter may make the cows feel itchy and these machines help clean up their bodies automatically. If cows feel they need to scratch they will go to the scratching machines themselves.

One of interviewees told that usually, cows will have had their tails docked at a very young age. It is thought that this is more hygienic and prevents tail bacteria from coming into contact with the cows' udders and the milking equipment. It is also safer from the point of view of the staff who are looking after the cows as they will not face the threat of injury from a heavy, swishing tail.

Researcher analyses the feed for the cows must be stored properly to avoid deterioration in quality, and loss. Some of the factors affecting feed storage are: loss due to scavenging animals such as rats or mice; damaged caused by rain; damage caused by too high a temperature; damage caused by insects; and damage caused by fungi. It is important to protect feed from such potential damage and store it in a cool, dry, watertight place incorporating barriers to rodents (Klein-Jobstl et al., 2014).

The twice daily milking takes place at fixed times. It is important to note that the process of milking needs to be automated with the most up-to-date specialised equipment. The time when milking was done by hand has long since gone. During milking, it needs to be ensured that the cows' udders and the attached milking equipment are disinfected

(Damron, 2013). The manager from Company C mentioned best practice here, which could be adopted by other milk companies. Each cow has its own disinfected towel, which is not used on any other cow. The cows should also be standing comfortably, on special pads.

Milk coming from the cows should go directly to the storage tanks for inspection. Only qualified milk should be transferred to the production plants by milk tankers. Once milk reaches the production plants it needs to be inspected again. Only qualified milk should enter the production process where it is filtered and sterilised before starting the process of producing milk powder and filling containers with milk powder. Before leaving the production plants, the milk needs to be inspected once again. Each cow has a label on its ear which is its ID card. Therefore, if there is something wrong with the milk source, the problem can be traced back to the individual cow.

The time the milk spends in the various stages needs to be monitored. The manager from Company D stated that the maximum time allowed for transferring milk from the farms to the production plants is 12 hours, and that companies must observe this as best practice. Timing also needs to be considered with regard to the length of time a cow can be milked. The normal length of time for which a cow will produce milk is somewhere between 270–365 days. It is true that cows could be milked for more than 400 days. However, experts do not advise such a long milking period. Cows' udders would cease to function properly if the cows were milked too much and for too long (Rowbotham and Ruegg, 2015). This could have a negative influence on their second calving and subsequent milk production. Therefore, farm staff must carefully note when a cow starts to produce milk so that they know when to withdraw it from milking.

Baby dairy product companies need to put in a great deal of effort to avoid problems with quality in order to ensure that the quality of the final product is the best possible. Part of this effort needs to be expended on managing the production of milk at source in the most effective manner. A quality milk source is vital and this, of course, depends on the cows. A cow can produce about 20-45 kilogrammes of milk per day, and may

produce milk from being 2 years old and is at its peak of output when it is between 5–8 years old. The average life expectancy of a cow is 20 years. As already stated, cows are milked for a period of between 270–365 days. After this (and it may take up to 400 days for this to happen), a cow’s milk eventually dries up. It will then conceive again and the gestation period is approximately 9 months. Following the birth of another calf, a cow would produce milk again.

It is analysed by the researcher that in order for cows to be bred and developed successfully, there is a need for proper systematic management and professionals trained in dairy cattle husbandry should be employed (Damron, 2013). Artificial insemination may be used in order to get the cows into calf. Calves are often fed domestic milk powder instead of their own mother’s milk because fresh milk is more expensive than milk powder. As calves reach maturity they need to be separated from younger animals beneath them in the chain. Cows are treated according to their differing needs at each stage of development and this means different types of hay are used as they mature.

If cows do not have access to pasture they will spend time a lot of time in the sheds and not only when they are being milked. If this is the case then they also need access to some sort of outside exercise area. It is a good idea for dairy farmers to cooperate with institutions who are doing research into dairy cattle husbandry in order to learn about best practice. The cows need to be made as comfortable and happy as possible with the best nutrition in order that they can produce both the best quality of milk and the largest quantity possible.

From the above discussion, it can be seen that animal management is a very important factor for managing the quality of milk products.

#### **7.10.2. Source of milk**

The utmost attention should be given to the source of milk. The raw material must pass the inspection test and only then can production start. Milk from all sources used must be of good quality. Some farms have outdated technology and it is possible that milk

from these sources may contaminate other milk. Quality tests need to be conducted on raw materials and the dairy farms should inspect the quality in advance before delivering the products to the manufacturing plants. Once the problem has occurred, it can create serious problems for the whole batch. Although companies are using advanced testing and inspection instrumentation, in milk combined from a number of different sources, it is still not possible to trace the one source from which a problem has initiated. One possible solution is for baby dairy product manufacturers to have their own dairy farms. When the milk is acquired from this source, it becomes easier to track and manage the quality. In addition, any problems can be detected in a timely fashion. This is not the only solution, but as per the findings of this research, respondents have reported it as the best possible solution. Once milk reaches the production plants, it needs to be re-tested for quality before it enters production. Similar views are also presented by Munir et al., (2015).

As mentioned by the interviewees, only qualified milk should be used for production, while unqualified milk should be returned to the source (if it can be traced). In all cases it should be disposed of under supervision. Inspecting the milk source for quality is a vital step. In baby dairy product companies, this inspection is carried out using various types of equipment and this needs to be checked and maintained periodically in order to ensure there are no hold-ups in the quality assurance/control/inspection process. The nutritive indices (i.e. the amount of fats, cholesterol and carbohydrates) of milk quality should be improved only by using a superior breed of cow, not by adding substances that could be harmful to the milk. This was also found in the analysis of UK baby dairy product companies; with a superior breed of cow, the overall quality of the milk can be improved.

Moreover, it was found from the interviews with the managers of baby dairy companies that the processes by which milk powder is produced have stricter controls than that of instant milk because it is produced for infants. For example, milk powder has to comply with GB 2760-2014 and GB 14880-2010. The amount of the various substances contained therein is different for milk powder and liquid milk. The manager from

Company A explained that the amount and proportion of all ingredients must be determined strictly in accordance with the relevant standards. In particular, harmful substances must be tested for very carefully.

The analysis shows that the melamine incident in 2008 occurred because there were no proper quality inspections at dairy farms. Therefore, it is recommended that baby dairy product companies integrate their milk source, so that the whole process from cow to end product takes place in one long continuous line. Through the integration of the milk source, the major quality problems could be resolved. As the manager from Company D said, citing the example of the Yantang Dairy Co. Ltd in Guangzhou, in order to control and improve the quality of the milk source, this company invested in its own dairy farms and so took preventative measures against any quality problems right from the start. Companies that realised the importance of this aspect of baby dairy product quality were successful in avoiding the melamine issue.

Company D, therefore, has ensured the integration of milk source, and it is effectively managing the quality of its products through the control of the whole of the production process from start to finish. One point the company particularly likes to focus on is control of the cattle feed, so that harmful and forbidden substances can be prevented from polluting milk via this route. This company has not encountered the serious quality and safety problems that other companies have faced. One of the government officials said that this closed-effective system contributes to the products of these companies gaining consumer confidence and trust. It is a well-known fact that quality problems are often due to problems or carelessness at the raw material production sites and it has been found in this research that it was due to a problem occurring at a raw material production site that the melamine incident occurred. The quality of the raw material production sites is, therefore, absolutely critical to the quality of the final product and the introduction of quality measures needs to be done at the very beginning of the whole process of production. If at all possible, baby dairy product companies should have their own farms.

The food business needs to attach the utmost importance to the source of ingredients. This was evident in a case concerning McDonald's and KFC. The cooking standards for McDonald's outlets in China are the same as in other countries. The only difference is in the ingredients. In consideration of cost, ingredients are sourced in China instead of from other countries. A past incident relating to both McDonald's and KFC saw the 2 companies buying ingredients from one of the biggest and most well-known food suppliers. This food supplier reprocessed meats past their sell-by date and then sold them to McDonald's and KFC. The incident had a devastating impact on the two businesses (Hornby, 2014). This example serves to reinforce that the source of the raw materials is critical to the success of the business. On the basis of analysis, it is recommended that baby dairy product companies need to start searching for ways in which they can integrate their whole supply chain. Companies who have done so are managing the quality of their products very successfully. It is, without doubt, an expensive process. Companies could also try other means by which they could gain the commitment of supply chain actors, e.g. loyalty programmes and incentives.

### **7.10.3. Production process of milk**

There are many processes involved in the production of baby dairy products and the actual manufacturing is just one of them. There is a need to look at monitoring the whole supply chain. From the interviews, it was found that in the baby dairy product industry, every stage of production needs to be carefully monitored and managed, so as to ensure the quality of products meets the standard requirements and further incidents like the melamine one can be avoided in future. The analysis is that quality issues cannot be resolved by an improvement in one single place or of one isolated procedure; the whole supply chain needs to be addressed. When all parts of the supply chain in the baby dairy product industry work collaboratively on implementing QMS, the results will be positive and improvements will be made. The involvement of relevant stakeholders coupled with internal changes, such as the use of advanced technology, will ensure effective QMS.

China's major companies do use the world's most advanced equipment, but the

problems do not just occur solely during the production process (Gadiesh et al., 2007). As Government Official B stated, the baby dairy industry needs to pay attention to its foundation: the raw material. If this is not satisfactory, then the quality of the product certainly cannot be guaranteed. The process of quality management needs to start from the raw material, and in the case of the baby dairy product industry, the dairy farm should inspect the quality of the milk in advance before delivering it to the production plants.

It was found that high-tech equipment imported from abroad helped the case study companies to ensure better quality in their production processes. However, using imported equipment is not a long-term solution for the future of the baby dairy product industry in China; the country needs to be able to develop its own equipment and the government should take the appropriate measures to create an economic environment where this can happen (Rahimi et al., 2010). As referred by the interviewees, microbial inspection needs to be conducted on each batch of products, and advanced equipment is required for the identification of problems. Moreover, regular inspection and maintenance of machinery and instrumentation is also crucial in order to avoid quality problems. There is a need for automatic alarms on instrumentation in case something goes wrong and all supply chain actors should have these where their processes demand it. Often, small-scale processors have not had them installed, but it is something they need to consider. The researcher commended something the manager from Company A told him. In his company there is an inductor in all production links. If one of these breaks down, the staff can inspect and repair it quickly at the exact link. If the same problem is discovered in large quantities of the product, it shows that there may have been a machine fault, such as a breakdown in the inductor. However, the products will be inspected and only qualified products can be offered for sale. Therefore, if there has been a machine fault, the resulting products will not pass the inspection and will not be offered to the market.

As it is told by the interviewees, the milk type is different depending on whether it is summer or winter and this needs to be taken into account. Usually, milk is lighter in

summer and thicker in winter. However, thicker milk is better for milk powder production. In the summer cows eat fresh grass which contains a lot of water and oil. As a result, these ingredients are transferred to the milk and become long-chain polyunsaturated fatty acids which cause the milk in summer to be lighter in composition. In winter, cows eat highly nutritional dry hay which contains short-term fatty acids and cause the milk to have a thicker composition. To make milk thick, a thickening agent needs to be added to it. When considering the addition of artificial substances and their impact, companies need to take every precaution and look at each process carefully.

Every baby dairy product company should focus on the basic knowledge contained in its own internal standards in relation to the production process: the composition and characteristics of milk. The production process itself is not actually that difficult. The milk must be inspected when it is ready to be sold (Ismail and Nielsen, 2010). One of the interviewees suggested how to tell whether milk has gone bad or not where they use various instruments (e.g. milk checker) which tell them whether the milk quality is acceptable or not. It is being emphasised that the milk quality needs to be managed from beginning to end. There is a need for after-sales service as well with regard to quality. If there are any problems with the quality of the products, the customers need to know how they can contact the company and professionals should be on hand to liaise with them. Such problems could be solved effectively if staff are willing to pay proper attention to customer complaints. Hence, staff should be given some incentive for adopting a positive attitude.

#### **7.10.4. Involvement of stakeholders in QMS**

This section reviews the importance of the various stakeholders in QMS and specifies the role that all parties need to play in making improvements to QMS in China's baby dairy product industry. As told by Mitra (2016), every important stakeholder needs to take joint responsibility, and if the industry does not address the problems of the entire system but just focuses on a single procedure, then this is not enough. Of course, a single procedure will also affect the entire system, but addressing it on its own will not solve the problem. To ensure that the products have as few quality problems as possible,

the baby dairy product industry must control the whole chain of production.

It is said by the interviewees that in order to improve QMS, there is a need for developmental changes throughout the entire system. Every relevant supply chain actor and stakeholder in the system needs to perform its part in an effective manner. For example, soil, cattle and feeds belong to the agricultural sector and there needs to be a proper system for coordination within this sector to resolve the quality issues. Such coordination could take place through governmental efforts. Quoting the example of one stakeholder, Government Official B mentioned that cows need to drink water to survive. In the production of baby dairy products, the milk needs to be watered down. Thus, if the relevant Water Conservancy Department had not managed and supervised the quality of the water, it may have caused some quality problems for baby dairy products.

The problem of quality could be solved with the help of information sharing, public opinion and sharing of feedback. The baby dairy industry needs a traceability system in order to find the root causes of problems. If the root cause is not identified, then quality cannot be ensured. Through proper information sharing among relevant stakeholders, quality issues and problems could be managed in an effective manner (Cooper, 2016). For example, as mentioned by one interviewee, if a problem with the water is detected, it must be resolved by the relevant Water Conservancy Department. If, for whatever reason, the department is unable to resolve the problem, then it must share information with the agriculture sector in the hope that a joint approach will bring about a resolution. Likewise, the information related to the problem must be shared with the production departments. Information sharing will help the baby dairy products industry to investigate, control and correct the problem promptly.

There is a need to establish a traceability system for the baby dairy product industry because it is harder for the agro-industrial sector to share data. Data sharing is one of the most important requirements of this traceability because it will help to investigate the problem on a real-time basis. The weak information system is another challenge

with regard to effective implementation of QMS in China's baby dairy product industry. The weakness of the information system here is shown by a lack of information from all of the supply chain actors (Gale and Hu, 2009). For example, findings from interviews and focus group discussion tell the fact that large manufacturers are unable to identify the source of contaminated milk shows that the information system is weak. In developing an effective information-sharing system there is a need for high-tech instrumentation and equipment and these are quite expensive. However, for improving QMS, such a detection and traceability system is crucial. In discussing this further, it was said by Government Official B (and the researcher agreed) that a high-tech information-sharing system requires people who know how to use it. This highlights the importance of relevant skills. Likewise, training staff in how to use such a system would be another factor for the successful implementation of improved QMS in China's baby dairy product industry. Most importantly, training would be needed for farmers who would probably have no knowledge of such a system.

It is also known that farmers do not have the economic capability to purchase such systems. Therefore, the role of the government becomes more prominent here. There is a need for planning, and investment and training in information and data sharing systems not just for actually tracing the root causes of quality issues, but detecting them in time before real problems arise. The government would then need to establish monitoring of such systems. As Government Official C said, managing a country is like playing a game. One wrong step can lead to serious consequences. The analysis is that the whole system needs to be viewed macroscopically: the breakdown of a small link can have a critical impact on the entire production line. Every step should be managed and supervised strictly. The aim of this research is to provide a framework which would help improve QMS in the baby dairy product industry. Therefore, every aspect related to the production line must be part of this framework.

It is important to ensure that responsibilities of all stakeholders are clearly articulated. With clear responsibilities, accountability can be ensured which leads towards effective implementation of QMS. The focus must be on raw materials as well because the true

beginning of production (at the source of the raw materials) in the baby dairy product industry is often not properly regulated. However, there is a need for a system which would not just keep a check on the quality of the raw materials, but on the quality of the finished products too (Sallis, 2014). As found from focus group discussion, the relevant legislation must be applied to all stakeholders, including the distributors and other intermediary parties. This is challenge, and it seems unrealistic too. However, in future, we expect that laws, regulations and standards will specify the role of all supply chain actors. Accountability and responsibility should be shared equally by all stakeholders.

There should be standards that would specify by what method farmers should give feed to cows, what the quality level of the feed should be, how the cows should be milked and how the milk should be transferred from one destination to the other, etc. As one of the focus group members said, the example of melamine incident was a case in point. When it was found that melamine was in the milk and that it had been added by farmers, many of the baby dairy product companies were simply not aware of this fact. Therefore, if standards could specify the role of farmers as well, the baby dairy product companies would not be the only stakeholders responsible for quality management. This is clear evidence that laws, regulations and standards should not only be applied to one party. They must be implemented by all stakeholders, especially the supply chain actors. With equal responsibility and accountability for all stakeholders, there will be less chance of quality problems occurring.

The media are another important stakeholder in that they help in creating awareness among consumers. Many customers develop their perception of various issues from the news and information available through the media. Therefore, it must be ensured that the media share the correct information with the general public (Mitra, 2016). Government Official A mentioned that the media are a double-edged sword because when they share false information with the general public, it can lead to serious consequences. If there are quality issues with whatever service or products, then these must be communicated to consumers. With the involvement of consumers, the system

will take effective measures to solve the quality issues more efficiently. However, monitoring of the media are critical, and they must adhere to policies and rules. Spreading fabricated news, such as the McLibel scandal involving the quality of McDonald's products, is dangerous. Furthermore, companies must realise that the facts related to the products on the market should not be fabricated either; in particular, the quality aspects should not be exaggerated and the media should operate in an ethical fashion. Everyone including the media and society in general, should take an objective view with regard to resolving quality issues. If quality issues with a particular product are found, then it is right that the media should highlight these. Customers should also report quality issues to relevant authorities as it has been proved that pressure from customers is a driver for improvement in the internal QMS of companies. The Chinese baby dairy product industry cannot be improved with the efforts of a single party. Every individual needs to play their part in improving QMS in this sector.

As the interviews with government officials showed, a new development strategy has been proposed for the baby dairy product industry in China which is focusing more on the top layer and advocates a top-down approach. However, there is a need for a bottom-up strategy from the government. Therefore, the recommendation is to foster the bottom-up strategy. On the part of the government, there is another effective step that could be taken: responsibility for supervision could be widened. If responsibility for supervision could be shared between all stakeholders, then there would be less chance of issues relating to poor quality arising. For example, if the quality of the raw materials (the milk) were to come under the responsibility of the Ministry of Industry and Information Technology (MIIT), then this responsibility should be shared with the MOA. The analysis shows that in all such steps, the government should guide baby dairy product companies in the process of implementing wider supervision and in developing responsibility sharing, with itself.

#### **7.10.5. Improvement in standards for QMS**

This section analyses what changes could be brought about in the standards for the baby dairy product industry. It considers the recommendations made by the interviewees

which will help in developing an integrated framework for effective implementation of QMS in the baby dairy product industry. The production of baby dairy products must be subject to the national standard. The international standard, which is based on the national standard, should also be executed. From the analysis, it has been found that the current laws, regulations and standards were not strict enough to stop events such as the melamine incident. Hence, it is vital that the standards be improved, but this must be done in relation to the local conditions in China.

From the analysis, it was found that companies have their own internal quality standards apart from national and international standards. Many Chinese companies do not have stricter internal quality management standards. If companies are aiming to reach the international market, there is a need to meet international standards. If a company has not yet been able to comply with international standards, but it wants to provide products for some foreign supermarkets, staff from these supermarkets will conduct an onsite examination of the company's products and evaluate them. With international approval, there would not be any need for onsite examinations from foreign supermarkets, and it is, therefore, recommended that well-established companies seek to meet international standards.

As mentioned by the interviewees, there is, however, a need to maintain the balance as per the local situation in China. If a baby dairy product company starts making a product which is of good quality but has a high price that cannot be afforded by consumers, then customers will not buy them. On the other hand, if the quality is poor and could be harmful to health, consumers would report this and fight against it because they now have a stronger awareness of food safety and how this affects their health. Although this appears to be very contradictory, a balance should be maintained between price and quality.

Another option is to adapt the content of international standards for a company's internal standards. If national standards are not considered to be strict enough, as Company A has shown, then baby dairy product companies have developed their own

internal standards, taking guidance from international standards, as Company A has done. However, few international standards could be applied in their entirety, because of local conditions in China, and selective interpretation is necessary. China is a developing country, so it cannot adopt international standards from developed countries. The expectation is that laws, regulations and standards are not copied verbatim from somewhere, but that they are applicable to China's needs. As mentioned by a focus group member, international standards need customisation. For example, international standards specify the amount of certain ingredients that are not used in the production of milk powder in China, so this section would be entirely useless. Only those standards should be used that have direct relevance to the Chinese baby dairy product industry.

The interview findings tell that the existing standards applied in China approach the international ones. For example, in setting the QMS standards in China, guidance was taken from the ISO 9001 system. Many national standards for the production process followed foreign criteria. The international standard system is comparatively more complete and standardised. However, these standards need to be adjusted according to the local situation in China. There is a huge difference in national conditions in China as compared to other countries. For example, the breeds of cow that many of China's baby dairy product companies use are introduced from abroad. These are bred and developed for a long time in order to make products suitable for Chinese consumers. In addition, 'additives' are found in a great many dairy products. There are 2,000 additives applied internationally, but only some 300 in China, hence, this aspect of the standard has been adapted for China. For example, calcium peroxide is not on the list of allowable additives in China as per the National Food Safety Standard for Use of Food Additives GB 2760-2011. It is important to control the dosage of additives in the baby dairy product industry very strictly. GB/T 22388-2008 and GB/T 22400-2008 have declared melamine and sodium thiocyanate to be non-edible substances which it is illegal to add to baby dairy products. Before 2008, this was not legally prohibited. Therefore, the application of additives must follow the standard rigorously.

In addition, one interviewee presented the novel view that ethnicities vary, so genetic

make-up and physique is different, leading to different food compositions appropriate for different races. Developmental needs of Chinese babies are different and the Chinese prefer a different range and level of additives and other substances because of this. Therefore, international standards have less viability in China. However, the research does not entirely agree with this viewpoint as it is quite difficult to see how the genetic make-up and physique of Chinese babies would require a different dosage of milk.

It is found that although China's national standards need to be improved, and they need to be more detailed there is a need to adapt international standards to suit the local situation in China and not just apply them wholesale. The standards must provide details about the relevant raw materials and must also specify the name, type and amount of additives that can be used in baby dairy products. When details about the various substances are known, the quality assurance/control/inspection departments and the relevant authorities could better identify the problem areas. Every substance criterion varies for different industries. For example, as mentioned by the interviewees, the proportion of melamine in pet food and in fertiliser is different. Therefore, there is a need for standards appropriate for the various industries. These standards should be the highest possible in order to improve the quality of baby dairy products.

Stakeholders have certain expectations with regard to the relevant laws, regulations and standards for QMS. These must be taken into consideration while designing and implementing QMS in the Chinese baby dairy product industry. Such laws, regulations and standards should set the criteria even before products arrive at the manufacturing plants, and after they leave it. For example, standards must specify the optimum temperature at which milk should be transported. It would be a very good idea if such requirements were specified for retail units as well.

Managers need detailed guidelines on how to implement the standards effectively in order to ensure quality. The standards should become a 'roadmap' for employees and managers, and should guide them at every step of the quality process. There must be

certainty that if standards are followed, there will be no quality problems.

#### **7.10.6. Quality assurance/control/inspection department**

The quality assurance/control/inspection department of the government is a crucial part of the entire system. This department is mainly responsible for supervision, testing, recording and processing (when a quality problem occurs) and tracking, and there is a need for it to have rigorous procedures (Muruganantham et al., 2016). The interviewees mentioned that these functions are performed on behalf of both national and local government. The relevant authority formulates the laws, regulations and standards and then the quality assurance/control/inspection department's staff test whether the indicators meet the requirements, noting down various data, such as the batch number. It is found that the challenge is that, although the quality assurance/control/inspection department can supervise and monitor the manufacturing process in the baby dairy product industry, it cannot look at other aspects related to production, such as agriculture, water and the environment. Therefore, there is a need to extend the function of this department.

#### **7.10.7. Employees and managers**

Employees need to be trained in certain skills in order to be able to implement quality management standards effectively and this is a very important aspect of QMS as a whole. Every employee in the company should be trained in the implementation of the relevant standards. When employees are not adequately trained, it can become a problem for companies to ensure that quality standards are met (Prajogo, 2011).

As found by focus group discussion, apart from skills, competencies are also important and when relevant personnel do not possess the required competencies, it can create problems too. Competencies refer to the ability of the individuals for doing certain jobs in the best possible manner using the defined behaviour which enables to do the work in a good manner. It is about being well qualified to perform a job and it is about having the skills, knowledge and abilities to perform the job in an adequate manner. If companies believe their employees do not have the competencies (skills, knowledge

and ability) to implement quality standards effectively, then they should employ the services of consultants to train them. Hence, it can be concluded that employees must be trained properly, because where there is a lack of clarity in the implementation process it will be more difficult to enact. The government should also arrange skills development programmes, which should not only be undertaken by companies, but also by other stakeholders, such as farmers and distributors.

When employees are sufficiently trained in the skills they need for implementing QMS, then there will be positive results. For improving implementation of QMS, the focus group members have provided certain recommendations. These should be considered when designing and implementing QMS with their integral laws, regulations and standards. First, there needs to be a high level of commitment from top management for implementation and top management must involve other employees in the process. It needs to be said that it is top management that provides access to the resources which are necessary for the implementation of QMS. Therefore, appropriate steps must be taken in order to ensure its commitment.

### **7.11. Summary**

This chapter has examined the QMS implementation in the Chinese baby dairy product industry.

Firstly, it has reviewed the China's baby dairy product industry's present situation where overview of the whole industry is provided. This section has examined the laws, regulations and standards as well as the role of government. It is also analysed that how melamine incident influenced the quality management in this industry.

Secondly, as four case study companies are selected from Chinese baby dairy product industry, the brief introduction of case studies is provided to know how quality is managed in these companies.

Thirdly, it has examined the challenges of implementing QMS in China where it is found that personnel related aspects, internal management, source of milk, production process, distributors, warehouse and transport vehicles, dairy farms management,

stakeholders, information sharing technology and cost are most critical challenges for this industry.

Fourthly, it has critically evaluated the standards and legislations which are related to quality management. After doing the analysis of challenges, current situation of baby dairy product industry and weaknesses in standards and legislation, few significant factors are identified.

Finally, this chapter explored the organic linkage among the three stages: pre-production, production and post-production stage. If the pre-production stage, which provides quality raw milk to production stage, has any problems, the quality management at production stage might become more challenging and costly. Likewise, if production stage does not produce quality products, the efforts at post-production stage cannot bring a change in quality. It is found from the interview that breeding, feeding and development of cows, source of milk production process of milk, stakeholders and employees involvement, improvement in standards and role of quality assurance/control/inspection department at the pre-production stage are significant aspects for improving the QMS implementation in Chinese baby dairy product industry.

## **Chapter 8: Findings and Analysis with Regard to the UK Baby**

### **Dairy Product Industry**

The purpose of this chapter is to analyse how QMS are managed in the UK baby dairy product industry and is based on the analysis of QMS in two UK companies, Company E and Company F. It starts with the overview of UK baby dairy product market where secondary data is used for analysis. The UK baby dairy product industry is selected for comparison because UK baby dairy product industry is able to manage the quality of its dairy products better than many other countries (Kersting et al., 2016). Therefore, to seek out best practices from this industry, UK's dairy industry is selected for analysis. The chapter aims to analyse the UK baby dairy product industry which have helped in developing the integrated framework for implementation of QMS. The strong and weak points of the two companies are also analysed. The companies are introduced briefly before the analysis of how their products are managed for quality begins. For each company, three stages, i.e. pre-production, production and post-production, are examined. The companies' adherence to quality standards and legislation is also considered, as are their information-sharing mechanisms and management styles/techniques.

#### **8.1. UK baby dairy product market situation**

The UK is a lucrative market for baby dairy products. Its population increased with 0.63% reaching total of 64 million by 2016. Due to later marriages, the birth rate has been declining over the past few years, from a rate of 13 per cent in the year 2000 to 11 per cent in 2010 (Euromonitor, 2013).

This trend has never become the cause of the declining baby dairy product market. In fact, the baby dairy product market in the UK has been growing at a rate of about 11 per cent in value terms. It was expected to grow further by a steady 10–11 per cent by the year 2015. The baby food sector has grown as a whole and was expected to be worth about 0.96 billion sterling/GBP by 2015. This is an increase from the year 2012 and the market was expected to grow at a rate of 75 per cent until 2015 (Euromonitor, 2013).

The increased growth levels have been marked by innovative new products (e.g. instant milk for babies) being introduced to the market by UK companies (Hawkins, 2011). This has provided very healthy competition in the industry, resulting in an increase in the number of food items overall and in their healthiness and wholesomeness, and it has caused the big players to revamp their products. These changes in the market have not only been caused by a different lifestyle, but are also due to the increased income that comes from people marrying later (Warren, 2012).

Table 8.1: Sales of Baby Food by Category in UK: Value 2011-2016.

GBP million	2011	2012	2013	2014	2015	2016
Dried Baby Food	34.6	36.0	37.2	38.6	35.6	33.8
Prepared Baby Food	190.8	194.1	201.3	193.5	194.3	197.1
Other Baby Food	78.3	84.7	86.0	86.5	92.8	100.0
Milk Formula	358.4	394.2	429.0	437.8	507.1	571.9
- Standard Milk Formula	195.2	216.2	235.0	243.5	271.3	298.8
- Follow-on Milk Formula	88.1	99.8	105.7	97.8	120.0	136.3
- Growing-up Milk Formula	54.3	57.0	66.9	74.7	91.5	109.3
- Special Baby Milk Formula	20.8	21.2	21.4	21.8	24.3	27.5
Baby Food	662.1	708.9	753.5	756.4	829.8	902.8

Source: Euromonitor International from official statistics, trade associations, trade press, company research, store checks, trade interviews, trade sources

(Source: Euromonitor, 2016.)

Table 8.1 shows the trend for baby food market in the UK from 2011 to 2016. It can be seen that dairy sales for baby food including milk formula were continuously increasing in the years between 2011 and 2016, which indicated the demand for baby food is increasing.

Parents in the UK value their children's health and care about their nutrition, these two factors being very important things in child care. (Reed, 2013). This includes choosing the right baby food as awareness with regard to food that is good for stimulating cognitive growth has made parents more cautious (Sarma, 2013). Baby dairy product companies are cashing in on this attitude and formulating the best food possible for health and wellbeing. There is a trend towards greater usage of Omega 3 (fatty acids) due to the increased awareness of its contribution to cognitive development, and parents are more inclined to buy what they consider to be better food because it is a premium

brand (Reed, 2013).

Table 8.2 shows the size forecast for the UK baby food market. It shows the Compound Annual Growth Rate (CAGR) for all types of baby foods. The forecast is for the time period between 2016 and 2021, and shows that the baby food market is expected to grow further in the future (Euromonitor, 2016).

Table 8.2: Sales of Baby Food by Category: % Value Growth (2016-2021).

% constant value growth	2016/2017	2016-21 CAGR	2016/21 TOTAL
Dried Baby Food	-3.2	-1.5	-7.4
Prepared Baby Food	0.6	1.2	5.9
Other Baby Food	5.3	3.9	21.1
Milk Formula	8.2	4.3	23.4
- Standard Milk Formula	6.7	3.6	19.4
- Follow-on Milk Formula	8.2	4.0	21.9
- Growing-up Milk Formula	11.9	5.7	31.9
- Special Baby Milk Formula	10.6	7.1	41.2
Baby Food	5.8	3.4	18.2

Source: Euromonitor International from trade associations, trade press, company research, trade interviews, trade sources

(Source: Euromonitor, 2016.)

## 8.2. Company E

Company E is a British pharmaceutical company that has expertise in manufacturing high-quality health care products for both children and adults. It makes products for brands such as Nutricia, GSK, Heinz, Meiji, Boots, United Pharmaceuticals, Hero and Danone.

The company also sells its products in China with the help of Chinese distributors, such as Orient International. It is the only one of the two companies studied that exports goods to the US. It is also the only UK company that sells baby dairy products in China. The factory was established in Cumbria in 1962 under the name of Glaxo and after several years it acquired Farley's brand, which was eventually purchased by Boots in 1986. In 1994, Heinz bought the health products of Farley brand. In 2015, the company purchased this factory from Heinz.

As the interviewee told the Company E produces milk products and cereals, which are packed into tins and sachets, and exports them to other countries. For its dairy products,

it uses whole cow's milk, goat's milk and organic cows' milk. It also exports raw milk to other countries. The company's favourable political relationships with other countries help it to operate in the international market effectively. It is planning to launch another brand of goat's formula milk powder and it also has plans to introduce another organic food brand.

This company has been inspired by dairy farming practices in the UK that prevailed several decades ago. In the 1950s, companies in the UK promoted the use of whole milk for infants, extolling its benefits. Later, the baby dairy product market in the UK was captured by Danone and Nestle, French and Swiss companies respectively. These two companies now have a monopoly on the UK market and there is less competition because both companies follow each other with regard to their pricing structure. (Kersting et al., 2016). Company E has not moved from traditional practices for the manufacture of baby dairy products, and is managing quality in an effective manner.

### **8.3. QMS in Company E**

#### **8.3.1. Quality standards and legislations**

As per interview findings, Company E has to ensure that its products meet customer demands and that all the required standards are implemented effectively. It exports to other countries and has accreditations as follows: ISO 9001, BRC Grade A, ISO 14001, certified kosher, certified halal, China HACCP, Soil Association certification and CNCA (Certification and Accreditation Administration of the People's Republic of China) registration.

As mentioned by the interviewee, a important point to note about this company is that all of its products are subject to strict manufacturing guidelines (e.g. a clean and hygienic manufacturing environment, clearly defined manufacturing guidelines, trained operators who follow documented procedures). The finished goods leave the factory only if they are approved under the specifications of chemical, microbiological and organoleptic tests. The purpose of chemical tests is to ensure that dairy products are free from chemicals, such as detergents and antibiotics. Microbiological tests include

total colony count, E. coli count and methylene blue dye reduction tests. Examples of organoleptic tests are: testing for differences between samples; sensitivity testing in which stimulus-response dynamics are assessed; preference testing in which 'like' or 'dislike' feedback with regard to samples is provided; and descriptive testing which is about assessing the characteristics of dairy products. The milking process of this company meets the requirements of Codex Alimentarius guidelines which refer to international food standards, and they specify numerical criteria for food additives, pesticides and veterinary drugs. All of the company's suppliers are regularly audited and its team of laboratory technicians, quality assurance experts and microbiologists ensure quality at every stage of production. The analysis finds that the company's internal standards for quality are stricter than the international standards. As told by the interviewee, before any raw material/ingredient is used, it is checked by the quality department. Cameras are installed for monitoring the canning process and X-rays of every packaging line are taken. The company has also implemented HACCP systems.

The UK has strict laws and regulations (e.g. Animal Feed (England) Regulations 2010, Regulation (EC) No 1829/2003, Genetically Modified Food and Feed, Common Agricultural Policy) for the baby dairy product industry and some manufacturers in this sector have had to close down because they have been unable to meet these (Barkema et al., 2015). The interviewee mentioned that with the introduction of strict standards, the government is ensuring that only those companies that have the capacity to manage quality can remain in the market. As the participant stated, the UK government expects there to be 10–15 big companies in this field, and it does not expect many smaller companies to be able to manufacture to the exacting standards.

The analysis finds that the UK government plays an important role in managing the overall quality of the baby dairy product industry and inspections are regularly conducted by external inspectors and auditors. Company E undergoes many such inspections. For example, the Department for Environment, Food and Rural Affairs (DEFRA) is one of the inspecting bodies that visits the factory every year to check the quality of its operations and products. The best quality level is 'A', but there are 'B'

and 'C' (lower levels) too, which also have strict inspection criteria. Although the company strives to reach level A, the criteria become tougher every year and, so far, it has been unable to do so. Inspections are arranged for both the production plants and the associated dairy farms. The results of the farm inspections have to be given to the company so that it can check the level of minerals, such as cotinine and iodine, in the milk. The quality of the milk is inspected more than 30 times while it is being processed and everything is properly documented. External auditors and inspectors are very interested in the backup plans. For example, they might ask for 'Plan B' and ask what will be done if something goes wrong. They might also ask such questions as 'What if the quality of raw material does not match the internal standards, how will you deal with this issue?' or 'How do you deal with poor quality milk?', 'Do you return the milk to farmers or send it for some other process?' 'What if further processing does not solve the milk quality problems?' or 'What if farmers do not comply with the Animal Feed (England) Regulations 2010?'

Interviewee mentioned that at this company, there are computer-controlled procedures for everything. For example, all raw materials have a barcode which is scanned. When employees use raw materials they have a production sheet to follow and every ingredient is scanned into the batch being made. Every ingredient is fully traceable. For example, for a formula milk mixture, the system can easily trace which powder has been used, its composition, which batch it came from and many other details.

### **8.3.2. Supply chain of Company E**

From the interview, it was found that all supply chain actors are involved in the QMS. Therefore, it can be deduced that QMS in this company are applied throughout, from the source to the packaging of the final product.

#### **8.3.2.1. Pre-production stage**

The analysis shows that the supply chain of this company starts with the dairy farmers. Company E does not outsource the milk, and has its own farms in Cumbria, one of the largest regions for dairy production in England. According to the participant, it is

economic to outsource the milk as managing own dairy farms is quite expensive but while outsourcing, it could not be ignored that there are many dairy farmers who actually alter the composition of the milk by adding water to it (in the proportion 33 per cent milk, 67 per cent water) before delivering it to the companies. This is also confirmed by Mowlem (2005). Therefore, to avoid any adulteration of the milk this company has its own farms that it can monitor closely. However, it could be said that a disadvantage here is that owning farms is more expensive as compared to outsourcing the milk supply to small farmers.

This company uses the traditional manual mechanism for feeding cows. The interview confirmed that grass is very good for high fat content and butter fat in the milk. Furthermore, the volume of milk is greater when cows eat grass and, of course, it is the cheapest feed for them. Different views exist with regard to cows eating grass. However, as shown from the personal analysis of this company's practices, it is quite effective and successful. The cows are not only healthy, but they are eating the most cost-effective feed. However, it is important to note that there is a need for an animal management plan if cows are to be allowed to graze outside.

Information gained from the interview indicated that, in the UK, when the weather is pleasant, cows can be let out into the fields to graze between March and October. Weather conditions during the winter are not suitable for cows to graze outside anyway. However, when the winter season starts, the feeding costs increase significantly. In addition, the cost of animal management also increases. Such increased costs ultimately filter down to the baby dairy product companies. When the cows are let out to graze it is important to keep a close eye on the weather. If there is a lot of rain and the grass becomes soaked, the animals should not be left outside because this can be a source of problems as it leads towards diseases and contamination problems. One aspect of quality management here is that it is important to maintain a balance between letting the cows go out to grass and keeping them indoors and feeding them. Company E controls this aspect as per the weather conditions and the cows at their farms are managed in an effective manner.

The respondent did say that during unfavourable weather, cows are quite happy to stay inside and be fed. They are still able to produce good-quality milk because they are provided with the required level of nutrients through being given high protein food, such as barley. However, one disadvantage of keeping cows inside was not discussed by the participant. When they are kept inside they get less opportunity to act naturally; it might, therefore, become difficult to manage them if their behaviour deteriorates (Bourlakis et al., 2014). The analysis tells that good management and good barn design are, therefore, essential for welfare. Poor ventilation, crowded conditions and high humidity could increase the risk of infection.

According to Chen et al., (2015), another disadvantage of keeping cows inside is that when they are indoors for a longer period, there is a higher risk of them getting mastitis. There is a greater risk of infection from contaminated bedding and dirty surroundings and of transference of infection from one cow to another when they are kept in closer proximity indoors. As mentioned by the interviewee, the most common cause of mastitis is bacterial transmission from the milking equipment. This farm uses the somatic cell count to detect mastitis. When there is a low somatic cell count, it indicates a high level of safety and quality of the milk. Pathogenic bacteria, a cause of mastitis in cows, cause an increase in the somatic cell count. There should be fewer than 100,000 cells/ml in uninfected cows and more than 250,000 cells/ml show significant pathogen levels. The target level of protein in milk is 4.1 per cent and it is also checked for the level of fat. Milk from mastitic cows may have an off flavour and the fat and protein may deteriorate more quickly than in milk from healthy cows. Interviewee further told that farmers are paid according to the correct levels of protein and fat in the milk and, therefore, it is to their benefit to ensure these levels are optimum at all times.

According to Ventura et al., (2015), it is now possible, with the help of advanced detection techniques, such as Genetic Marker Technology, to analyse DNA and select those cows that have a low risk of becoming infected with mastitis and the dairy farm managers on the farms owned by Company E do just this. However, mastitis is still a problem among the majority of dairy cows in the UK. In a herd of 100 cows, there are

likely to be around 70 cases of mastitis in a year.

The respondent also explained that when cows are happy, they give better quality milk, but when they are stressed, the quality of their milk is not satisfactory. Catlette and Hadden (2012) also mention that contented cows give better milk. It can be deduced, therefore, that animal management practices are very important and there is a need for an animal management plan to help the dairy farm managers control every aspect of milk production. It is important that the cows are not stressed in any way. Their barns must be neat and clean with the required level of ventilation so that the risk of infection is minimised. If they are not out at grass, they should exercise sufficiently in an area specially for this, but not too much because this can make them tired. It should be noted that the feed also influences the quality and quantity of milk that is produced. As the dairy farms owned by Company E have done, it would be beneficial for others to shift their focus with regard to feed because it has a significant influence on the quality of milk produced by the cows. There are some cows that produce milk with a higher fat content, more protein or more calcium, which is due to the particular feed they have been given. Those cows that are producing the most milk are given more feed. Cows also need a significant quantity of water for producing milk and they should have easy access to a clean, plentiful supply. In short, cows need an environment that ensures they can produce the best quality milk in the largest quantities possible. Proper management of the environment is taken very seriously at the dairy farms owned by Company E.

As mentioned by the interviewees, the herds of cows as a whole are also managed very carefully. A dairy cow's milk producing period is around 4 years and the farms have to ensure that there are always enough cows of the right age to produce the amount of milk required.

Furthermore, it was found from interview results that for feeding and breeding cows, technology is now playing a significant role. Robotic feeding, based on every animal having an individual tag which is read when they enter the feeding area, is a new practice. It could be said that technology has improved the process of managing cows, including how they are fed, and that it has subsequently improved the efficiency and

effectiveness of dairy farm management practices in general which, in turn, contribute to QMS.

If there is any contamination in the soil on a dairy farm (such as lead and pesticides), it will get into the milk and farmers should take the necessary steps (e.g. purification, filtration, sterilisation) to avoid this happening. Likewise, there could be too high a concentration of certain minerals in the milk, e.g. iodine and iron. The manufacturing company decides what vitamins and minerals are required and what their levels should be. As the participant explained, in order to ensure the right balance of vitamins and minerals in the final product, it is important to know what the average quantities of vitamins and minerals already in the milk are, so that extra can be added through artificial means if necessary.

The analysis on the above quality management practices carried out by Company E on its dairy farms show that the milk source is critically important. The milk is inspected before it leaves the farms and again before it enters the production process. Company E found that it was important to analyse how all its suppliers were managing the quality of their products and one of the biggest challenges for this company is that it has to check the quality of every single ingredient, not just the milk. All other ingredients are also sourced from quality suppliers. As a result, this has led to fewer quality problems when compared with China.

#### **8.3.2.2. Production stage**

From the dairy farms, the milk is transported to the production plant where it is pasteurised and sterilised. It is then inspected again for quality and the company checks the levels of toxins (e.g. lead, dioxins) and yeast in the milk. The regulations are quite strict, and the government also checks the level of toxins through inspections and microbiological testing in laboratories. There are four categories of microbiological testing that are performed by the government, i.e. a direct enumeration of the total bacterial count; assessment of the microbial metabolic activities; detection of specific contaminants; and an estimation of biochemical changes along with an analysis of the

metabolites that are formed in baby dairy products due to microbial growth caused by toxin production, acidity and gas production (Faysse and Simon, 2015).

The interviewee told that once the liquid form of milk is ready, it is sent for blending and is combined with special ingredients, such as fish oil, omega-3 and omega-6. Quality is checked throughout the production process. Following this 'wet blending' process, the product is put on a roller dryer which helps in converting the liquid milk into milk powder. The participant explained that the company has a special machine called the FILTERMAT dryer that carries out the drying process.

At the manufacturing stage, it is important to ensure that the baby dairy products contain the specific amounts of vitamins and minerals decided on by the R&D department in the product development phase. As has already been mentioned, to ensure the final product has the right amount of vitamins and minerals it is important to know what the amounts of vitamins and minerals in the raw milk are. If there are any discrepancies, these need to be added by artificial methods (Lim et al., 2014).

The participant highlighted another aspect related to the quality of the milk. 15 years ago, whole milk was more expensive than skimmed milk. Most of the baby dairy product companies in the UK decided to use less cream because they could sell the cream for butter production, particularly to Russia, where there was a big export market. As a result of this, the companies only used skimmed milk in baby dairy product manufacture.

However, this reduced the amount of energy obtained from formula milk powder. Therefore, baby dairy product companies in the UK began to use vegetable and palm oils in their products to increase the inherent amount of energy. Company E did not adopt this practice, realising the importance of cream and fat in the milk, and it adheres to the traditional method of using whole milk for producing formula milk powder. Although vegetable oils are good in terms of nutrients, they are different from animal fats, with varying levels of saturated/polyunsaturated fats, depending on the type of oil. Too much oil can cause digestive problems because polyunsaturated fats are highly

unstable and they can be oxidised in the body easily, resulting in inflammation, and mutation in cells, both of which can be harmful. As the participant said, the formula milk powder produced by this company is popular with a lot of customers, who feel their babies obtain more energy from it and sleep better for drinking it. This is a big selling point for this company because its competitors have switched to more modern methods of producing formula milk in order to cut costs. Nowadays, people are realising that, in general, cream and natural ingredients in dairy products are healthy. Therefore, at a time when consumer awareness is high, companies like Company E can differentiate themselves in the market and it has found that its customers seek out its products and are very satisfied with them. The participant mentioned that a recent survey of customers had provided evidence that they were very satisfied.

#### **8.3.2.3. Post-production stage**

Once the production process is completed, the formula milk is sent for packaging in tins and sachets. Compared to the UK, China has stricter standards for packaging of baby dairy products due to the improvement in its quality regulations and, previously, the packaging used by Company E was not acceptable. It has, therefore, improved its packaging process. According to food labelling and packaging regulations, only a little oxygen is allowed to be inside the container in order to ensure the longest shelf life possible (Charlebois et al., 2014). The interviewee mentioned that Nitrogen gas is used in food packaging to prolong shelf life and preserve the integrity of the contents. The quality of paper used by Company E proved to be problematic, so it has moved to plastic packaging. Every package has a security tag, through which the history of the product and the details of the manufacturer can be traced and this traceability is very important. Before the formula milk powder is actually put into the containers, it is tested again for quality to ensure that it contains the right amount of vitamins and minerals. The insides of the containers themselves are tested with ultraviolet light to make sure they are clean. Microbial growth can cause problems, such as a shorter shelf life and increased risk of infection for consumers. The use of the ultraviolet disinfection method has gained acceptance in the baby dairy product industry in the UK because it kills all organisms

that could spoil food: viruses, yeasts and bacteria. Further analysis finds that it is a low-maintenance solution that is also environmentally friendly and does away with the need for chemical disinfection of packaging (Ventura et al., 2015).

The interviewee mentioned that once the product is packaged, a visual check is done on every container before they are closed to make sure that there are no foreign bodies (e.g. scrap metal or plastic) inside. Once they are closed, an X-ray scan is done on every container to check for any foreign bodies inside and the weight of container. Finally, the containers are packed six to a carton. From the analysis about these practices, it can be deduced that packaging is very important for ensuring the quality of end products and that there are various measures that need to be taken in this post-production stage. If there are any problems at this stage, it is possible that the quality of the final product will be affected.

#### **8.4. Company F**

Company F is another UK dairy product company with headquarters in London. It was established to produce quality nutritional products using cow's milk. Now, it primarily produces scientifically advanced infant formula milk, although its product lines also include nutrition for mothers and weaning cereals.

The interviewee mentioned that Company F uses farms in the Netherlands and Belgium as its milk source because these have adopted the kind of advanced animal management practices the company is looking for. The company has a number of factories, the largest of which is in the Netherlands, and it adheres to European regulations for ensuring quality. Furthermore, this company has adopted the latest validated research for improving the quality of its products. Company F ensures the highest quality of its products by employing rigorous quality controls throughout the production and distribution process and its production process utilises strict microbiological controls with a reliance on cutting-edge technology. Its R&D programme is specifically concerned with quality rather than just functional nutrition. Its biggest production facility is in the Netherlands where it employs highly skilled professionals working

with advanced technologies. Company F maintains accurate records for traceability such that the information about an individual container could be accessed.

## **8.5. QMS in Company F**

### **8.5.1. Quality standards and legislations**

Company F is an ISO 9001-certified company adhering to best practice in its production process and it also has BRC certification. The certifications are vitally important for ensuring the highest quality of the company's products, which are tested throughout the production process. According to the participant, there are 70 tests in all.

The tests are performed at different stages of production and involve visual, chemical and physical tests (Boulton et al., 2015). Company F believes that the QMS must involve suppliers. For example, it currently produces two types of formula milk, i.e. a wet and a dry blend. For a dry blend, ingredients come from suppliers in a dehydrated powder form and are mixed together. Therefore, it is necessary for Company F to rely on the quality standards of its suppliers and it ensures that they adhere to the necessary laws, regulations and standards, such as GMP and HACCP. Furthermore, ingredients from suppliers undergo more tests when they arrive at Company F's production plant. The analysis shows that through an effective partnership with its suppliers, Company F is able to share information relating to testing and quality, and proper documentation takes place so that the information can be utilised at any time.

The critical analysis show that this company was unable to keep a check on whether the dairy farms it sourced its milk from were rigorously enforcing quality standards. This inability to keep a check involves many risks as quality could not be ensured till the time all stages especially pre-production stage is secured to all uncertainties due to quality problems. Quality standards is a tool which helps in ensuring that quality is managed and monitored appropriately and when there is no assurance regarding their enforcement; it results in quality problems during next stages. This does indicate that there might be a weakness in the pre-production stage of this UK Company in that it is unable to maintain a strict check on quality regulations at this point.

## **8.5.2. Supply chain of Company F**

The interview results told that quality is monitored during and after the manufacturing process, however, it is unable to monitor its suppliers at the pre-production stage. At all the production factories in Western Europe, the same standards for quality are followed. Once the milk arrives at the production facility, it is tested in order to ensure that it meets the core quality standards. Tests include: somatic cell count, standard plate count, preliminary incubation count, coliform count and laboratory pasteurisation count. During the manufacturing process, the quality systems are managed through inspections and implementation of internal quality standards. The final products are again examined in order to ensure that they meet the exacting quality standards for retail sale.

### **8.5.2.1. Pre-production stage**

Cattle breeding is very important to Company F. The dairy farms it sources its milk from use advanced methods which involve control of the breeding cycle, artificial insemination, laparoscopies, rectal palpation of genitalia, embryo manipulation, and detection of oestrus and ovulation. In order to produce a large quantity of milk, advanced technology, such as sexed semen and embryo transplantation, needs to be used to improve the breeding process (Rad and Lewis, 2014).

Cattle management is very important to the company as well (Cook et al., 2016). It would be difficult for the dairy farms it uses to produce quality milk without an in-depth knowledge of animal husbandry. There are dairy farms in the Middle East and in the middle of the desert where there is no grass and, while it might be safe to obtain milk from such farms, it certainly would not match the appropriate quality standards. Company F, therefore, has ensured that the farms it uses as its milk source have adopted appropriate animal management practices. The analysis regarding animal management practices showed that this company is striving to improve the cattle management.

The use of advanced technology (e.g. robotic feeding and milking, individual cow sensors, or inline parlour techniques) is important in the animal management process

(Beynon et al., 2015). The interviewee mentioned that every dairy cow is tagged, and whenever the cow is milked, the tag is scanned, connecting the cow with the milk obtained. This helps the company to trace problems in the milk. Although the dairy farms used by Company F are following certain traditional methods with regard to milk production, they are moving towards using more advanced technology.

With regard to the source of milk, Company F pays the farmers in accordance with the level of quality (which is assessed through somatic cell count) provided; the farmers are, therefore, motivated to test the milk quality before it is delivered to the company. The somatic cell count is an indicator of quality level of milk and when there is low level of somatic cell counts, it indicates low likeliness of harmful bacteria. The reference range for somatic cell count is less than 100,000 cell/mL in those cows which are uninfected from disease. The respondent discussed the quality of the source of milk in a positive manner and the current crisis in the UK dairy industry was not highlighted. However, a known fact regarding current crisis in the current situation, dairy farmers are paid extremely low prices for milk and many of them, particularly the smaller ones, have left the industry. Large and intensive producers find it easier to remain successful. The price of milk is constantly falling and supermarkets are selling a pint of milk for less than a bottle of water. As indicated by Perry (2015), the cost of producing a litre of milk is between 30–32p. However, dairy farmers are being paid less than 20p per litre. This is a demotivating factor and is the reason why half of the UK's dairy farms have gone out of business. On the one hand, it is analysed that large companies in the UK baby dairy product industry are striving to ensure quality by paying the farmers as per the quality of their milk but, on the other hand, many farmers have left the industry due to the small rewards for their efforts. When these small dairy farms go out of business, this has multiplier effects because knowledge and skills are lost, as well as jobs. Not only have farmers lost their jobs as a result of this crisis, but milkmen too. In 1990, 89 per cent of milk used in UK households was delivered by milkmen, but in 2013, this had dropped to 3.2 per cent (Kersting et al., 2016).

The analysis reveals that along with the milk, all the other ingredients in baby dairy

products, such as vegetable oil, lactose and vitamins, should also be of good quality so that there is the least possible chance of bacterial contamination. Therefore, cleanliness from the first step of the supply chain is important because once the bacteria get into the process, they cannot be stopped from growing. The analysis of Company F has revealed that suppliers of raw materials (other than the raw milk) also have a critical role to play in the QMS and the company expects all of its suppliers to adhere to rigorous quality standards. It has contractual agreements with suppliers in Germany, France and the Netherlands, where it has large operations.

#### **8.5.2.2. Production stage**

The analysis of interview findings shows that efforts are made to ensure that milk is transferred from the dairy farmers to the production facilities in the minimum possible time, in the cleanest and most hygienic vehicles and at the correct temperature. The rationale for this is that when the milk can be transported quickly and hygienically there is a less chance of bacterial contamination. When the milk reaches its destination, it will be tested again, e.g. for carbohydrate and protein amounts (using a dip test), before it is transferred for further processing. At this company, laws, regulations and standards drive the QMS.

#### **8.5.2.3. Post-production stage**

Company F operates with high safety margins. It never sends the final product for distribution until all the quality tests have been performed and are satisfactory. When the final product does not meet any of the inspection criteria, the whole batch is scrapped, incurring a significant cost. Hence, efforts are made to inspect and correct quality problems at earlier stages of the production process in order to avoid this happening. Products are released on to the market with follow-up instructions to retailers and customers who are advised to read them carefully before either selling or using the product.

Company F ensures that the raw milk it uses goes through a number of processes and checks to prevent it from being contaminated. Analysis shows that the participant did

remark that a company can have the best facilities in the world with the greatest of attention paid to QMS, but it still occasionally happens that babies become sick. In order to keep the chances of this happening to an absolute minimum, the implementation and maintenance of QMS are vitally important.

#### **8.6. Information sharing in the UK baby dairy product industry**

It has been found that, in the UK baby dairy product industry, there is a robust traceability process which is based on an information-sharing system. This has allowed baby dairy product companies to trace milk and any problems with it throughout the supply chain. UK baby dairy product companies use RFID tags (Radio Frequency Identification Devices) for information sharing among all supply chain actors. This technology consists of a tag (transponder) attached to the animal, the data from which is retrieved using a transceiver (reader). Information received from the transceiver is stored on a data accumulator where it is translated into useful information by processing software (Barkema et al., 2015).

The interviewee mentioned that every ingredient is assigned a batch number along with barcode trackers that help to identify which ingredients have been used in a product. This means that any quality problems can be traced throughout the production process. On UK dairy farms, even the smaller ones, every animal is provided with a tracking ID that helps to trace the source of the milk. The critical analysis of the traceability system in the UK baby dairy industry has revealed that it does involve costs related to its implementation and operation. For example, the annual costs related to tagging, reading the information and data transfer have to be borne by the dairy farms. When a calf is born, RFID tags are applied (manually, incurring labour costs) within 48 hours. The price per tag decreases as the size of operations increases. However, further analysis highlighted the fact that UK baby dairy product companies also enjoyed numerous benefits from implementing a good traceability system (Accorsi et al., 2016). It has improved regulatory compliance, recall capacity has increased, operations have become more efficient and customer responses are managed more quickly.

### **8.7. HRM in the UK baby dairy product industry**

The analysis has shown that HRM plays a very important part in UK baby dairy product companies with regard to implementing and monitoring QMS successfully. Effective systems can be put into place, but these are reliant on the human element to operate them successfully and human behaviour can be difficult to manage (Mowlem, 2005). Tests for quality eventually rely on human beings who have to implement them to generate the results; therefore, human resources are of critical importance for business success. The participant did say that quality checks could be influenced by human behaviour.

Therefore, analysis shows that there is a need for standardisation of human behaviour. The two UK baby dairy product companies studied manage HR through a focus on adequate compensation and benefits, training and development, and performance management and they emphasise HR more than Chinese baby dairy product companies do. As found from interview, in the UK baby dairy product industry, training of employees is considered critical for the successful implementation of QMS and it is believed that they can only be implemented successfully if the concepts of intrinsic motivation and involvement in decision making are employed. This indicates a higher level of responsibility which demands that employees have more skills. Managers in UK baby dairy product companies not only believe that, in relation to quality, training must be given to employees, but actually provide such training. The interviewees also highlighted the fact that they manage the performance of employees continuously in the same way as they focus on continuous improvement as an aspect of manufacturing quality. The focus is on both behavioural factors and the actual performance of employees. Although the respondent said that compensation and rewards were linked to QMS, evidence was not forthcoming, highlighting a weakness in their systems.

In managing the quality of milk in the UK baby dairy industry, the trade unions and the government also play dominant roles. When lower prices were being offered to the farmers even for quality milk, they protested strongly and the National Farmers Union

(NFU) and pressure group Farmers for Action have played their role in managing this situation (Cook et al., 2016). Hence, as analysis shows, the large retailers who were paying extremely low prices to farmers caved in under pressure. Prices are still quite low but better; however, it has been found that companies of milk are still suffering because the prices they are paid barely cover the cost of production. The government is aware of the problem and is indirectly helping the farmers through relaxation of the Common Agricultural Policy (CAP) subsidy checks. Furthermore, the EU provided GBP 26 million to milk companies in the UK. This enabled the small milk companies to match quality criteria in the same way as large companies, e.g. Company F. Farmers received a cash boost, but this was a short-term measure. There is a need for management practices that could ensure the long-term sustainability and resilience of dairy farmers and this has been emphasised by the farming unions and pressure groups. Likewise, they are also asking for mandatory country of origin labelling which would further promote the UK baby dairy industry.

The analysis finds that there are various support measures which are being taken in the UK to manage the dairy industry and address its problems. The farming issues have been resolved with the help of the support offered by the NFU as follows: 1) extending the remit of the Groceries Code Adjudicator to farmers, which allows them to achieve fair prices; 2) ensuring that the Basic Payment Scheme 2016 runs smoothly so that payment delays can be avoided; and 3) improving the price reporting of farmers, enabling them to manage their own risk.

### **8.8. Summary of UK baby dairy product companies**

This section identifies and summaries the similarities and differences between the two dairy product companies in the UK that were studied. With regard to similarities, there are strict laws, regulations and standards that have been developed by the UK government and their purpose is to ensure that only the best quality baby dairy product companies can survive in the market. Both of the companies in question manage the quality of their products through implementing various standards, such as BRC Grade

A, ISO 9001 and HACCP. They both rely on external and internal quality audits to manage the quality of their products, and throughout the supply chain and production process many inspections are carried out by the appropriate bodies. The combination of laws, standards and regulations along with inspections allow these two companies to manage quality in a better way.

It can be said that there are three stages in the manufacturing process: pre-production, production and post-production, and these two companies examine quality at every stage. However, the level at which tests are done varies between the companies as per the local situation. The analysis has shown that the source of milk is one of the most important factors relating to quality management. It must, therefore, be managed in a proper manner to avoid quality problems. From the analysis, it has become clear that animal management is also crucial and cows need to be looked after, fed and bred appropriately.

The analysis has also shown that both UK baby dairy product companies believe that suppliers must be involved in the QMS and, to this end, they have established strict measures for their suppliers' practices regarding quality management. They ensure that only those suppliers that provide the best quality raw materials become part of their supply chains and raw materials from suppliers are inspected to ensure that they match the quality standards before they enter the production process. During the production process itself, both companies ensure that quality standards are followed strictly and products are not distributed to the end customers if they do not pass inspection criteria. With regard to the distribution of goods, both companies ensure cleanliness. Even follow-up measures are taken to ensure that quality products reach the customers. These two UK baby dairy product companies use advanced equipment and facilities, which are critical for the successful implementation of QMS. Furthermore, as part of the UK dairy industry, which as a whole has a strong traceability system, these companies are able to identify and rectify quality problems at the earliest possible opportunity.

A few differences were also found between the two companies. Company E has its own farms which allow it to obtain better quality milk because there is no uncertainty

regarding the amount of water and other substances in it. This company uses traditional practices for manufacturing its products. Company E also implements strict quality measures at the packaging stage. What differentiates Company F from Company E is that Company F believes that human resource management plays a crucial role in the implementation of QMS and it manages HR effectively for achieving the objective of quality in its products.

In conclusion, it can be said that the two UK baby dairy product companies studied believe that all three stages of the production process, namely pre-production, production and post-production, are equally important, and this is their main strength. If there are loopholes in any of the stages, it will have an impact on the quality of the final product. The two companies strive to give equal importance to quality management practices at all stages. However, along with their strengths, the two companies also display some weaknesses (for example, they neither conduct inspections on every product, which will increase cost and time demands, nor focus on sophisticated packaging). These need to be addressed in order to further improve QMS in the UK baby dairy product industry. However, it needs to be said that QMS in this industry, including a robust traceability system, have been implemented well and, as a result, it is flourishing. If baby dairy product companies elsewhere wish to improve the quality of their products, they need to implement effective QMS, including a robust traceability system, as UK companies have done.

## **Chapter 9: Comparison Between the Chinese and UK Baby**

### **Dairy Product Industries**

#### **9.1. Introduction**

The purpose of this chapter is to compare and discuss the implementation of QMS in both the Chinese and UK baby dairy product industries. Currently, there are many factors influencing the implementation of QMS in the baby dairy product industries of both countries and these will be discussed in this chapter. The chapter will set the foundation for a framework for implementation of QMS in the Chinese baby dairy product industry utilising the best practices of both industries. These will be identified, and then recommended in the framework.

#### **9.2. Overview of the Chinese and UK baby dairy product industries**

The economic environment of China is conducive to the growth of the baby dairy product industry and it experienced double-digit volume and value growth in 2014 (Euromonitor, 2015). In the past three decades, both the consumption and production of milk in China have increased (Sharma and Rou, 2014). In 2016, for baby dairy industry, constant value CAGR (Compound Annual Growth Rate) of 7 per cent is being observed and it was higher than the previous year. It is expected that the use of milk formula will increase further in the coming 5 years (Euromonitor, 2016). This was due to the growth in the number of infants, toddlers and new born babies, which has stimulated the demand for increased baby food. It is expected that the Chinese baby dairy product industry is comprised of both state-owned and private enterprises. The performance of state-owned companies is better in terms of profitability, but it does not mean that private companies are not doing well. Consistent with the recent findings of Burns et al. (2015) and Fuller and Beghin (2015), the analysis of China's baby dairy product industry has shown that both private and state-owned companies are facing quality management problems. A summary of the comparisons between QMS in the Chinese and UK baby dairy product industries is given in Table 9.1.

Table 9.1: Comparison of the Chinese and UK baby dairy product industries.

	China	UK	Comments
Emphasis on HRM	-	✓	HRM is considered important in the UK companies while China's companies have not emphasised on this aspect for managing quality of baby dairy products.
Investment in training of employees	✓	✓	The level of investment is greater for the UK.
Use of advanced technology	✓	✓	The UK has more advanced technology.
Quality inspections	✓	✓	A greater number of inspections are carried out and the process is more rigorous in the UK.
Traceability system	-	✓	UK dairy industry has developed a strong traceability system.
Information sharing	-	✓	In UK dairy companies, there is extensive information sharing among supply chain actors.
Animal management system	✓	✓	The animal management system in the UK is better planned.
Robotic feeding systems	✓	✓	Both countries are using these in a similar manner. However, small milk producers in China are unable to adopt such systems.
Internal rules and regulations for dairy farm management	✓	✓	The UK's management system is more advanced.
Emphasis on source	✓	✓	Both have realised that source is vitally important.
Rigorous selection process for suppliers	-	✓	In the UK, suppliers are selected on the basis of quality certifications.
Regular inspections and audits on suppliers	-	✓	In the UK companies, inspections and audits for suppliers are organised on regular basis.
Involvement of suppliers in quality management	-	✓	In the UK, suppliers are provided with the incentive of higher prices for their milk depending on its quality. Though not all companies from UK baby dairy product industry are able to manage the suppliers, practices for their involvement are observed.
Inspections at each stage of production	✓	✓	Both industries use quality inspection tests conducted by their internal quality assurance/control/inspection departments.

Strict manufacturing guidelines	-	✓	The UK baby dairy companies are following the strict manufacturing guidelines and this helps them to prevent quality problems.
Inspection of sample from batch of final products	✓	-	In China, a sample is taken from a final batch of products and inspected for quality, while UK companies do not focus on sample but whole population.
Inspection of each product	-	✓	Using advanced technology, UK companies test every single final product. On the other hand, China's companies are relying on samples.
Sophisticated and effective packaging system	✓	-	China has adopted sophisticated and effective techniques for packaging.
Involvement of third parties in QMS	✓	✓	The UK has a more organised system for involving third parties in QMS.
Skilled drivers and suitable transport	✓	✓	Both have realised the importance of using skilled drivers and suitable, temperature-controlled transport.
QMS in the warehouse	✓	✓	Chinese companies have realised that they need to give attention to this aspect and are aware that improvements need to be made.
Use of technology at post-production stage	✓	✓	Both are using this, but the UK has more advanced technology.
Supportive and active role played by government	-	✓	Government of UK is playing a supportive role in supporting the quality management at baby dairy product industry.
National quality standards	✓	✓	The UK has stricter standards which result in better quality and fewer problems for the industry.
Robust implementation of legislation	-	✓	The system for enforcing the legislation related to quality management is quite robust in UK.
Internal quality standards	✓	✓	The industries in both countries have internal quality standards that help them to manage quality.
International quality standards	✓	✓	The industries in both countries have adopted the international quality standards. However, China is far behind the UK in the process.

### 9.2.1. Quality-related issues

In China, many incidents related to food quality have been observed. This has not only

affected the Chinese baby dairy product industry, but other food-based industries, such as oil and chillies, which have also faced problems with quality. It has threatened the confidence of Chinese customers and they have become more conscious about the quality of food, as demonstrated in a research study conducted by Hiu et al. (2012). Chinese customers prefer purchasing those brands that, to them, offer food safety and security, so companies that provide quality products for customers are more likely to become successful. Likewise, quality consciousness is high in the UK, and UK brands are focusing more on the quality management of their products. The attitude of Chinese customers towards international brands is not very positive, but they are ready to purchase from well-known international companies if they feel assured of safe and high-quality products. However, due to events such as the melamine incident, the growth rate of the local baby dairy product industry declined rapidly. The quality issues also had serious consequences with regard to China's self-sufficiency in producing milk for a rapidly growing rate of daily consumption (the daily consumption of milk is expected to increase by 38 per cent by 2022). The expected rate of growth in baby dairy product imports is 20 per cent till 2020 (Sharma and Rou, 2014) and this research found that the Chinese baby dairy product industry is relying more on international brands due to the fact that Chinese customers have become very quality oriented (Gao et al., 2015). The melamine incident drastically damaged the confidence of Chinese consumers in the domestic industry and this has created opportunities for large foreign companies to enter the market.

### **9.2.2. Role of small dairy farmers**

Due to incidents such as the 2008 melamine scandal, China's baby dairy product industry was restructured. There are many small dairy farmers who are part of the supply chain and their role in this is critical (Fuller and Beghin, 2015). The challenge is that they do not implement the relevant laws, regulations and standards, often adding substances to the milk (some of them harmful), which goes against the regulations. Other supply chain actors do not demonstrate compliance with the relevant standards either. There is a greater tendency for larger dairy farmers to comply with the standards

and this is also asserted by Yu and Huatuco (2016). On the other hand, in the UK baby dairy product industry, quality is ensured through the involvement of suppliers. Companies of baby dairy products in the UK source their raw materials only from those suppliers who apply relevant standards, such as GMP and HACCP. This is not yet the case in China, resulting in quality issues. The comparison shows that involvement of suppliers has proved effective for the baby dairy product industry in the UK. The presence of small milk producers in the Chinese baby dairy industry is due to the fact that the current demand for milk cannot be fulfilled from one source, so milk collected from various sources has to be utilised by large companies. However, many small dairy farmers were adversely influenced by the melamine incident, having given in to pressure exerted on them by the government and large baby dairy product manufacturers to supply milk of a certain quality, which they could only do by adulterating it. In 2006, 8 per cent of milk was being produced on dairy farms in China that had fewer than 10 cows. However, after the 2008 incident, the government introduced stricter regulations. As a result, during the period 2008–2011, the milk produced on dairy farms having more than 1000 cows increased from 9 to 16 per cent. On the other hand, the number of dairy farms having fewer than 4 cows decreased to 11 per cent (Durst, 2016).

### **9.2.3. Challenges for the baby dairy product industry**

Many foreign brands of baby dairy products were available in China and, owing to advanced technology and economies of scale in being produced for a global market, their cost of manufacture was low. Therefore, foreign companies were in position to offer low prices to Chinese customers. Chinese baby dairy product companies had to try and compete with these foreign brands and lower their prices to try to attract and retain customers. Furthermore, the production costs of Chinese manufacturers were high due to the rising cost of cattle feed. The government raised the price of feed in order to provide a better-quality product. In order to try and keep prices low, the large baby dairy product companies put pressure on the small milk companies to provide milk at the lowest possible cost. This is also consistent with the findings of Sharma and

Rou (2014), who stated that the production costs of these small dairy farmers continued to increase, so they started to add extra water and melamine (to increase protein content) to the milk in order to provide the 'quality' required for a saleable product. Many babies became sick due to drinking the tainted formula milk powder.

The comparison between the Chinese and the UK baby dairy product industries shows that both face the challenge of keeping a check on the quality of products coming from many small milk suppliers. The findings of this research have shown that the large UK baby dairy product manufacturers have been able to cope with this challenge far better. The analysis of the UK baby dairy product industry reveals that raw materials from suppliers have to meet specified criteria that are developed by the companies. The overall findings of this research show that, in the Chinese baby dairy product industry, the activities of all the important stakeholders, i.e. the small dairy farms, the large manufacturing companies and the government, resulted in the melamine incident. Therefore, in developing the framework for successful implementation of QMS, the roles for all stakeholders are identified. Further details are presented in chapter 10.

Considering the overall situation with regard to the Chinese baby dairy product industry, it can be deduced that there is a need for changes at the macro level. For example, availability of information, the local situation, public opinion and consumer demands all need to be considered. In particular, there is a need for further improvement in China's public disclosure system. Currently, a top-down approach, with decisions being made by those individuals who lead the system, is more prevalent, but there is a need for a bottom-up approach to government, whereby the people who will be affected by the decisions are involved in the decision making process. Other than changes in the system, the companies also need to effect changes by implementing QMS and a mechanism for monitoring them. In this research, changes related to the source of milk, the production process, storage and distribution, technology, management and HRM are recommended to ensure quality in the baby dairy product industry in the future. The challenges faced by companies when they try to implement QMS are discussed bearing these necessary changes in mind.

In the following sections, those factors are identified which need to be considered for the development of the Chinese baby dairy product industry. Chapter 10 presents an integrated framework for implementing QMS in the industry.

#### **9.2.4. Internal management**

Starting with internal challenges, it is important to mention that with regard to quality management, companies cannot neglect the role of management and other employees. Ultimately, the QMS have to be managed by the employees. Therefore, their attitude and behaviour are of the utmost importance. It is suggested that the attitude and behaviour of employees pose challenges for the implementation of QMS. Their willingness, commitment and positive attitude are essential for the successful implementation of QMS in the baby dairy product industry. These findings are consistent with the research studies of Hill (1991), Flood (1991), Gunasekaran (1999), Ugboro and Obeng (2000) and Beer (2003), which highlight the importance of employees' attitude in the implementation of QMS. Furthermore, management remains reluctant to dedicate resources for QMS if it does not understand the importance of laws, regulations and standards in relation to quality. Both management and other employees have important roles to play in the successful implementation of QMS; however, the role played by management is the more critical (Evans and Lindsay, 2002). In the UK, the baby dairy product industry places a high value on HRM. However, the Chinese industry does not see HRM as being a critical element in the implementation of QMS, which is problematic.

For managing quality, laws, regulations and standards are the most important tools and organisations adopt these in order to improve quality. However, one of the internal challenges associated with implementing standards concerns the associated administrative work, which must be performed efficiently in order to obtain good results. This is confirmed by De Bruyn and Gelders (1997). Likewise, apart from documentation, the implementation of QMS requires certain skills which require training of both management and other employees. It was found from the UK company analysis that there is a need for expertise in managing quality, so Chinese baby dairy

companies need to ensure that their management and employees possess the necessary knowledge and skills. This is an important factor which is going to be added to the recommended framework. Moore (2009) also reported that when QMS were implemented in the Irish baby dairy product industry, managers had to undergo extensive training for ensuring that employees have skills and knowledge. Hence, the successful implementation of QMS requires heavy investment in the training of employees. Moreover, implementation of QMS does not show results in a short period of time and managers need to be able to look at things from a long-term perspective. This is confirmed by Goetsch and Davis (2014).

#### **9.2.5. Advanced technology**

Another challenge is that QMS cannot be implemented in an effective manner without updated machinery and equipment and advanced technology. The comparison of the Chinese and UK baby dairy product industries revealed that the UK industry is more developed because it uses more advanced machinery and technology throughout the entire production process. From its dairy farms to the retailers, every supply chain actor has access to advanced machinery and equipment and the use of this has helped companies in the UK to match the quality expectations of the customers. Similar findings were reported by Mamun and Islam (2002) and Yamaji et al. (2011), who found that the role of advanced machinery is critical for quality management. Mamun and Islam (2002) found that the use of advanced technology helped Bangladeshi and Thai companies to improve their implementation of QMS. Similarly, Yamaji et al. (2011) highlighted the effectiveness of advanced technology in the implementation of QMS in Japanese firms.

As observed in both the Chinese and UK baby dairy product companies, there is a need for rigorous inspection of milk when it arrives from the dairy farms. The comparison of the Chinese and UK industries shows that the UK industry carries out more inspections than China, enabling quality to be improved as problems can be identified more easily before the products reach consumers. This inspection capability is heavily dependent on advanced technology. Both the government and the manufacturers

contribute to the development of such advanced inspection systems so that quality problems can be traced at the initial stages. In China's baby dairy product industry, it is hard to trace the source of poor quality milk. Neither China's government nor its large manufacturing companies have introduced any system for tracing the source of the milk. On the other hand, the comparison of the UK and Chinese industries revealed that the UK industry is managing its QMS in a better manner because of its information sharing and strong traceability system, which allows it to trace every minor detail associated with the milk. It is also argued by Opara (2003), Kelepouris et al. (2007) and Aung and Chang (2014) that the food industry needs a good traceability system in order to ensure the safety and quality of products. Furthermore, the comparison between both industries revealed that the UK industry uses advanced technology, such as the somatic cell count, an indicator of milk quality. However, evidence for similar advanced technology is not found in Chinese companies. Consequently, on the basis of results of this study, it should be said that every supply chain actor needs to use updated machinery and equipment, and advanced technology and devices, such as a traceability system.

#### **9.2.6. Animal management**

Moving on to external challenges, quality management practices should start with the first actor in the supply chain. Animal management is an important aspect for quality, so this section compares animal management practices in the UK and Chinese baby dairy product industries. The foundation of baby dairy products in the milk source, so it is vital to effectively manage the cows that provide this. From the interviews with both the Chinese and UK baby dairy product companies, it was found that it was essential to take care of the cows from the time they are born. Few Chinese baby dairy product companies have a robust system for managing the cows on dairy farms they own and practices here are somewhat remote from the manufacturing facilities and not monitored properly. Conversely, those UK baby dairy product companies that own their own farms have a very effective management system for taking care of the cows: from their breeding to feeding to rest and milking, everything is considered to be important. Therefore, for improving quality, quality management practices are required from the

initial stages of the supply chain and these can be ensured with the help of a proper animal management system, as there is in the UK. This is consistent with the arguments of a recent study conducted by Fraser, Mench and Millman (2001) who stated that proper monitoring and improvement of the animal management system is required for managing quality in the baby dairy products industry of UK. The Chinese baby dairy product industry could improve the monitoring of its dairy farms through vertical integration of the supply chain. In China, even although robotic feeding has been introduced in several companies and the process of milking has become automated, there is still room for improvement. The quality of feed given to the cows needs to be monitored and controlled and there need to be proper rules and regulations with regard to the functioning and management of the dairy farms. These are elaborated in the chapter 10. The comparison of the Chinese and UK baby dairy product industries shows that breeding practices are more organised and advanced in the UK. Even though Chinese baby dairy companies have started to focus on breeding, the animal management system is more advanced and better managed in the UK.

#### **9.2.7. Production factors**

With regard to production, the raw material (milk) should first be inspected for quality problems because prevention of these should start from the source. Microbiological inspection of products is desirable and this can be done with advanced equipment. However, it cannot be denied that the economic capability of farmers and other supply chain actors in the Chinese baby dairy product industry does not allow them to afford the most advanced equipment. Therefore, the government needs to take a proactive approach towards improving the capability of such small producers so that, in turn, they become able to improve the quality of their products. By adopting a proactive approach, the Chinese government would work for the future development of the baby dairy product industry by developing the capability of farmers instead of helping them by relaxing the regulations.

The procurement of raw materials needs to be thought of as vitally important, and quality inspection processes should start at the dairy farms and continue through all

stages of supply, production and distribution. Not only milk is used in the production of baby dairy products, but many other raw materials too, e.g. sugar, protein powder, and vitamins and minerals, and the purchasing of all raw materials requires significant attention. In the UK baby dairy product industry, suppliers are audited on a regular basis (i.e. quarterly). Only those suppliers that are capable of providing quality raw materials are selected. Moreover, UK dairy product manufacturing companies select those suppliers who have obtained quality certifications. The findings from the four case study companies from China's baby dairy product industry reveal that although they are auditing their raw material suppliers, this is not done regularly enough. From the comparison, it can be deduced that better quality in the UK baby dairy product industry is ensured by auditing the suppliers on a regular basis. Likewise, it was found that the UK industry has developed a mechanism where suppliers are paid for their products in accordance with their level of quality. Consequently, suppliers to the UK baby dairy product industry are motivated to provide quality ingredients in order to get higher prices. Furthermore, the UK baby dairy product industry relies on extensive information sharing with suppliers. Under this mechanism, the supply chain actors share every minor detail about products with other supply chain actors using an electronic system. It is not difficult, therefore, for manufacturers to trace which ingredients or what level of quality of a particular ingredient has been provided by a particular supplier. This mechanism of information sharing has improved the traceability system that helps companies to identify and rectify quality problems.

In addition, when the raw material arrives at the manufacturing facilities of the UK baby dairy product companies, teams of qualified staff ensure the highest quality at every stage of the production process. Similar practices are also observed in the Chinese baby dairy product industry but, during the manufacturing process, stricter guidelines are followed in the UK as compared to China. In the UK, the finished goods leave the factory only if every single final product is approved under the specifications laid down, e.g. tests for antibiotic and detergent residues; microbiological tests (e.g. total colony count, E. coli count, methylene blue dye reduction); and organoleptic tests (subjective

evaluations of odour, texture, flavour). The Chinese companies, however, do not test every product, just samples from the final batch of production. The comparison shows that the testing of every product through advanced technology is the factor which could help in improving QMS in the Chinese baby dairy product industry. Currently, both the Chinese and the UK baby dairy product industries use advanced production equipment, but the standard of equipment is higher in the UK because the UK industry is able to test every single final product, while the Chinese industry is only able to test samples.

There are certain challenges for the baby dairy product industry that are hard to manage. For example, if milk comes into contact with air, it reproduces bacteria far more quickly. However, preservatives are not used. Packaging, therefore, plays a critical role in delivering quality products to customers. Zygoura et al. (2004) have also asserted that quality of milk is heavily influenced by the packaging material. Vassila et al. (2002) stated that microbiological changes can occur in milk because of the packaging material used, so selecting appropriate packaging is vitally important. The UK baby dairy product industry uses sophisticated packaging (use of linear low-density polyethylene laminates) through which it is ensured that the final product reaches the customer in the right form and shape.

#### **9.2.8. Transportation and storage**

Apart from dairy farmers, supply chain actors related to transportation and storage are an important part of the supply chain. There is a need for a system whereby quality management practices can also be implemented for other supply chain actors, such as distribution centres, transportation vehicles and warehouses. Every supply chain actor should be equally responsible for implementing QMS and, therefore, the commitment of those people who are indirectly linked to the manufacturing company must be managed. Currently, one difficult challenge would be to introduce a standard system whereby every single member of a supply chain had to commit to implementing QMS with the help of the relevant laws, regulations and standards. However, this level of involvement of all third parties was not found, either in the Chinese or the UK baby dairy product industry. Both realise, however, that involvement of all supply chain

members is necessary.

Consistent with the findings of Skjoett-Larsen (2000), the Chinese case study analysis has also highlighted the critical role of third party logistics services providers in quality management. It has to be ensured that transporters of milk are aware of the quality rules. If they are not aware of the required temperature at which milk needs to be stored, it is not possible to deliver good quality milk to customers. If cold chain vehicles are not properly maintained, then this could also cause problems. The involvement of logistics companies is a challenge for quality management. For maintaining the desired level of quality during transportation, the importance of control increases. Hence, baby dairy product companies need to maintain control over logistics companies and this could be done through vertical and backward integration of the supply chain. The challenge of transportation is also highlighted by Martin (2012), who says that third party transportation is a challenging issue, often resulting in high costs for companies. If a baby dairy manufacturing company decides to do its own transportation, then it needs to ensure that drivers have the necessary knowledge and skills to be able to transfer the milk quickly and safely.

Warehouses are also part of the supply chain of the baby dairy product industry. When there is insufficient capacity to transfer milk immediately to its destination, it has to be stored in warehouses. To have sufficient capacity for stocking milk is another challenge for baby dairy product companies. Milk must be stored at the correct temperature, constantly. Unfortunately, overstocking in the warehouse can cause the temperature to fluctuate. Marisa et al. (2002) emphasise the importance of warehouses in the overall QMS in the Chinese baby dairy product industry. Likewise, retailers have to provide the correct environment for the products so that quality problems do not arise. This is confirmed by Alvarez (2008). While Chinese baby dairy product companies are striving to improve QMS with regard to warehouse storage, the UK companies have already addressed this problem successfully.

### **9.2.9. Roles of governments**

The Chinese government is not currently playing its expected role with regard to the

implementation of QMS in the baby dairy product industry. It is expected that the government should promote the implementation of QMS through strict laws, regulations and standards. There is, therefore, a need for more emphasis on the implementation of quality regulations in China and a need for appropriate management and supervision by the relevant government departments. The implementation of QMS in the baby dairy product industry could be improved by clearly defining the roles, responsibilities and accountability of the MOA, the Ministry of Water Resources, the State Bureau of Quality and Technical Supervision, the SAIC, the Ministry of Industry and Information Technology and the Ministry of Environmental Protection. The framework that is presented in the chapter 10 will highlight the role these organisations could play in devising better QMS for the Chinese baby dairy product industry.

The previous chapters have revealed that the role of the government with regard to the industry could be more effective. Although numerous laws, regulations and standards relating to quality management do exist, the government is not strict enough with regard to their implementation. In addition, government departments have their own specific goals and objectives but there is overlap and inconsistency in their roles, so responsibility for certain tasks is not clear. Some of the necessary elements in improved QMS for the Chinese baby dairy product industry (e.g. information sharing) have still not been assigned to any government department. Due to the bureaucratic system in China, corruption is also found. The melamine incident was a result of the ineffective role played by the government and, above all, this shows that there is a need for the government to play a more prominent part in regulating the baby dairy product industry. Interviewees did, however, report certain improvements. For example, the new Food Safety Law has been officially promulgated now.

In conclusion, it can be said that the comparison of the UK and Chinese baby dairy product industries with regard to the role of the government highlights the fact that the UK industry is more developed because the government plays a more active role in regulating it.

### **9.2.10. Quality standards and legislations**

Although there are many laws, regulations and standards relating to the baby dairy product industry in China, there is a need for these to be improved. Stricter regulations would leave less room for quality-related problems. Consumers are now not only concerned with a product's features, but also with its quality and safety. Buying food of any type is a decision heavily dependent on quality and safety (Anić et al., 2014). It is, therefore, critical for the food industry to follow the relevant laws, regulations and standards. When the quality standards are not implemented, companies often have to face severe consequences (Arvanitoyannis et al., 2016). Quality standards and legislation allow companies to introduce a process of continuous improvement, hence their competitiveness increases. The analysis of the UK baby dairy product industry has shown that both of the UK companies studied have been able to improve the quality of their products by applying quality management standards. These days, companies cannot afford to be backward when it comes to implementing legislation and standards because they allow companies to improve their competitiveness in the international market as well as produce products that comply with international standards. This has been observed in the UK baby dairy product industry. With the adoption of various quality standards, such as the BRC food safety standard, ISO 9001, ISO 14001, kosher, halal and Soil Association certification, and GMP, the UK companies have been able to improve their competitiveness in the international market. HACCP certification for China has also been obtained by one of the companies so it is eligible to export its products to China.

Chinese baby dairy product manufacturers need to adhere to quality standards if they are to meet customer demand because customers are attracted to those companies who pay attention to quality. China's standards in relation to quality management are somewhat basic, and this is due to the local situation. The country is progressing by adapting international standards to its own circumstances, but there is still room for improvement. In a situation where there are only a few large baby dairy product manufacturers, but many smaller producers of milk, there is fierce competition among

the smaller milk producers. However, they are also important for China's baby dairy industry in general as they help to meet the demands of Chinese consumers for milk. For large baby dairy product companies, the milk supply comes from many small dairy farmers. However, many of these farmers possess fewer than 5 cows (Sharma and Rou, 2014). Therefore, they are not in a position to comply with strict laws, regulations and standards, as explained by Psomas and Kafetzopoulos (2015). The Chinese government is aware of this situation and, therefore, its current standards are not strict because, if they were, it would have a devastating impact on the baby dairy industry in general. Small milk companies would be put out of business in a situation where the current consumption of dairy products is already increasing. As a result, the self-sufficiency of China's baby dairy industry would be adversely affected. The challenge for the government is to ensure that it designs standards at a level which would promote quality throughout. It can be observed that the UK government has introduced strict standards for its baby dairy product industry. Therefore, as far as China is concerned, there is a need for change at the system level and this is down to the Chinese government.

The key findings from this part of the analysis show that the Chinese government is not playing the role it should be. The overlap between and inconsistencies in the role of government departments have resulted in quality management problems. It was also found that, although the design of laws, regulations and standards was appropriate for the products in question, implementation was not carried out effectively.

China's laws, regulations and standards are weak and one example is where legislation has specified the amount of protein in the milk. The large baby dairy product companies do not purchase milk from small milk companies if the level of protein is below the set percentage. In order to deal with this problem, small milk producers added melamine to the milk which enhanced the amount of protein in an artificial manner. When this milk was used in the production process many infant formula milk products were affected, ultimately causing harm to consumers. So far, the analysis has found that China's national standards are unable to prevent small milk companies adding harmful substances to milk. This is a significant challenge for this industry.

The findings of this research have further shown that large baby dairy product companies in China have developed their own standards, which are even stricter than the national ones. Currently, even though national standards are implemented effectively, it cannot be certain that there will be no quality issues with regard to baby dairy products. This calls for a modified system that could ensure quality in the Chinese baby dairy product industry as long as certain standards, rules or a framework were followed. The comparison between Chinese and UK quality standards demonstrates that the UK has better standards than China, and this is one of the significant reasons why UK baby dairy product companies make better quality goods.

However, after the melamine incident, efforts are being made with regard to improving the legislation that applies to the Chinese baby dairy product industry and the analysis has shown that this is absolutely necessary. The content of international standards has been adopted by the Chinese industry, but in a customised format to suit the local situation in China. There are certain weaknesses in China's standards, e.g. they do not specify the quality level for many ingredients in food products. With regard to all stakeholders, improvements could be made to the current regulations, and these are proposed in chapter 10. Most importantly, it was found that penalties for non-compliance were not strict enough. If a company does not comply with the law, then, currently, the consequences are not significant enough to force compliance. This situation needs to change.

DeLuca's study (2016) found that, following the melamine incident, several of the regulatory authorities of China now understand the importance of quality and are taking their role seriously. They are trying to keep a check on the processes and products of baby dairy product companies and, to this end, carry out quality inspections, testing sample products from the industry in a random manner to ensure that the desired level of quality has been achieved. This is a favourable development in the practices of the Chinese regulatory authorities. Comparing this with what happens in the UK baby dairy product industry – the regular inspections carried out there by such bodies as the Food Standards Agency – it could be said that this practice should prove helpful for

increasing the quality of baby dairy products in China, as it already has in the UK.

Furthermore, as far as quality management is concerned, regulatory bodies need to consult professionals when developing laws, regulations and standards for the baby dairy product industry. The role of customer awareness is critical for their implementation, because when pressure is exerted by customers with regard to companies adhering to laws, regulations and standards, companies need to comply, otherwise they will not be able to sell anything and will go out of business. In addition, managers must play a supporting role when it comes to the implementation of QMS. Both the process of designing relevant laws, regulations and standards and of implementing QMS are critical to the success of China's baby dairy product industry today.

### **9.3. Summary**

It can be concluded from this discussion that, in China, many aspects of QMS, e.g. animal management, implementation of quality standards and HRM, are not handled well, and it is vitally important for quality and safety issues to be managed in a proper manner (DeLuca, 2016). From the analysis of this research, it has been found that the companies which control the whole supply and production process from the raw milk through to the end product are in a much better position to prevent serious quality and safety problems. The UK baby dairy product industry is already managing quality by implementing QMS throughout the whole process. In order to gain and retain the trust and confidence of consumers in China, a system is needed whereby all supply chain actors in the baby dairy product industry contribute equally to QMS. To a certain extent, the Chinese government is playing a crucial role, and consolidation of dairy farms into large-scale milk production units along with sourcing milk from large dairy farms are being promoted. In response to this, many Chinese companies have adopted vertical integration of the supply chain. Previously, it was quite dispersed, but now has become quite standardised and concentrated. However, there is still room for improvement as this practice has been adopted by only a few companies and there are still many others that are unable to ensure this integration.

## **Chapter 10: Framework – Pre-Production Stage**

### **10.1. The need for a framework**

A framework is a combination of concepts that are systematically organised and broadly defined to provide a focus and a rationale for something. It is also a tool for integrating the concepts and for interpreting the information contained therein (Mosby, 2009). To put it another way, a framework refers to a ‘network’ of interconnected concepts for providing a comprehensive understanding of a particular phenomenon. Moreover, these interlinked concepts support each other, such that a framework-specific philosophy becomes clear. Accordingly, concepts that constitute a framework for QMS in the baby dairy product industry are based on the pre-production stage of the manufacturing process where the role of government, laws, standards, regulations, the information sharing system, and the milk source are connected with each other. According to Garrison and Vaughan (2008), a framework provides the structure for the whole study and, with regard to the issue in question, it has its foundations in literature, the views of participants and the personal experience of the researcher. The framework for this research is no exception and it focuses on the four key factors in the baby dairy product industry that must be taken into account when implementing QMS. These are: 1) the milk source; 2) the information-sharing system; 3) the role of the government; and 4) laws, regulations and standards. These four factors are based on the themes emerging from the interviews and focus group conducted in the process of carrying out this research and they are discussed in detail in the next section. The framework will provide a classification system for the identification and categorisation of key constituents for implementing and supporting QMS in the Chinese baby dairy product industry. The framework, therefore, depicts a logical approach for the achievement of desired improvement in QMS in this industry. There are three stages in relation to the implementation of QMS in the baby dairy product industry (Figure 10.1). This research only focuses on the first stage, which is considered to be the core stage (pre-production stage) that needs to be managed in order to improve the quality of baby dairy products. It is hoped that the other two stages could be addressed in future research and highlights

pertaining to these two stages are already part of further work.

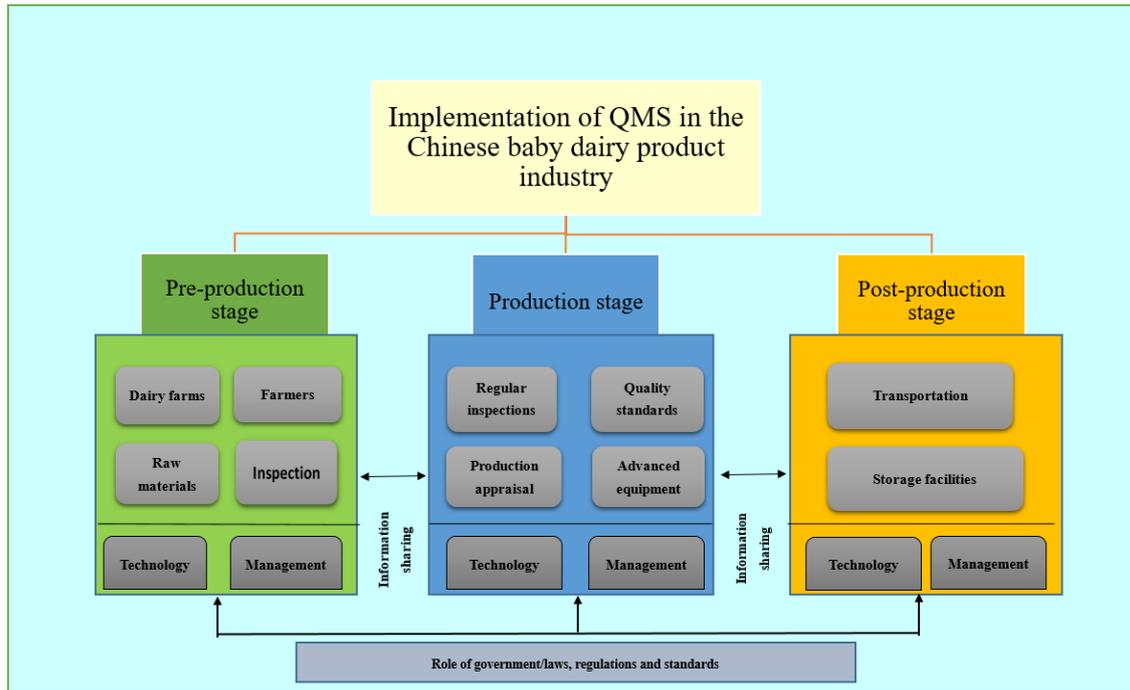


Figure 10.1: Three stages of QMS in the Chinese baby dairy product industry.

### 10.2. Integrated framework for the Chinese baby dairy product industry

The following framework presents how the problems at this stage could be resolved. It is expected that this framework would allow the milk source companies to manage the quality of their products in a better manner (Figure 10.2).

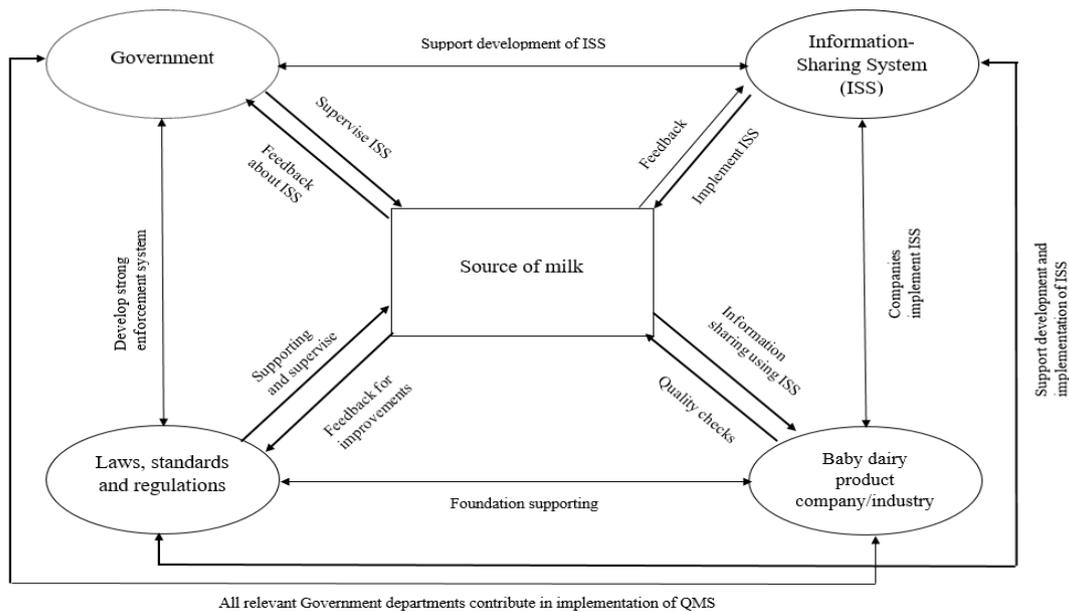


Figure 10.2: Framework for the pre-production stage.

As it is demonstrated in Figure 10.2, everything is interlinked with each other and collaboration of all parties is needed for solving the problems of baby dairy product industry of China. The source of milk is the most critical factor as most of the problems occur at this stage. Therefore, the main theme of this framework is to solve out the problems at the source of milk. The government of China needs to support the dairy milk source by providing appropriate supervision to Information-Sharing System (ISS). The dairy farms will also be needed to provide feedback about ISS to solve out the problems before they become severe. All of the government departments have to work in collaboration with each other and they have to revise their responsibility for improving the source of baby dairy products. These responsibilities are discussed below in further details. Laws, standards and regulations need improvement so dairy farms should provide feedback for improvements and such laws, standards and regulations need to be introduced that quality problems could be reduced. The government should also improve the enforcement system. The baby dairy companies should also provide support for the laws, regulations and standards development and enforcement. Information sharing system is needed to be developed which could be done by getting sufficient support from the government, baby dairy product companies and laws, standards and regulations. Dairy farms should also provide necessary support to ISS for its efficient implementation. Further details of this framework are discussed below.

### **10.3. Local situation in China**

The Chinese baby dairy product industry is comprised of both state-owned and private companies. Each has specific disadvantages. For example, there is more chance of state-owned enterprises being involved in corruption. On the other hand, private enterprises are driven by profit, hence, they are more likely to concentrate on shareholders' instead of stakeholders' interests. There is a need for regulatory measures in both types of companies and, in particular, the Chinese government needs to take measures such that the behaviour of leaders from state-owned companies is standardised, leaving no room for corruption at any level. The behaviour of private companies should be directed towards balancing the interests of both shareholders and stakeholders and a wider

awareness of the fact that a focus on stakeholders eventually leads towards the fulfilment of shareholders' interests. Managers from both state-owned and private companies need to understand that compromising on quality will never bring benefits for the Chinese baby dairy product industry. The investment in implementing QMS should not be considered as a cost or expense because it has the potential to produce long-term gains for the industry. After the 2008 melamine incident, Chinese customers have become more quality and safety conscious, and there is no room for similar scandals. Customers are only willing to pay for those products which they consider offer a high degree of quality and safety. A large percentage of the Chinese population has already shifted its interest to foreign brands, irrespective of the fact that they are not manufactured as per the needs of Chinese customers. However, Chinese customers are attracted to foreign brands because of their track record of quality and safety. This shows that in order to invigorate the Chinese baby dairy product industry, there is a need to implement QMS carefully and effectively.

There are many small milk companies, and the majority of them do not have the capability to follow the strict laws, regulations and standards related to quality. Therefore, the Chinese government has designed the standards such that they are sufficiently relaxed for small dairy farmers. Instead, it needs to focus its attention on developing the capability of these companies. Through various initiatives, such as loan schemes, training and awareness programmes, help and advice centres, and subsidies, the government can both promote quality and protect the domestic baby dairy product industry at the same time.

Due to local conditions in China, the government was unable to play an active role in quality management before 2008 and, because of this, many quality-related scandals occurred. Now, the local situation has indicated that the government needs to start playing an active role in the baby dairy product industry and paying more attention to quality and safety issues, otherwise, domestic companies of baby dairy products will no longer be able to stay in the industry (Ingelfinger, 2008). There are already 41 international brands of infant formula milk that are taking over the Chinese market. If

QMS are not implemented appropriately, then the Chinese baby dairy product industry will not flourish. There is a need to involve all stakeholders in the process of implementing QMS. If this is done, then not only will the domestic baby dairy product industry be reinvigorated but Chinese baby dairy product companies will also be able to capture the international market. Currently, there are a number of loopholes and problem areas in quality management in the baby dairy product industry (Xiu and Klein, 2010). In the next sections, recommendations for addressing these with the introduction of planning, and new methods and techniques will be put forward.

#### **10.4. Framework of Pre-production stage**

For managing the overall quality of baby dairy products, it is of the utmost importance to manage the pre-production stage (source of milk). This section analyses different aspects of this: dairy farms; the level of control over these; and the quality of the raw milk and other raw materials.

##### **10.4.1. Dairy farm management**

###### **10.4.1.1. Feeding of dairy animals**

In Chapter 6 which analysed the Chinese baby dairy product industry, it was found that there is a problem with the milk source, resulting in poor quality of the raw material. One of the problems identified is the feed given to cows. Cows at different stages of development have different health and nutrition requirements as per their physiological characteristics and it is important to tailor feed to individual animals to avoid under- or overfeeding. Problems such as infertility, liveweight gain and low milk yields are the result of cows receiving inadequate nutrition. Approximately 50–70 per cent of the cost of dairy production is related to the cost of feed, so when feed is provided as per needs, wastage of expensive feed resources can be avoided (Pei et al., 2011). It is recommended that balanced dairy cattle rations be developed using the simple technique of matching the main ingredients in the feed with the needs of the various classes of cattle. This practice is challenging for small milk companies, because they do not have skills to calculate the composition of feed reliably. Therefore, it is recommended that they should take appropriate advice, perhaps from the local livestock

production officer or a similar member of staff from one of the baby dairy product companies.

In addition to feed not containing the required nutrition, it can also be contaminated due to lack of cleanliness in cows' living quarters. In addition, it may contain harmful additives. As a result, the desired level of milk quality cannot be achieved because of the poor quality of the feed. The solution lies in proper systematic management of the feed given to dairy cows, enabling them to remain productive for a longer period. They need a balanced diet for good health and milk production and this also must include adequate water. In providing feed, individual cows' weight, level of activity and temperature need to be considered. It is necessary to ensure that cows are given sufficient feed to provide them with enough energy, and the feed should contain fibre (aids digestion and improves level of fats in milk), minerals, protein, carbohydrates, fats and vitamins.

Fodder crops are commonly used to feed cows as they are a good source of energy, helping them to grow and maintain body weight, produce a good quality and quantity of milk and reach peak condition for reproduction. For extra energy, other feeds, such as wheatgerm and maize should be given. The average weight of a mature cow is 400 kg, and for this weight 10–15 kg of fodder per day are required. It should be noted that it is not enough to only provide fodder such as Napier grass, along with stems and banana leaves. Indeed, Napier grass is good for cows, but it does not provide them with the required level of nutrients because 70–80 per cent of it is water, a small percentage only being dry matter (Borsting et al., 2003).

The amount of feed determines the amount of milk produced by each cow. Dairy cows that produce more milk should be provided with more feed. The analysis of the UK baby dairy product industry shows that cows producing a lot of milk need extra resins and proteins. It is important that feed is digestible so that nutrients are absorbed easily. Moreover, toxic substances in the feed must be avoided. A basal diet for cows is that which contains a sufficient amount of nutrients for meeting the animal's daily basic energy and has a calorific value equal to the production of basal heat. Although the

basal diet does not provide all the minerals and vitamins required by dairy cows, it is important because it allows them to fill their stomachs.

Cows' feed must also contain a sufficient amount of protein because this is one of the most important components of the food that cows must eat on a daily basis. Protein helps them to grow and maintain body weight, essential for milk production. Protein also helps microorganisms in the stomach to convert roughage into nutrients. An insufficient amount of protein in the feed will result in poor growth, loss of weight, reduced milk production and late maturity. In order to avoid quality problems at a later stage, it is recommended that dairy farmers add sufficient protein to cows' feed. Good sources of protein are white clover, bean straw and Lucerne. In addition, fodder crops, such as sesbania, leucaena and calliandra are also good sources of protein for cows (Meunier-Goddik and Sandra, 2011).

Other than protein, cows' feed must also contain sufficient minerals and vitamins. Minerals such as calcium and phosphorus support the process of milk production. Pregnant cows need more minerals because these help in the development of bone and tissues in the calf. Cows should never be provided with ordinary table salt; this does not contain the required minerals. Vitamins A, D and E are not produced by cows and, therefore, must be provided to them through their diet. With an optimum diet, the health of cows can be maintained for a longer period and they will provide better-quality milk (Papademas and Bintsis, 2010).

Cows also need a specific amount of water and a reliable water source should be provided for them. Water helps cows to transfer food to body organs and tissues and is also useful for cooling them down when it is hot. According to estimates, cows need about 60 litres of water per day (Cook et al., 2016).

When it is not possible to supply natural feed, feed supplements need to be provided. In the dry season, especially, when there is less fodder available, farmers rely on feed supplements. However, they need to be aware that this cannot replace the basal feed. Cows can only produce a sufficient quantity and quality of milk if they get enough basal

feed along with feed supplements.

Another factor that should be considered when managing dairy cows' feed is cooperation with research institutions in order to obtain up-to-date information as to the best feed to give them. It has been found that the optimum level of nutrition in milk from all its combined elements can be obtained with the right feed. Therefore, cows must be provided with whatever feed that allows them to produce the highest quality of milk.

It is recommended that whatever feed is used for dairy cows, it must be stored carefully because contaminated feed can cause disease. Cleanliness of the storage facilities is of the utmost importance and feed should also be stored according to suppliers' instructions. It is suggested that baby dairy product companies design an instruction manual for small dairy farmers describing the correct ways to store feed in simple, easy-to-understand language.

There are various scientific technologies (e.g. robotic feeding and milking) that have already been introduced on some dairy farms. It is recommended that large baby dairy product companies who own their own farms should install advanced machinery. However, small dairy farmers cannot afford to install such machinery; therefore, large dairy farmers and the government should take initiatives to help small dairy farmers gain access to it. One suggestion is that technologically advanced equipment should be shared between large and small dairy farms with small dairy farmers being allowed to visit large farms with their cows to use it. Furthermore, if there is any equipment that is not being fully utilised, then small dairy farmers should be allowed to use this at appropriate times.

Fodder given to cows may contain some elements that are dangerous for their health, which is a problem for the Chinese baby dairy product industry. For example, when grains, such as sorghum and maize, are stored in a place where the atmosphere has a high moisture content, this can result in aflatoxins, which are actually produced by the fungi *Aspergillus*. The quantity of aflatoxins found in crops that are given to cows as

feed can be transferred into their milk up to a level of 5 per cent (Fink-Gremmels, 2008). Therefore, it must be ensured that there are no such elements in the fodder provided to cows. Similarly, farmers often use rotten maize, which contains aflatoxins, as cattle feed. Such a procedure is, obviously, dangerous, because it, too, can result in contaminated milk. It is also important to avoid such substances in the fodder that can cause Bovine Spongiform Encephalopathy (BSE) and, therefore, dairy cows' feed should not contain mammalian protein (Lanza et al., 2015).

These problems identified in the Chinese baby dairy product industry could be resolved with the help of regulations, and the element of controlling undesirable substances in the fodder given to dairy cows needs to be included in any regulations that are developed. Although developed countries have already implemented comprehensive regulations, it is recommended that the Chinese baby dairy product industry also introduce regulations for mycotoxin (aflatoxins are a sub-group of mycotoxins) control. If feed is imported from other countries, then it must comply with safety and quality regulations and there must be prescribed limits for the amount of heavy metals, aflatoxins and pesticides it can contain. In the UK, for example, if Salmonella bacteria are found in feed, then this must be reported directly to the chief veterinary officer at DEFRA (Pryce et al., 2015). It is recommended that the Chinese baby dairy product industry adopts a similar practice because this will allow it to reduce the risk of the fodder containing harmful substances, resulting in better quality management.

#### **10.4.1.2. Quality of cows**

Superior breeds of cow produce good quality milk and only superior breeds should be used on dairy farms. A superior dairy herd can only be developed with appropriate planning and one way of achieving this is to utilise the skills of animal husbandry specialists. Such people have the relevant knowledge, skills, qualifications and experience to manage dairy cows properly and it is recommended that those baby dairy product companies who own their own farms should make use of them.

This research has found that the nutritive indices of the milk depend on the cows.

However, there are still many dairy farmers who are unable to provide the required feed and environment for reaching the desired levels in the nutritive indices.

For efficiency of the milk production process, the automatic milking system should be used. Some dairy farms have already adopted these; however, there is a need for such systems to be adopted by all dairy farms because not only does an automatic system improve efficiency, it also results in fewer quality problems. In the robotic milking process there is minimal contact with human beings and, therefore, there are fewer chances of the milk being contaminated.

In adopting robotic milking, it is important to ensure that cows' qualities and characteristics are suitable for such a system. Dairy farmers need to select cows according to certain characteristics (pre-defined criteria) and this information needs to be included in an animal management plan. Those cows that are to be milked using robotic technology must be highly productive and very healthy. Even a healthy and high-yielding cow could not be used with an automatic system if it did not have the right kind of calm and stable temperament required for such a system. In addition, cows need to have correctly placed teats along with healthy legs and feet, and good movement. Modern genetics treatment can be used for improving udder conformation, and selection of cows for dairy farms should be on the basis of their rear teats not being too close together; if they are too close it is difficult for the robots to attach teat cups. In addition, any cow showing unwillingness to go near the robot is classed as an inferior cow unsuitable for robotic milking and may well be culled.

The purpose of robotic milking is time efficiency, and an uncomfortable or stressed cow that avoids the robot will only negate the objective. In addition, the speed of milking is related to the temperament of the cow; a nervous animal has higher adrenalin levels that block the oxytocin reflex that can interrupt the milk let-down. Naturally, this has an adverse influence on the milk yield, resulting in lower profitability. Furthermore, if there are any problems with a cow not being milked properly, there is a greater chance of mastitis.

The behaviour of cows during the milking process is, therefore, very important and baby dairy product companies need to take this into consideration. Some companies emphasise the milking speed and overlook the factor of the cows' temperament. It is recommended that Chinese baby dairy product companies focus on the temperament of cows when selecting and developing animals in order to improve the milking process, and that they utilise the services of animal management specialists who can help to ensure the uniform behaviour of cows.

Other than being of the right temperament, cows must be good grazers and feeders, fit, capable of producing well in a high-performance environment, capable of moving well and able to make their own way to the robots. Lazy and unfocused cows will not contribute to making efficient dairy farms. An animal management plan must incorporate required traits in the selection criteria for cows. Certain types of cow have aggressive bloodlines; hence they are able to work harder in a high-performance environment. Dairy farms must have cows that are able to work with the minimum of intervention.

Genetic predisposition is another important factor when selecting cows. Superior breeds are predisposed to certain attractive traits, and breeding programmes can ensure that appropriate animals displaying longevity, fertility and health are produced. Other than the traditional fitness traits, such as measures of mastitis and lameness, lifespan or calving interval, temperament traits should also be considered as selection criteria for breeding programmes. There are three parts to a cow's temperament: fearfulness, activity and sociability. Fearfulness refers to the levels of fright and excitement shown by cows under stressful stimuli. There is a significant relationship between fearfulness and immunity to mastitis infection. Similarly, the level of fearfulness also influences the probability of becoming lame. Activity refers to the level at which cows are consistently active when isolated from other members of their herd. Sociability shows the motivation level of cows to be with other cows (Hurley et al., 2016). Those cows which are vocal during the period they are kept isolated from their herd— a sign of sociability – are more likely to perform better in the milk ejection process when robotic

milking is started. Choosing cows on the basis of temperament traits will improve their robustness and it can be said that certain temperamental traits are an indicator of cows adapting to practical husbandry conditions. However, this does not mean that only calm, non-fearful and non-aggressive cows should be selected, but those cows which show the appropriate responses to the challenges they are exposed to.

Furthermore, cows should be milked in a way such that their functioning is not adversely affected. Experts of dairy farming suggest milking cows in one cycle from 270 to 365 days. Although dairy cows can be milked for 400 days, it is not advised to milk them for this long as it could have a negative influence on their second breeding cycle (Kebreab et al., 2013). Dairy farmers are highly recommended to keep accurate records for the milking time span of cows for appropriate regulation. Also, many of dairy farmers are still working on decentralised milking system. It is recommended that they should move towards centralised milking system at milk stations.

It has been found that in the Chinese baby dairy product industry, those companies owning their own farms import superior breeds of cow (in terms of their traits) from abroad. These superior breeds are interbred with Chinese cows in order to produce animals with similar favourable genetic traits. Chinese baby dairy product companies have introduced their own strict standards for selecting cows, better even than national and international standards. Because the source of milk is so important, dairy cows' traits must be taken into consideration because they are such a vital factor for high quality milk. In the UK baby dairy product industry, it has also been observed that superior breeds of cow are used to make sure that the quality of the raw milk is good, therefore eventually leading to a better quality of final product. It is recommended that Chinese baby dairy product companies that are not yet doing so need to start selecting superior breeds of cow with appropriate traits for their farms and plan properly for dairy cow management.

#### **10.4.1.3. Production of raw milk**

In Chapter 7, it was found that the quality of the raw milk used by Chinese baby dairy product companies was sometimes poor, creating problems for the quality of the final

product at a later stage. To improve the quality of the companies' end products, there is a need to include effective raw milk production in the animal management plan because the raw milk is the essential ingredient of all the products. Therefore, by ensuring that the raw milk is produced effectively, the raw milk obtained from the cows will be of a high quality.

Production of good quality raw milk depends on the effective management of the cows. Those cows that are satisfied and happy are more likely to produce a good quantity and quality of milk. It has been found that in the UK baby dairy product industry the cows are managed for both inside and outside feeding depending on the weather. If the cows graze outside, it is important to manage the land for sufficient quantity and required quality of feed. If the weather is not pleasant, it is better to keep the cows inside, but it is important to maintain a balance between grass and grazing, and providing inside feeding, and this should be included in the animal management plan.

The production of raw milk is also influenced by the feed given to the cows. Cows can get mastitis through their feed, and this has serious consequences for the quality and quantity of the raw milk. Therefore, it is important to provide quality feed to cows, otherwise their milk production is severely affected, which ultimately influences the quality of the final baby dairy products. This matter can be addressed by baby dairy product companies including the minimum acceptable level of quality for all types of cows' feed in their animal management plan. This minimum acceptable level of quality for feed should also be consistent with the laws, regulations and standards used to measure quality in the baby dairy product industry.

It has also been found during this research that cows should not be stressed in any way at all. There are a number of ways of addressing this problem and providing the best possible environment for cows which also reduces the risk of the milk becoming contaminated: barns should be cleaned regularly to get rid of waste matter, and they should be properly ventilated; cows must have the opportunity for exercise when kept inside; clean, natural bedding should be provided and changed regularly and mattresses should

be provided for them to lie on indoors to protect their udders; scratching machines should be provided for the cows to rid themselves of parasites; and a supply of water should be readily available. Creating the optimum environment for cows is part of quality management and, in an ideal environment, outsiders making essential visits to dairy farms should wear protective clothing in order to reduce the risk of infection as much as possible.

#### **10.4.1.4. Modern animal husbandry**

In order to promote the high quality of dairy products, a reliable and safe source is one of the most crucial ingredients required. The practices of breeding at dairy farms in China need to be updated by the adoption of modern animal husbandry, and in order to promote modern animal husbandry to the Chinese baby dairy product industry there is a need for support from the government and companies already engaged in it. Animal husbandry is defined as the care and management of farm animals such that advantageous genetic qualities and behaviour are developed in them (Quigley et al., 2013). For example, for breeding calves, artificial insemination could be used. Modern animal husbandry requires a team of professionals; therefore, such people, who can take care of every single aspect, related to the development and breeding of cows, need to be employed by baby dairy product companies. For example, the amount of milk given to cows must be sufficient for their growth and development.

As said previously, selective breeding and other animal management practices are important for ensuring the quality of baby dairy products. Therefore, it is recommended that the Chinese government and large companies with experience (as a socially responsible practice) should invest in improving the breeding and animal management practices of small dairy farmers, for example, helping them to take steps to promote the most desirable traits in dairy cows. Due to lack of economic capability, small dairy farmers are unable to do anything like this at the moment.

Modern animal husbandry has found that, for healthy cows, the availability of clover and forage grass is critical in the pasture environment. These 2 types of feed are high

in moisture and energy content which is good for cows' health and enables them to produce milk with a higher nutritional content. Cattle use their 5 widely recognised sensory modalities in their complex behavioural patterns. For example, in the pasture environment, dairy cows show a preference for 30 per cent forage grass and 70 per cent clover. This preference is based on diurnal patterns where they prefer to have clover in the morning but forage grass in the evening. Therefore, it is recommended that this ideal pasture environment for cows should be created on the farms owned by the large baby dairy product companies and operated properly and efficiently in the most cost-effective way possible.

For resolving the problems related to breeding and animal husbandry, it is recommended that the Chinese baby dairy product industry should be required to implement good husbandry practices. These would be a set of rigorous standards for ensuring the health of cows. With the implementation of these practices, the mortality rate of cows could be reduced, but this would demand investment in managing any illnesses and provision of appropriate medication, and involve addressing subsequent lost production. Dairy farmers need to adopt those practices through which they could focus on optimising the production level of their cows. Any animal management plan to include good husbandry practices must also involve aspects related to waste removal, including separation of the solid and liquid waste material to prevent blockages in pipes, important for reducing environmental pollution. There is a need for baby dairy product companies to help the small dairy farmers who are their suppliers to adopt these practices. One way of doing this would be to arrange awareness programmes for the farmers. Another method would be to arrange for relevant company experts to visit the farmers to help them implement modern husbandry practices. The large baby dairy product companies must understand that their help and investment is beneficial for quality management throughout their supply chain. Conversely, small dairy farmers should be willing to adopt these practices in order to ensure the quality of the raw milk they produce. The overall QMS can only be improved if there is a collaborative effort from all stakeholders.

#### **10.4.1.5. Prevention of disease**

Epidemic diseases, such as bovine tuberculosis and foot and mouth, can result in a higher mortality rate for cows and in their reduced productivity with a resulting poorer quality of milk. On a lesser scale, it is common for cows to get mastitis and be infected with parasites, and this has been observed in the Chinese baby dairy product industry supply chain. These diseases do not cause death but, because of them, the productivity of cows declines, maturity is delayed, fertility diminishes and, most importantly, the milk quality is poorer. Such diseases have an influence on human health as well, i.e. drinking contaminated milk. The diseases are due to the limited knowledge of small dairy farmers in relation to disease prevention and effective management and control and the fact that they usually have few resources to invest in animal health and disease prevention. Therefore, in order to address this problem, it is recommended that the Chinese government take adequate measures to improve the health of and prevent the spread of disease among cows along the same lines as those already introduced in the UK. It is suggested that there should be specific legal controls along with biosecurity measures applied to dairy cattle. In relation to biosecurity measures, general principles related to the movement of stock, disinfection of vehicles and disinfection of clothes worn by people who travel between dairy farm sites should be introduced. In addition, it is recommended that, as per the law in the UK, animal by-products (ABPs) must be transported in covered, leak-proof containers/vehicles (Brooks-Pollock et al., 2015). Furthermore, again in line with UK practice, fallen stock should be managed carefully in order to prevent the spread of disease and the Chinese government should help small dairy farmers in disposing of carcasses.

When a notifiable disease, such as foot and mouth, is identified in cows, as per regulations in the UK, it is recommended that the appropriate restrictions must be implemented on the farms in question, including restrictions on visiting in order to control the spread of the disease. In the UK, anybody making an essential visit has to use the vehicle, clothing and footwear which are disinfected. If what is termed an exotic disease (such as foot and mouth), which could result in an epidemic, is confirmed, the

UK government must cull all affected animals in a humane manner. An area restriction with a protection zone of a minimum radius of 3 km is set up around the infected premises with the addition of a surveillance zone with a minimum radius of 10 km. The movement of animals outside the protection and surveillance zones is restricted to help reduce the risk of spreading the disease more widely. The UK government must empower local authorities so that they can take measures for preventing the spread of epidemic diseases in dairy cows when they occur and it is recommended that the Chinese government does the same.

It is recommended that large baby dairy product companies who have sufficient resources must adopt appropriate measures for disease prevention in animals by introducing and monitoring appropriate practices on any farms that they own and, in addition, encourage small dairy farmers to take measures for eradicating and preventing diseases, both common, everyday ones and epidemics. Measures should include: visitors to farms wearing protective clothing to reduce the risk of spreading infection; isolation of infected animals; disposal of infected carcasses in the appropriate manner; appropriate measures for the movement of animals, vehicles and personnel around and off the farms; and continuous disinfection of premises. In general, for disease prevention, it is recommended that large dairy product companies could introduce a disease prevention/animal health programme. It is not possible to recommend a standard animal health programme, but with the help of basic guidelines measures for disease prevention can be implemented.

It is recommended that cows must be selected from reliable sources that can supply healthy stock which is inherently vigorous. Further recommendations are as follows: when new animals arrive on the dairy farms, they must be quarantined and monitored for diseases before they can be kept with other animals; all cows must undergo a programme of vaccination; animals must be constantly monitored for disease and, if any problem is diagnosed, the affected animal(s) should be isolated and the best treatment along with eradication and control measures arranged; and herd records should be kept meticulously with details of disease problems, medication and

vaccination history. It goes without saying that the milk from any affected cows should not be mixed with other milk as only qualified milk should be used in further processing.

For animal health and the prevention of disease it is important to select animals appropriate for the local environment. It was found in the case study organisations from the Chinese baby dairy product industry that superior breeds of dairy cow are imported to ensure the highest quality of milk. This must be done bearing in mind that animals must be able to adapt to the Chinese environment and be able to cope with the local climate, resist endemic diseases and local parasites and feed on available resources. When animals are imported from a different environment, their vulnerability to endemic diseases remains higher as they do not have the required immunity.

A good quality of feed is another important factor with regard to the prevention of diseases in cows. There are various processes that could be adopted for eliminating substances from feed that affect its nutritive value and safety for animals. For example, heat treatment could be applied to feed and this is an effective process for controlling contamination with *Campylobacter*, *E. coli* and *Salmonella*.

#### **10.4.2. Control over dairy farms**

In the Chinese baby dairy product industry there is a need for a controlled milk source because, as the research has found, there are many problems that occur at the source of the milk. Baby dairy product companies need to have proper control over the milk source in order to ensure its safety. Interviewees also recommended the integration of the milk source as an effective solution for quality problems. Companies that can afford to have their own dairy farms are in a much better position to ensure the safety and quality of milk. It is, therefore, recommended that, if they have the resources to do so, more baby dairy product companies should take the step of owning their farms. By doing so, they could take care of every aspect related to the source of milk from the feed given to cows to the milking process. However, it is understood that this is not feasible for small companies.

If it is not possible for Chinese baby dairy product companies to have their own farms

then, instead, it is recommended that appropriate measures must be taken to introduce control over supplier farms. Such measures should include: regular visits from quality assurance personnel and reports from dairy farmers regarding the implementation of quality standards. A further recommendation would be for disease prevention/animal health programmes to be introduced.

For addressing potential problems related to the source of milk, it is recommended that Chinese baby dairy product companies inspect the quality of milk at the dairy farms. The traceability system in China is not robust and, once milk reaches the production plant, it can be problematic to trace where any contaminated milk has come from. Indeed, it is recommended that the Chinese baby dairy product industry develop a robust traceability system. However, this is not an easy thing to do and implementing it will take time.

It was also observed during the melamine incident that those baby dairy product companies that had control over their dairy farms were able to avoid the quality problems experienced by others. A controlled milk source will allow the companies to manage quality in an efficient manner. Among other things, they can keep a strict control over feed, ensuring that harmful and forbidden substances are not added to milk this way. The focus group discussion also led the researcher towards the viewpoint that integration of the dairy farms into the supply chain will enable the baby dairy product companies to avoid quality problems. Quality management depends on the integration of all supply chain actors.

### **10.4.3. Quality of raw materials**

#### **10.4.3.1. Quality of fresh and raw milk**

The raw material, which is then further processed and used in the manufacture of baby dairy products, is vitally important and must be of superior quality. Therefore, it is recommended that the milk is rigorously inspected when it arrives at the production plants from the dairy farms. The melamine incident was the result of the raw milk not being inspected. It has been observed in this research that Chinese baby dairy product

companies are now carrying out rigorous inspections at this stage to avoid quality problems later on. Only qualified milk should be used for production, while unqualified milk should be destroyed under supervision.

#### **10.4.3.2. Procurement of raw materials**

The raw materials used in the production process can affect the safety and quality of the end products. Therefore, it is recommended that all raw materials used in the manufacture of baby dairy products should be of the best possible quality and obtained from those suppliers who have obtained quality-related certifications. Other than raw milk, the manufacturing process uses other ingredients (e.g. vegetable oils, lactose, protein and a vitamin–mineral mix) and the quality of these also needs to be taken into consideration (Wang et al., 2015). Before any ingredient is used in the production process, it must be inspected by the quality assurance/control/inspection department. It has also been found that in the UK baby dairy product industry the quality of the raw material is critical for the quality of the final product.

#### **10.4.4. Animal management plan**

In the above sections, various recommendations have been made for improving the quality of the milk. This section recommends that dairy farms must develop an animal management plan outlining the internal rules and regulations for managing the farm in a cost-effective manner.

Other than this, the following recommendations are also made:

- **Performance goals:** It is not possible to reach a destination if it is not known where this is. In other words, dairy farms need clear quality goals. These goals must be specific, measurable, achievable, realistic and time specific. For example, goals should be developed in relation to the somatic cell count, the level of antibiotic residues, standard plate count and infection rate. It is recommended that Chinese dairy farmers should adopt best practice from the Western world with regard to quality goals and they should strive to work towards achieving them.

- **Problem identification and monitoring:** Only those dairy farms that have appropriate methods of monitoring animal performance can manage the quality of the milk effectively. It is recommended that dairy farms should have on-farm monitoring programmes. Furthermore, they should also implement risk management practices for controlling and monitoring farm practices. As the size of farms increases, the milking process has to be even more closely managed and monitored. When many different people are milking cows, there is more chance of losing control of the milking process. Without a clearly defined monitoring system, dairy farm managers will have no information about, e.g. the rate of clinical mastitis. In order to resolve a problem, it is important to detect it first; therefore, any monitoring system must be robust enough to report all issues that might affect the milk quality. Once a problem is identified, appropriate measures for resolving it can be taken.
- **Training of staff:** Different types of people work on dairy farms and a lot of them are non-professionals. Therefore, it is of the utmost importance to train them, so that they know how to comply with the appropriate standards with regard to the quality of the milk. It is recommended that Chinese baby dairy product companies and the Chinese government should collaborate with regard to developing training programmes for dairy farm staff. The investment in staff will indicate to them that quality management is crucial, hence their commitment to quality should improve. In turn, this should result in dairy farm staff having increased motivation for working towards the fulfilment of quality-related goals.
- **Use of professional consultants:** There are various issues in relation to dairy farm management that cannot be handled by the dairy farm owners and managers. Therefore, it is recommended that they should take advice from professional consultants and that the government should establish a system whereby small farmers could get such professional advice at a reasonable price. Consultants could help dairy farm managers to devise animal management plans

with quality at their heart.

#### **10.4.5. Role of dairy farmers**

The results of this research showed that small dairy farmers are not complying with the standards related to quality. This is the root cause of quality problems in the baby dairy product industry. When farmers do not comply with the standards, it is not possible to ensure the quality of the final product because the quality of the raw milk, the core ingredient of infant formula milk, cannot be ensured. It is, therefore, vitally important that all farmers comply with the relevant quality standards. To promote compliance, it is recommended that the government should play its role by creating awareness among farmers of the benefits that could be obtained by doing so. A further recommendation is that the government should monitor the implementation of quality standards more strictly. Those farmers who do not comply should run the risk of being put out of business and, in addition, penalties for non-compliance must be enforced. Baby dairy product companies who buy milk from farmers for further processing should also play an active role and only purchase raw milk from those farmers who are ready to provide a quality product by complying with the appropriate legislations.

#### **10.4.6. Quality and safety inspections**

It is quite common for quality and safety problems to arise from raw materials and this is one of the most important factors that can cause quality issues. As it has been found that many problems occur at the source stage, it is vitally important that raw materials are inspected rigorously with a whole series of tests. It is recommended that when milk from farms arrives at the production facilities samples must be inspected and the milk examined for quality based on the established quality standards, both internal and national. If the milk does not meet the set criteria, it should be rejected and either sent back to the farms or destroyed immediately under supervision. If it has come from a third-party farmer, then due consideration must be given as to whether the contract continues. The milk which arrives must be tested for freezing point, cell counts, germ count, any traces of antibiotics, PH value of the fat, visual purity and butyric acid bacteria. There should be appropriate measures to monitor the milk with regard to

harmful substances, such as aflatoxins, dioxins, heavy metals, PCBs (polychlorinated biphenyls) and traces of pesticides (Martin et al., 2015).

The milk should also be tested by the regulatory bodies. Currently, state supervision is ensured with the help of sample surveys for assessing quality. These sample surveys need to pay attention to the quality and safety of ingredients used in the production process in general, but specific tests could look at hygienic indices of microorganisms and the presence of heavy metals. It is recommended that the Chinese government increases the sample coverage and frequency in order to increase the potential for identifying any problems.

#### **10.4.7. Technology in the pre-production stage**

Advanced technology can be used for both feeding and milking cows and it improves animal management. Many companies have already adopted robotic feeding to help them feed cows in a more efficient manner. In addition, this research has shown that automatic milking, with its increased levels of cleanliness and hygiene, can ensure that the milk does not get contaminated during the milking process because it does not come into contact with air and does not require hands-on input. It has already been said that inspection of the raw milk is vitally important and this can be done far more effectively with advanced technology. Whatever advanced technology is used, it must be regularly checked and maintained properly to ensure that it is operating to standard.

#### **10.5. Information-sharing system in the Chinese baby dairy product industry**

It has been found in previous chapters with regard to quality management in the Chinese baby dairy product industry that China's public disclosure system needs to be improved. At the moment, this is one reason why supply chain actors are unable to share information with each other. The solution to this problem is for information sharing to take place at all stages of production, and for all supply chain actors to play their part in ensuring that information is shared in a transparent fashion with others. Other than transparency of information, digitalisation of information is also important for it to be

easily accessible. Furthermore, traceability at every stage of production for finding the root cause of problems is very important for quality.

In order to manage quality in the best possible way, record-keeping systems should be electronic, preferably in the form of spreadsheets or databases. Farmers often use handwritten records for information such as weight, milk quantity, type of cattle, feed given to cows, etc. However, it is difficult to share this format of information with other supply chain actors on a real-time basis and electronic records need to be developed. Likewise, suppliers, warehouse managers, distributors and retailers should also move towards developing electronic information systems. The application of information technology to the baby dairy product industry will also help to reduce production and unit costs. In addition, the physical working environment will improve, and efficiency of production will increase. Electronic information sharing will facilitate managers' decision making, and they will be in better position to solve quality problems from the very beginning.

From the analysis of UK companies, this research has found that quality problems could be solved through information sharing and the establishment of a robust traceability system. As both companies are sharing information extensively among all supply chain actors and government has developed a traceability system, this could be a good example for Chinese baby dairy product industry to set up a similar system. However, there is currently no or very little information sharing between all of the supply chain actors in the Chinese baby dairy product industry. Therefore, there is a need to encourage information sharing and foster the development of a robust traceability system for the industry. Through proper information sharing between all stakeholders, quality issues and problems could be investigated, controlled and corrected in good time. Such an information-sharing system is one of the foremost requirements for improving the quality of baby dairy products. Although it requires advanced technology that might be expensive, large companies need to consider this as an investment, and take steps to develop a traceability system to include every supply chain actor. With such a traceability system, the Chinese baby dairy product industry will be in a much

better position to manage quality. In the UK baby dairy product industry, it has been observed that quality is managed through a strong traceability system. It is recommended that the Chinese industry follows suit. The following sections contain suggestions for establishing a traceability system in the Chinese baby dairy product industry and these should be considered as basic principles for developing such a system.

➤ **Identification and recording of lot IDs:**

Lot IDs are referred to the identification number which is assigned to certain quantity or lot of any materials or products. When any raw materials enter a production facility there should be a specific method for recording all the lot IDs. Each raw material should also have its own identification mark. Training in the use of lot IDs should be provided to employees.

➤ **Identification and recording of flows:**

At this point, it is important to identify the main flow paths in the production facility through which raw milk and other raw materials are transformed into baby dairy products and there needs to be a specific method for recording all of the identified flows. Again, training should be provided to employees so that they are able to record these flows in a consistent and accurate manner. Records of flow paths should be kept in a manner such that it is easy to relate them to lot IDs.

➤ **Label final products with human-readable lot IDs:**

Once the final product is ready, it should be labelled with a simple, human-readable lot ID that will become the primary means of identification of the product, and can be easily found.

The requirements for an effective traceability system are advanced information sharing and people who have the expertise and skills to use it. In implementing such a system, it will be essential to give training to employees. Taking into account the specific features of the Chinese baby dairy product industry, more training will be required at the pre-production stage because people working here are less skilled.

## **10.6. Roles of the governments**

### **10.6.1. Role of the government in technology**

It has already been said that tracing the problems that cause quality issues with regard

to baby dairy products is a challenge because there is little coordination among supply chain actors and it is difficult to identify at which stage a particular problem occurred. The need for a traceability system has already been discussed and this will not be easy to develop because of local conditions in China. It is recommended that the Chinese government should play its part and subsidise the process of developing a traceability system. It also needs to work on improving the institutional infrastructure in order to eliminate duplication of duties between departments and establish categorically who is responsible for what. Otherwise, the development of a traceability system could get lost in internal government politics. It is further recommended that the government needs to take initiatives for controlling corruption in the management of the baby dairy product industry management so that planned new developments are not blocked.

There are various supply chain actors who do not have the economic capability to invest in developing a traceability system and it is recommended that the government should make an investment on their behalf by providing subsidies and tax rebates to companies prepared to make an effort to develop a new system. Once such a traceability system has been developed, training on how to use it would be another step forward for implementing QMS in China's baby dairy product industry. Most importantly, training will be required by farmers and herders who will have no appreciation of such a thing. Therefore, it is important for the government to arrange training for such supply chain actors.

It has been found in this research that there is a need for planning, investment and training for developing information sharing leading to a traceability system for finding the root cause of quality issues. This must be done with the involvement of all key supply chain actors and the government.

#### **10.6.2. Role of the government departments**

The process of managing quality involves various stakeholders. Besides milk producers and baby dairy product manufacturers, a number of government departments play roles important to the baby dairy product industry, and examples of the areas covered are: water, agriculture, the environment, information technology and administration.

Involvement by government departments (and cooperation between them) is important for ensuring the quality of end products because they should have oversight of production at all stages through inspections. For example, soil, cattle, and feeds come under the MOA, while water comes under the Ministry of Water Resources (MWR).

A summary of the current roles and responsibilities of Chinese government departments is provided in the table below:

Table 10.1: Summary of roles and responsibilities of Chinese government departments.

<b>Chinese Government departments</b>	<b>Roles and responsibilities</b>
MOA (Ministry of Agriculture)	Agricultural and environmental issues.
MWR (Ministry of Water Resources)	Water resources.
AQSIQ (Administration for Quality Supervision, Inspection and Quarantine)	Management of quality, inspections, health quarantine, animal and plant quarantine, certification and accreditation, import–export food safety, standardisation and administrative law enforcement.
SAIC (State Administration for Industry and Commerce)	Developing legislation for the administration of industry and commerce.
FEHD (Food and Environmental Hygiene Department)	Food safety, food inspection, food standards, licensing and other environment-related issues.
MIIT (Ministry of Industry and Information Technology)	Implementation of regulations, development of an Internet service, postal service, communication, manufacture of electronic/information technology products and oversight of the software industry.

Source: Official websites of Ministries, 2016.

### **10.6.2.1. MOA**

This research has found that agricultural regulations play an important role with regard to animal management, including the feeding process. China's MOA should, therefore, emphasise the quality aspect so the quality of the feed that is given to cows is improved. Currently, the MOA has responsibility for agricultural and environmental issues and deals with fisheries, agriculture, horticulture, animal husbandry, foodstuffs, animal welfare, hunting, and education and research in agriculture sciences, as well as dealing with related consumer affairs. It is recommended that it needs to add a perspective focusing purely on the baby dairy product industry as follows: monitoring of the quality of feed; responsibility for designing laws, regulations and standard that are advantageous for dairy farms; encouraging farmers to take appropriate measures for quality; and pasture management.

It is recommended that many of the aspects not covered by the new Food Safety Law should be covered by the responsibilities of the MOA. For example, the new Food Safety Law does not include the planting of fodder crops and breeding; therefore, the MOA must look into these activities. Farmers use chemicals and fertilisers on the land and various types of medication and hormones for breeding. The MOA should keep a control over the use of these substances and the use of any potentially poisonous ones should be completely prohibited.

As per the current situation in China, many of the farmers are unable to take any measures for improving the processes of cultivating crops, so it is recommended that the government starts giving loans at the minimum possible interest rate (less than 5 per cent). A ceiling of CNY 2.5 million (equivalent to GBP 0.28 million) for individuals and CNY 5 million (equivalent to GBP 0.56 million) for corporate entities is recommended. In order for dairy farmers to be able to have access to advanced machinery to improve the quality of fodder for cows and efficiency of harvesting it, it is further recommended that the government needs to introduce some sort of leasing system. In addition, in order to alleviate the adverse impact of extreme weather conditions, such as drought, on crops, the government needs to provide assistance to

farmers. It should be the responsibility of the MOA to implement an action plan for improving the amount and quality of cows' feed (including growing hay and silage) in order to provide the most nutritive type of fodder for the best-quality milk. Furthermore, herd recording programmes should be introduced in order that dairy farmers can identify those animals with high yield potential. The government could also start developing agroparks where the same type of integrated supply chain could be applied to the crops as it is recommended be introduced in the baby dairy product industry.

Another recommendation would be for the MOA to develop an animal facility management programme for breeders, dealers and farmers concerned with dairy farming. The purpose of this programme would be to ensure that quality standards with regard to feed, shelter, maintenance, veterinary care, and identification and record-keeping requirements are met by these supply chain actors.

In addition, it is recommended that the MOA should start licensing programmes for the supply chain actors at the 'source' of the baby dairy product industry. This research has found that the quality problems exist at the source stage, therefore, it is particularly important to eradicate the problems here. The researcher's viewpoint is that this could be resolved through such licensing programmes and only those farmers should be able to continue operating who obtain licences related to their function. For example, Food Safety and Standards Authority of India (FSSAI) has started licensing and permit programs for dairy farmers. It is recommended that similar programmes for Chinese dairy farmers related to cattle are introduced. Those farmers who meet the inspection criteria should be given some kind of privileged status through which they could also get additional benefits in the market. Schemes such as this would motivate farmers to meet rigorous standards and apply for elite status, giving them a good standing in the industry (Potter and Hotchkiss, 2012).

It is also recommended that in order to eradicate the problems identified completely, the MOA needs to involve its field staff and the general public in order to help identify farmers who are working without a licence. Furthermore, if animal facility management

programmes are started by the MOA, it is recommended that staff employed by these conduct routine inspections at the dairy farms, investigating complaints received by MOA field staff and the general public in relation to possible unlicensed facilities. In addition, under this programme, it is recommended that the MOA should educate farmers with regard to animal husbandry practices such that they manage their animals to a standard where there is little chance of quality problems occurring. The staff carrying out this programme and responsible for its management should be appropriately qualified and ensure that laws, regulations and standards related to quality management are fairly and consistently enforced.

In summary, China's MOA needs to dedicate time and resources to reviving the Chinese baby dairy product industry.

#### **10.6.2.2. MWR**

The MWR is responsible for managing water resources in China. The baby dairy product industry relies heavily on a good supply of water at all stages and, for example, it has to be ensured that a sufficient quantity of water is available for the cultivation of fodder crops. There should not be any harmful pollutants in water used during the cultivation process because these could lead to quality problems with the fodder, ultimately resulting in cattle disease and a poor quality of milk. Furthermore, cows need a substantial amount of clean water to drink and this also needs to be free from any pollutants. Water is also utilised during the processing of milk at the manufacturing plants and its purity needs to be ensured.

#### **10.6.2.3. AQSIQ**

Quality is a core responsibility of AQSIQ which is in charge of national quality, inspections, health quarantine, animal and plant quarantine, certification and accreditation, import–export food safety, standardisation and administrative law enforcement. The department directly administers the provincial Quality and Technical Supervision Bureaus. From this research, it was found that the interviewees believed there was a problem with regard to enforcement authorities because they were often

unable to identify quality problems due to corruption, ineffective inspection or irresponsibility at their end. Therefore, it is recommended that this particular government department must start working more proactively, which means it must be able to detect quality issues before these affect the baby dairy product industry. It was found in this research that quality-related laws, regulations and standards are not implemented strictly enough and this situation needs to be rectified. AQSIQ needs to start enforcing the regulations by means of harsh penalties for not complying with them and the penalties should not only be for milk companies but for all supply chain actors.

Moreover, under the inspection system organised by this department, it is recommended that rigorous inspections should be carried out and that every baby dairy company should pass the quality tests in order to be able to sell their products on the market. Currently, rules are relaxed for small companies to allow them to meet the criteria. It is recommended that this practice should be stopped and there should be no relaxation of the rules for any company, large or small. The scope of these inspections should also cover the sources of the raw milk, i.e. the dairy farms.

Under the existing production licensing system, this department issues licences to those companies that control the quality of the final product. It is recommended that it should also issue licences to those companies that can control the quality of the raw materials as well, e.g. in the case of the baby dairy product industry, only to those milk companies and milk processing companies that have sufficient control over the quality of the raw milk. The emphasis on the source of the products should be increased and, in relation to processing companies, the rigorous criteria for obtaining a licence need to take into account such factors as product standardisation, production equipment, testing equipment, quality control, technology, the environment, packaging and production staff. No baby dairy product company should be allowed to function in the industry without such a licence. For the award of a licence, the quality and safety at dairy farms and milk collection stations should be examined along with the final product. Any company that does meet the criteria for an already awarded licence in future inspections should have its licence revoked, and a list of any baby dairy product companies who

have had their licences revoked must be publicly available on the website of this government department and updated regularly. It should be the responsibility of this government department to create public awareness with regard to licences so that consumers do not take the risk of buying products from unlicensed companies.

#### **10.6.2.4. SAIC**

The SAIC is responsible for developing legislation for the administration of industry and commerce and, currently, there is a need to revise the legislation relating to quality in the baby dairy product industry. Any new legislation introduced needs to enhance the quality level requirement for raw materials. When it comes into force, companies that are unable to comply with the new regulations will not be able to operate in the industry any more. This will be advantageous for the overall health of the baby dairy product industry, because events like the melamine incident could be stopped. This government department has already taken the US as a role model, and has adopted reforms, initiatives and best practice from this country. It is recommended that the SAIC should continuously improve the laws, standards and regulations related to the baby dairy product industry in order to ensure that it only makes the best-quality products.

It has been found that the Chinese baby dairy product industry lags behind others in relation to welfare regulations. As the SAIC is responsible for the development of legislation for industry, it is recommended that it should work on welfare regulations for the baby dairy product industry. As in other countries, especially EU member states, including the UK, it should encourage the establishment of a Farm Animal Welfare Committee where a variety of issues related to animal welfare and animal husbandry could be discussed and managed in relation to dairy farm animals, and where guidelines for the welfare of animals could be developed. It is recommended that any such guidelines are implemented on all Chinese dairy farms. As the foundation of its work, it is recommended a Farm Animal Welfare Committee should consider 5 needs of animals: (1) freedom from hunger, thirst and malnutrition; (2) freedom to express behaviour as per the normal pattern; (3) freedom from discomfort; (4) freedom from disease, pain and injuries; and (5) freedom from distress and fear (Eldred, 2015).

Animal welfare also includes stockmanship, and it is recommended that the SAIC should introduce regulations for promoting the acquisition of stockmanship skills at all dairy farms. There is a need for formal training in this area and mentorship under an experienced person. Competence in stockmanship should be considered mandatory for all dairy farmers.

The SAIC works on the principle of maintaining quality in all industries and the quality of products in the baby dairy manufacturing industry could be improved when improved legislation is introduced in China.

#### **10.6.2.5. FEHD**

This department reports to the Health, Welfare and Food Bureau and is responsible for environmental and food hygiene. Its responsibilities include food safety, food inspection, food standards and licensing. This department needs to work actively in order to promote quality in the Chinese baby dairy product industry and it is recommended that it arranges regular and random audits and inspections at all facilities concerned with this industry: dairy farms, production facilities, distribution centres, warehouses and other storage facilities.

#### **10.6.2.6. MIIT**

This government department is responsible for the regulation and development of: an Internet service, other communications, postal services, wireless technology, production of electronic and information technology-related goods, and the software industry. It is strongly recommended that this government body, in collaboration with others, works on the development of a traceability system, for which its support is required.

Currently, there is a problem with over-administration, where there are many departments with similar kinds of responsibilities. This has made the problem of quality more difficult because the responsibility for implementing and monitoring of food safety laws and regulations is spread throughout various government departments that have overlapping responsibilities. It is recommended that the Chinese government

needs to work on increasing the efficiency and collaborative efforts of all departments in order to meet quality objectives. A continued lack of collaboration would mean there was a chance that companies trying to avoid complying with quality laws, regulations and standards would go undetected and the problems with quality management would never be resolved. Cooperation between government departments is, therefore, essential.

As has been said above, there is no unified administrative body in China that has the authority to deal with all food safety and quality issues and all the above-mentioned departments are working on these to some extent. In this situation, it has become important for all departments to develop detailed rules as to what is in their scope and power. It is recommended that to reduce the cost of law enforcement, and duplication in the work of the various government departments regarding food safety and quality issues, there must be clear responsibilities and rules for each of the departments mentioned above. For the long-term development of the Chinese baby dairy product industry to a stage where quality problems have been completely eradicated, it would be advantageous to have one single authority that could be held responsible for the quality and safety of food.

#### **10.7. Laws, regulations and standards**

Laws, regulations and standards permeate the whole of quality management in the baby dairy product industry. The quality standards which are commonly used are HACCP, ISO 9001, ISO 22000 and GMP, and companies that have adopted such standards are able to manage quality in a much better manner. Furthermore, there is a need for self-developed quality standards for baby dairy product dairy companies because it has been found that the current national standards are not strict enough. It is, therefore, recommended that companies have more stringent internal standards for managing quality, from factory design to plant maintenance, food production and hygiene. Companies that have not yet implemented quality standards should start by implementing relevant internal standards based on a critical analysis of the national and international standards to identify areas of weakness, and on an understanding of how

these can be adapted for local use.

When products are transferred from farm to production facility, quality control requirements should be followed and when products arrive from farms, they should be inspected carefully. The hygiene standards for technical equipment should also be complied with. The whole production process must follow production protocols that have been developed for managing quality. Every supply chain actor in the baby dairy product industry needs to comply with quality standards for best results because the implementation of standards by only one or two supply chain actors can never give the best results for quality management. All supply chain actors should have equal accountability with responsibilities clearly defined, and this should not be considered as something which applies to the production stage only. With clear responsibilities, accountability could be ensured. Laws, regulations and standards related to quality should, therefore, not only target the baby dairy product companies but the whole supply chain of the industry.

This research has found that the design of laws, regulations and standards is satisfactory, but that there is a problem at the implementation stage. The recent revisions that have been made to food safety law in China are expected to improve the quality of food products and, in turn, it is expected that the baby dairy product industry will also benefit from this. The amendments have clarified, consolidated and expanded the pre-existing food safety regulations and more severe penalties for non-compliance have been introduced. As a result, more authority has been given to regulatory bodies and more guidelines have been brought in for the manufacturing of consumer products. Improvements in the design of laws, regulations and standards have, therefore, been made; now, there is a need to focus more on implementation.

The laws, regulations and standards have not been implemented properly in order to protect the small dairy farmers, who are unable to meet strict quality standards. It is recommended that the Chinese government should support small dairy farmers through some other measures, such as loan schemes, because it should not compromise on the strictness of the criteria for meeting quality standards. The government should

introduce such programmes that could improve the capability of small dairy farmers instead of relaxing standards at the expense of quality.

The following are the recommendations for ensuring that every supply chain actor implements the quality standards.

- There should be awareness programmes for supply chain actors with regard to the benefits of implementing laws, regulations and standards in relation to quality.
- There should be penalties for supply chain actors who do not comply with the standards. To be more specific, penalties for non-compliance should be severe enough to motivate every supply chain actor to adhere to the standards.
- The performance of suppliers should be evaluated on the basis of standards implemented. Suppliers who do not adhere to the standards should not be given contracts in the future. Conversely, suppliers who implement the standards consistently should be given long-term contracts.
- Dairy farmers, who are often less educated, and who do not possess sufficient knowledge to implement the standards, must be provided with adequate guidance. Both the government and large dairy farms with resources should assist small dairy farmers to enable them to implement the standards.
- Third parties should be encouraged to implement the standards by being given incentives.
- There should be specific motivation programmes to encourage employers to adhere to quality standards throughout the production process.
- Government bodies should conduct inspections on all supply chain actors in order to check compliance with food safety and quality laws, regulations and standards.

So far, not enough importance is being given to building the capacity of supply chain actors to ensure the safety and quality of food. Therefore, it is recommended that the focus should now shift slightly from punishing those who do not comply with the regulations, to capacity building, such that small dairy farmers become self-sufficient

and self-motivated to ensure quality and safety. The idea of strict penalties could work in the short term and it might motivate farmers to abide by the law but, in the long run, it is important that they build their own capacity to provide safe, quality products. The government needs to play a proactive role in capacity building and introduce measures to engage small dairy farmers.

This research has found that there is now a tendency to use international quality standards in combination with national and internal quality standards. This practice is helping baby dairy product companies resolve their quality-related issues and become more competitive. Therefore, it is recommended that baby dairy product companies who wish to target the international market must opt for international standards. These help in gaining customers' confidence, and it has been found that the stricter international standards provide a better means by which to resolve quality-related problems. A problem with international standards is the feasibility of using them in China due to the local situation and if they cannot be adopted in full, then it is recommended that companies at least use them for guidance when devising their own internal quality standards and customise them at the organisational level.

It might not be within the scope of baby dairy product companies to influence the relevant national laws, regulations and standards because the design of these is the responsibility of the Chinese government authorities. Therefore, companies should adapt the best elements of international standards for use in their internal quality standards.

### **10.8. Summary**

After reviewing the relevant literature and analysing the results of the fieldwork that was carried out in both Chinese and UK baby dairy product companies, a framework for managing the implementation of QMS in the Chinese baby dairy product industry has been presented. Consistent with the findings of the research – that the pre-production stage is the most crucial and that baby dairy product companies should focus on the management and control of dairy farms and on the quality of the raw materials

– this chapter has focused on the pre-production stage. The other two stages of production have less issues and, therefore, they are not part of this framework discussion. It is recommended that the other two stages should be explored in greater detail in future research. It is important to note that all supply chain actors need to participate in information sharing, the core of which would be the introduction of a traceability system. In summary, it can be said that with regard to the whole process of managing quality in the Chinese baby dairy product industry, the roles of the government and of laws, regulations and standards are vitally important. Finally, it must be observed that if QMS are to be implemented successfully in the industry, all stakeholders must be involved.

## **Chapter 11: Validation of the Framework**

### **11.1. Introduction**

The purpose of this chapter is to validate the framework that was presented in Chapter 10. A questionnaire was developed and the same managers (12 in total) who participated in the interviews responded to the questionnaire. Their views are considered valuable for validation as they are directly involved in quality management practices at their respective companies. Farmers were not contacted for this validation because of their limited knowledge under the current situation and the fact that they were open to be influenced by the advice/guidance from the companies which received their raw milk. Each question (also called an item) had three options: agree, neutral or disagree. This chapter presents the findings of the questionnaire using the descriptive analysis technique.

### **11.2. Pre-production stage**

The framework has shown that the pre-production stage of the manufacturing process is critical for the success of the Chinese baby dairy product industry. It covers a number of different aspects, which are presented here. This section validates these aspects by examining the responses of the managers. This section presents the responses of managers for all items of the questionnaire. The questionnaire given in Appendix F has provided list of all items which are used in this section.

### 11.2.1. Dairy farm management

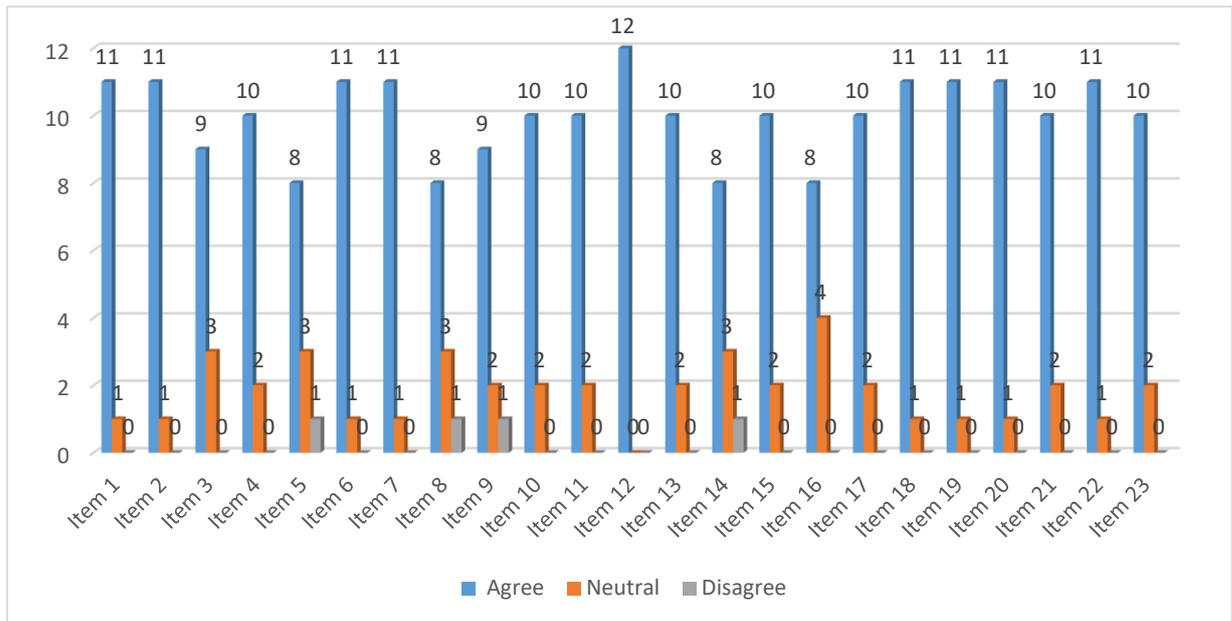


Figure 11.1: Managers' responses in relation to dairy farm management.

Figure 11.1 shows that the majority of managers agreed with almost all of the views with regard to dairy farm management that were presented to them. Looking at the response for Item 1, there was only 1 manager who was neutral regarding the use of a systematic feed management plan that would contain the necessary guidelines and information in relation to watering and feeding cows and the necessary attendant cleanliness. All the other managers agreed that the solution to the problem of contaminated feed was to implement a systematic feed management plan.

Likewise, for Item 2, only one of the managers was neutral with regard to optimising cows' feed in terms of amount and combination. All the other managers agreed with the given statement that cows' feed should have the optimum combination of fodder crops (i.e. sesbania, leucaena and calliandra), wheat, maize and Napier grass, along with stems and banana leaves for their growth and development, weight gain, milk production and reproduction.

Item 3 mentioned the systematic feed management plan where a basal diet, protein, bean straw, lucerne and water were suggested. For this item, 25 per cent of the managers remained neutral, which means there is something here that is not totally acceptable to

them. However, it should be remembered that they were neutral, which does not necessarily indicate their disagreement with this aspect.

The responses to Item 4 showed that 83.33 per cent of the managers agreed that professional experts' services should be used for dealing with the problem of lack of requisite expertise in farmers.

For Item 5, there was one manager who disagreed regarding the involvement of research institutions in managing the quality of baby dairy products. This disagreement might be due to concerns about cost, a factor which is associated with cooperation with research institutions. It is managers' usual perception that cooperation with research institutions requires heavy investment from their side; this might be a reason that managers in dairy baby product companies have not appreciated this aspect. Moreover, there is also a greater tendency nowadays for companies to have their own R&D departments. This might be another reason the managers were neutral about the benefits of collaborating with external research institutions.

In relation to Item 6, the majority of the managers agreed that the cleanliness of storage is vital for preventing diseases and that this must be maintained at all times. As there was only one manager who remained neutral, it could be said that his/her uncertainty was due to the fact that even when cleanliness of storage is maintained, dairy animals could still get various diseases.

Likewise, in relation to Item 7, the majority of managers agreed that following proper guidelines through instruction manuals was something that needed to be done. There was only one manager who was neutral about this aspect and this might be due to the fact that, usually, such instruction manuals are not considered important by either managers or employees.

As far as Item 8 is concerned, the sharing of equipment is a viable solution, but this requires a change in perception and orientation of the managers. As expected, it was found that large milk companies hesitate to share their technologically advanced equipment with small dairy farmers. This might be due to the fact that they might

consider it a lost opportunity if they allowed others to obtain benefits from their assets. Item 8, therefore, did not get agreement from all of the managers. Eight of them agreed, while 3 were neutral and 1 disagreed with this solution. So, given the current situation, this aspect could not be recommended in the framework as it would not be acceptable to all stakeholders.

With regard to Item 9, currently, baby dairy product companies do not select those cows whose physical characteristics and qualities are aligned with the environment. This is presented as a solution, but there were two managers who were neutral for this statement while one manager disagreed with it. A reason for these mixed responses could be the fact that it is a challenging task to ensure such alignment and managers might have previously experienced difficulty in trying to do this.

For Item 10, the effectiveness of an automatic milking system was endorsed, as shown by the responses of the majority of the managers. In fact, 83.33 per cent of the managers agreed with the effectiveness of an automatic milking system. The uncertainty demonstrated by two of the managers might be due to the fact that although an automatic milking system increases efficiency and reduces the risk of contamination, it cannot be used by small dairy farmers owing to the significant costs associated with it.

For Item 11, only two of the managers were neutral with regard to the statement that AMS require cows with certain characteristics. Their uncertainty might be due to the fact that, usually, this aspect is ignored when cows are selected and the focus is mainly on other factors.

The responses for Item 12 show that the solutions of on-farm monitoring programmes and risk management procedures would be extremely beneficial because all of the managers agreed with these.

The analysis of Item 13 demonstrates that two of the managers were neutral about whether or not the quality of cows was a determinant of the quality of the final products. This uncertainty might be due to the fact that, as is generally understood, there are a number of other factors that determine the quality of the final products.

Regarding Item 14, three of the managers were neutral and one disagreed about adhering to a minimum acceptable level of environment and quality of feed for the cows. A further exploration of this aspect indicates that it may be difficult to control or manage the environment of dairy farms to which milk production is outsourced. This could be one reason why mixed responses were obtained for this question.

The responses to Item 15 indicate that having fodder free from harmful substances is not an acceptable solution for all managers and two of the managers were neutral about this aspect. Their uncertainty might be linked to the perception that national regulations are not strict enough to avoid such substances occurring in the fodder.

Regarding the responses to Item 16, four of the managers were neutral about and eight agreed with the adoption of modern animal husbandry. This item achieved the most mixed responses because of the fact that it is difficult to establish a link between modern animal husbandry practices and the quality of milk. It has been proved by scientific research studies that modern animal husbandry practices could prove effective for the quality of milk, but four managers could have been neutral probably due to a lack of technical knowledge about this aspect.

The analysis of the responses to Item 17 also demonstrates that the majority of the managers, i.e. 83.33 per cent, agreed that the participation of a number of stakeholders, including professional experts, the government, large milk producers and skilful employees, is necessary for promoting modern animal husbandry practices. Two of the managers remained neutral for this item and their rationale could be that it is by no means certain that other stakeholders will be interested in investing in modern animal husbandry practices.

The analysis of Items 18, 19 and 20 indicates that 91 per cent of the managers agreed that the government should improve the health of cows and prevent disease by specific legal controls, along with biosecurity measures, such as controlling the movement of both personnel and animals to and between dairy farm sites, and putting restrictions on effected premises and areas for dealing with the problems related with the baby dairy

product industry. The reason for the uncertainty in relation to Item 18 shown by one of the managers could be due to the fact that legal controls are already imposed by the government but, unfortunately, they are not proving to be effective. The neutral response to Item 19 could be due to the fact that, normally, visits to dairy farm sites cannot be easily controlled. The reason for the neutral response of one of the managers in relation to Item 20 could be due to the fact that once epidemic diseases occur, it becomes virtually impossible to control them.

For Item 21, 16.67 per cent of the managers were neutral about the statement that only essential visits by specific people should be allowed to dairy farm sites in order to prevent the spread of diseases. Their uncertainty might be due to the fact that, normally, these visits could not be controlled very easily.

The responses to Item 22 show that 11 managers agreed with the solution of animal health programmes being introduced by large baby dairy product companies.

Likewise, for Item 23, 83.33 per cent of the managers agreed that small dairy farmers should take advantage of the advice available from the local livestock production officer. The reason for any neutrality could be due to the fact that only a small number of livestock production officers exist in a few regions and, where they are available, they are not being approached by dairy farmers for advice.

### 11.2.2. Control over dairy farms

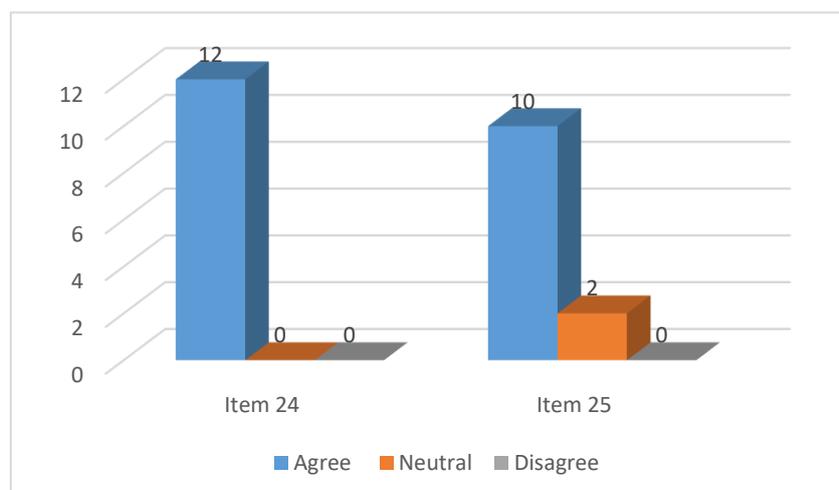


Figure 11.2: Managers' responses in relation to control over dairy farms.

Item 24 gained complete acceptance from all of the managers who participated in this validation survey. They all mentioned that dairy farms owned by baby dairy product companies can better deal with certain aspects of animal management.

However, for Item 25, two of the managers were neutral about the effectiveness of having an optimum level of control over third-party dairy farms. The reason for the neutral responses could be due to the fact that having control over third-party dairy farms involves limitations and, as per the general understanding, real-time control could be costly.

### 11.2.3. Quality of raw materials

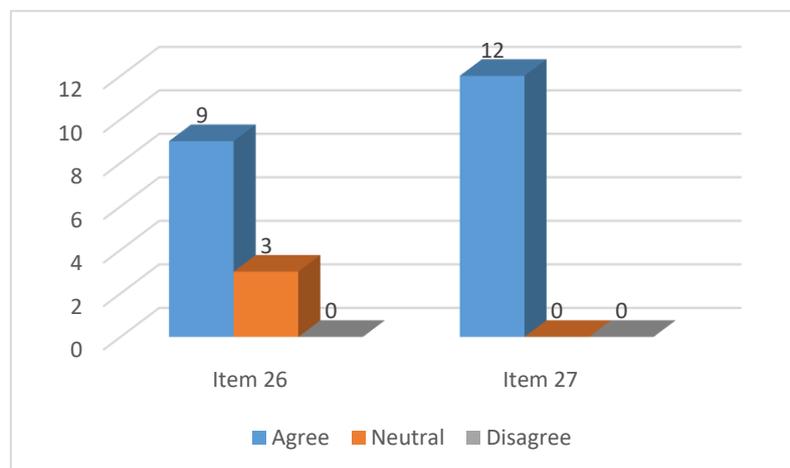


Figure 11.3: Managers' responses in relation to the quality of raw materials.

Item 26, which was about quality problems linked to suppliers, achieved three neutral responses. In actual fact, 25 per cent (one quarter) of the managers were neutral as to whether getting raw material from certified suppliers would solve the problem. The reason for this uncertainty could be due to the fact that problems could still occur if the quality of the raw materials was ensured.

Item 27, which was about developing an internal quality assurance/control/inspection department for checking the quality of raw materials got strong support from all of the managers as they all agreed with this statement.

#### 11.2.4. Animal management plan

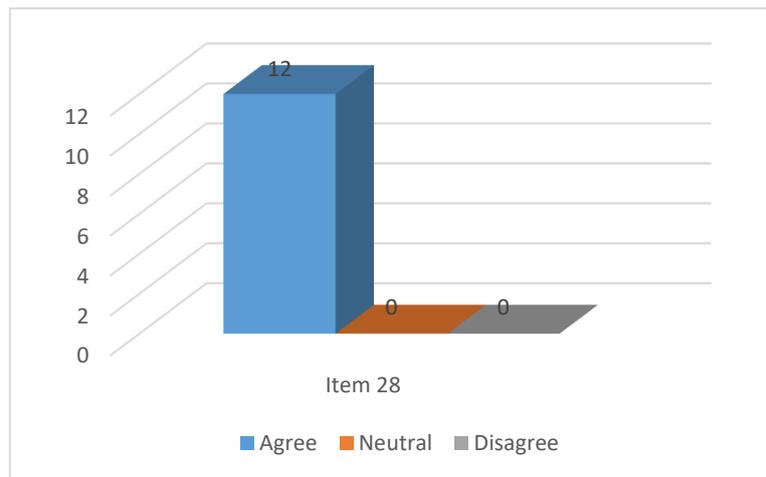


Figure 11.4: Managers' responses in relation to animal management plan.

Animal management plan is critical and this was also proved from the responses to Item 28 which was about implementing a formal animal management plan consisting of internal rules and regulations for managing dairy farms. All of the managers agreed with the given statement of this item which provides evidence for the usefulness of the solution presented in the framework.

#### 11.2.5. Role of dairy farmers

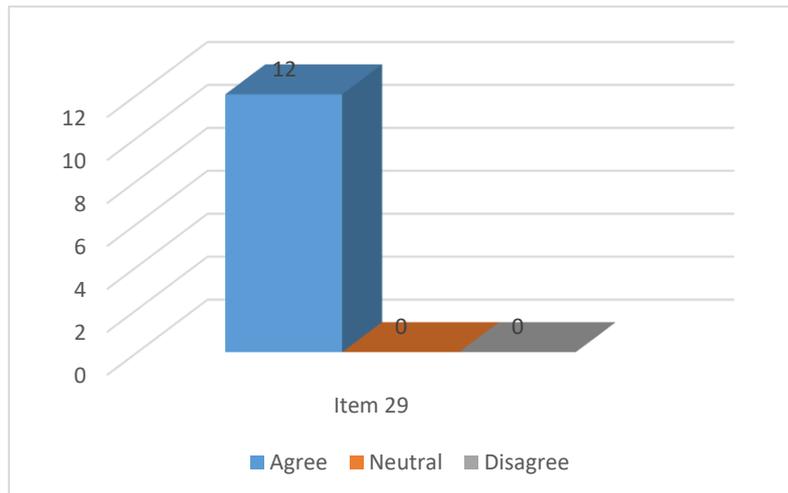


Figure 11.5: Managers' responses in relation to the role of dairy farmers.

With regard to Item 29, dairy farmers play a significant role in relation to quality management as far as the pre-production stage in the manufacture of baby dairy products is concerned. The results showed that awareness programmes for farmers

regarding compliance with quality-related laws, regulations and standards are needed. All of the managers who participated in this validation survey agreed that awareness programmes should be introduced with the aim of achieving the goal of highest possible compliance.

### 11.2.6. Quality and safety inspections

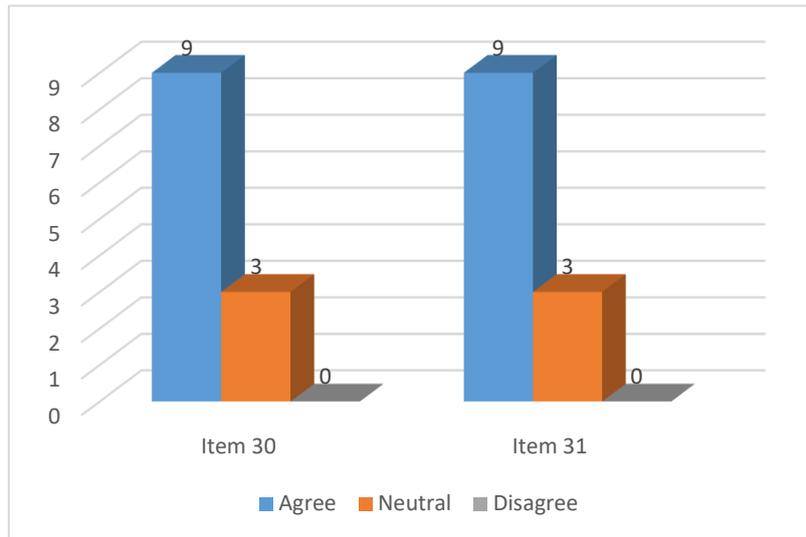


Figure 11.6: Managers' responses in relation to quality and safety inspections.

Quality and safety inspections are of critical importance and these must be organised throughout the supply chain. As shown from the responses to Item 30, 25 per cent of the managers were neutral about the statement that it is the responsibility of the company's quality assurance/control/inspection department to arrange such inspections. The reason for their uncertainty could be due to the fact that managers often believe that it is the responsibility of the managers of both internal and external parties to arrange the inspections.

Similarly, as proved from Item 31, there was uncertainty about increasing the sample coverage and frequency of inspection for reducing quality problems. The reason for this neutral response from 25 per cent of the managers could be due to the fact that increased sample coverage and frequency of inspections are not cost-effective, hence their success in dealing with quality problems has not been proved.

### 11.2.7. Technology in the pre-production stage

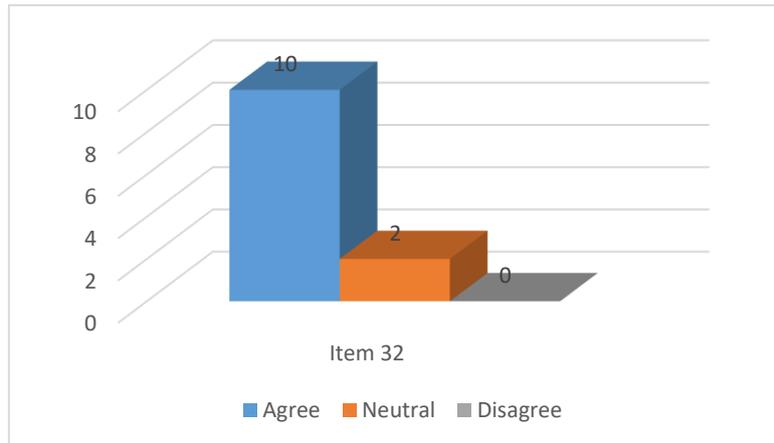


Figure 11.7: Managers' responses in relation to technology in the pre-production stage.

The responses to Item 32 indicate that 16.67 per cent of the managers were neutral with regard to the use of technology for improving quality at this stage. However, 83.33 per cent of the managers agreed with the statement that technology could prove helpful at this stage. The reason for the uncertainty of a few of the managers could be due to the fact that the concept of utilising technology at this stage for improving quality is considered novel.

### 11.3. Information-sharing system

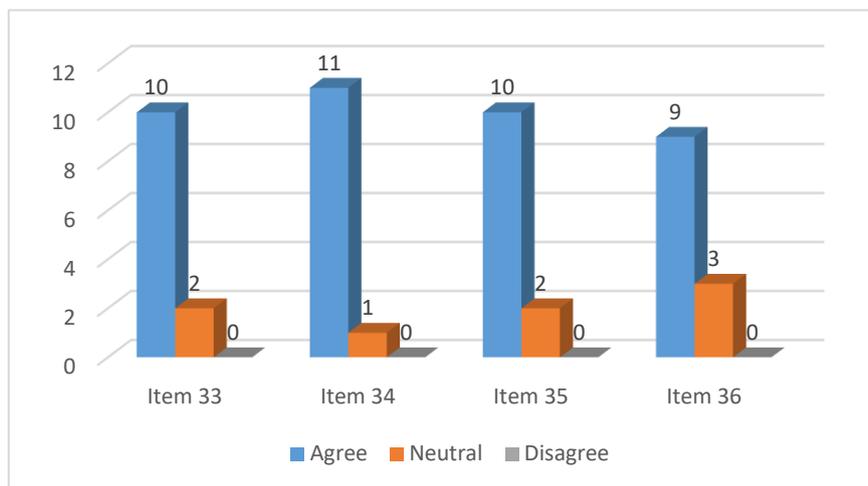


Figure 11.8: Managers' responses in relation to an information-sharing system.

For Item 33, which was about an improved information-sharing process among all supply chain actors, 83.33 per cent of the managers agreed that this was important for the baby dairy product industry. Two of the managers were neutral about this aspect,

and a reason for their uncertainty could be the fact that implementing an information-sharing process among all supply chain actors would involve facing considerable challenges and difficulties.

For Item 34, only one of the managers was neutral with regard to sharing information in a transparent manner with all supply chain actors. As the interviewees were the managers of large-sized baby dairy product companies, a reason for the uncertainty could be the fact that sharing internal information with others can lead to all sorts of problems.

Regarding Item 35, two of the managers were neutral about the role of the government in developing a traceability system. The reason for their uncertainty could be due to the fact that it is not easy to influence the government.

For Item 36, 25 per cent of the managers were neutral because they have never used such IDs before and, therefore, are not certain about the practical benefits of this aspect. It needs to be pointed out that the majority of the managers agreed with these particular suggestions presented in the framework and, again, this provides evidence that the framework should be validated.

#### 11.4. Roles of governments Information-sharing system

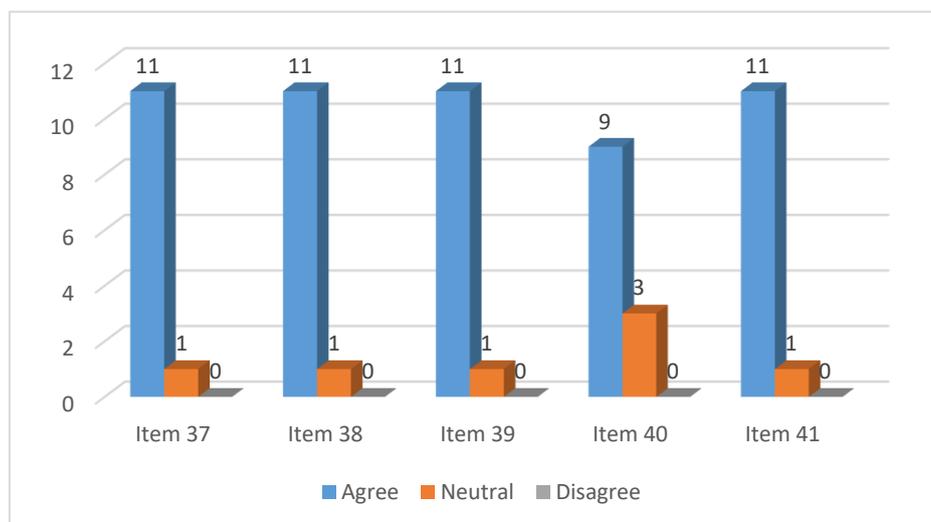


Figure 11.9: Managers' responses in relation to the role of the government.

The government has a critical role to play in improving the overall quality in the

Chinese baby dairy product industry. For Items 37, 38, 39 and 41, it was found that 91.67 per cent of the managers agreed regarding the roles that have been defined for the Chinese government in the framework. The majority of the managers agreed that the government should concentrate on eradicating corruption, providing subsidies and tax rebates, developing training opportunities and fostering collaboration and cooperation across all government departments.

However, for Item 40, 25 per cent of the managers were neutral regarding the effectiveness of one single authority to manage quality and safety in the Chinese baby dairy product industry. The reason for this neutral response could be due to the fact that it is considered out of the scope of one authority to manage everything by itself.

#### 11.4.1. Ministry of Agriculture (MOA)

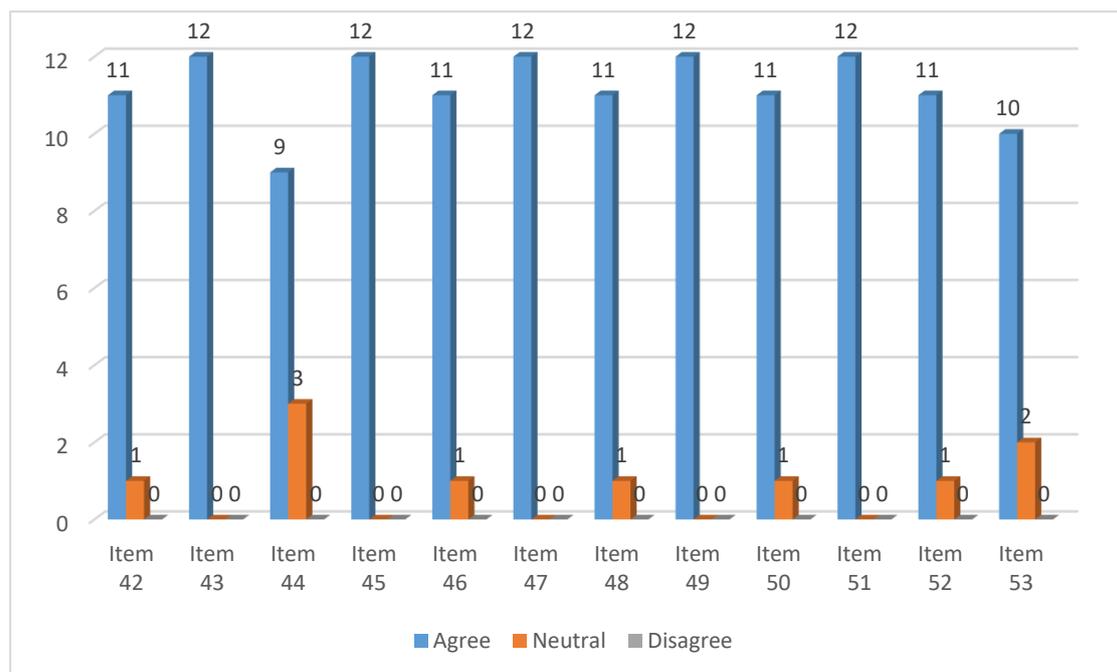


Figure 11.10: Managers' responses in relation to the MOA.

For Item 42, only one manager did not agree that the MOA should oversee in particular the quality of cows' feed and dairy farm management in general. The reason for this uncertainty could be due to the fact that, as per the current structure, there is no oversight of dairy farms by this department, so the general perception could be that the MOA should not be responsible for this aspect.

For Item 43, all of the managers agreed that those aspects of QMS that are not covered by the new Food Safety Law of 2015 should be added to the responsibilities of the MOA.

As far as Item 44 is concerned, three of the managers remained neutral with regard to avoiding the use of pesticides on cows' feed. The reason for their uncertainty in relation to the practicality of this solution could be due to the fact that in certain situations pesticides cannot be avoided and, in point of fact, avoiding them can actually lead to more harmful consequences, such as poor quality of milk due to certain diseases.

With regard to Item 45, all of the managers agreed that the MOA should take responsibility for designing laws, standards and regulations suitable for dairy farms.

For Item 46, only one manager was neutral with regard to controlling the use of chemicals and fertilisers that are harmful to cows. The reason for this uncertainty could be due to the fact that, sometimes, the use of fertilisers and chemicals appears to be mandatory.

For Item 47, all of the managers agreed that it was a good idea for the MOA to introduce loan schemes, animal facility management programmes, awareness programmes and licensing systems for dealing with quality-related problems.

Regarding Item 48, only one of the managers did not agree with the solution whereby the MOA would allow farmers to lease advanced machinery for dairy farming. The reason for this uncertainty could be due to the fact that, as per the view of this particular manager, it would be by no means certain that advanced machinery would solve all quality-related problems.

In relation to Item 49, all of the managers agreed that the MOA should invest in growing hay and silage for animal fodder as it does in cultivating other crops.

For Item 50, one of the managers was neutral about the development of agroparks for integrating the supply chain for crop production. The reason for this uncertainty could be due to the fact that this particular manager considers the suggestion to be based on a long-term view; developing agroparks needs investment of time and money.

As far as Item 51 is concerned, all of the managers agreed that the MOA should introduce an animal facility management programme for regulating breeders, dealers and farmers involved in dairy farming.

For Item 52, only one manager showed uncertainty about the effectiveness of starting a licensing system for supply chain actors who supply raw material to the Chinese baby dairy product industry. The reason for this uncertainty could be the availability of various other types of licensing system.

In relation to Item 53, only two of the managers were not confident about the idea that the MOA should engage in educating farmers about modern animal husbandry techniques. The reason for this lack of confidence could be due to the fact that, although literacy among Chinese farmers is by no means poor, quality problems still occur. Therefore, educating the farmers may not be a solution.

#### 11.4.2. Ministry of Water Resources (MWR)

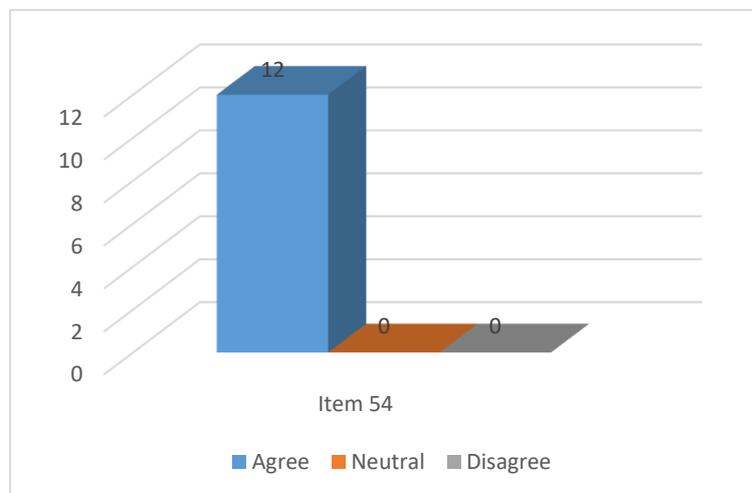


Figure 11.11: Managers' responses in relation to the MWR.

For Item 54, all of the managers agreed that the MWR should ensure that the quality of water provided to dairy farms and baby dairy product manufacturing facilities is satisfactory (no pollutants) because this will be beneficial for quality management in the Chinese baby dairy product industry. This provides evidence of a viable solution presented in the framework.

### 11.4.3. Administration for Quality Supervision, Inspection and Quarantine (AQSIQ)

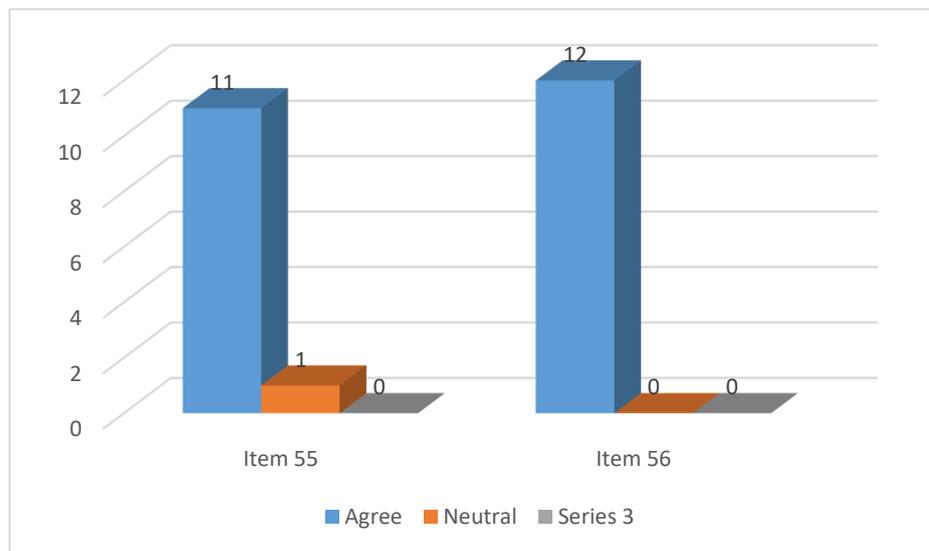


Figure 11.12: Managers' responses in relation to AQSIQ.

With regard to Item 55, one of the managers demonstrated uncertainty about adding dairy farms and small milk collection stations to AQSIQ's responsibilities. The reason for this neutrality could be the current role that is being performed by this ministry such that it might not be considered AQSIQ's responsibility to manage dairy farms and small milk collection stations. The majority of the managers, 91.67 per cent, agreed that this would be a good solution for dealing with quality-related problems.

For Item 56, all of the managers agreed that AQSIQ should provide licences on the basis of monitoring the quality of raw materials and that it should organise rigorous inspections for baby dairy products before these are sent to market.

#### 11.4.4. State Administration for Industry and Commerce (SAIC)

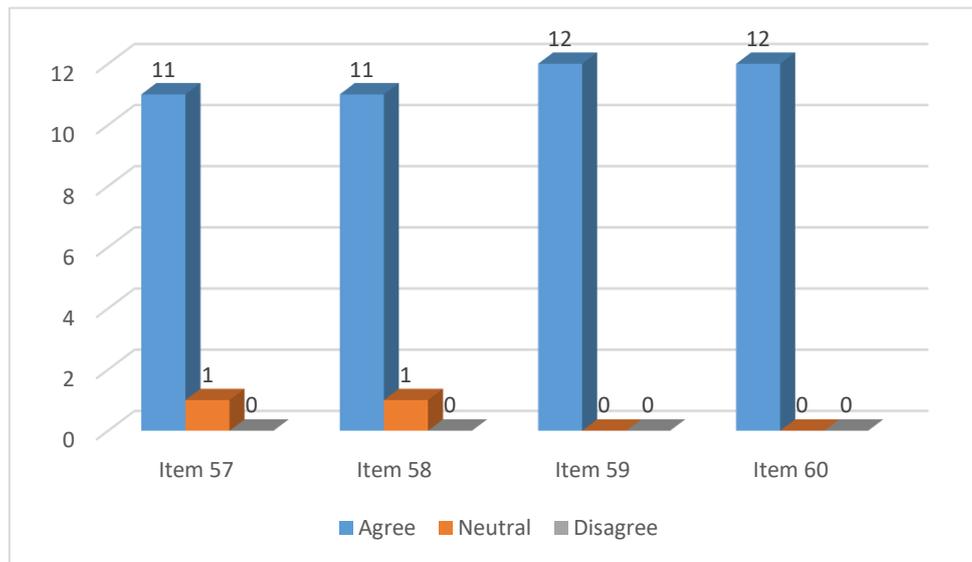


Figure 11.13: Managers' responses in relation to SAIC.

The SAIC also has an important role to play with regard to quality management in the Chinese baby dairy product industry and the results of the validation survey corroborate the importance of this department. As far as the responses for Items 57 and 58 are concerned, only one of the managers was neutral in relation to enhancing the level of laws, regulations and standards and introducing animal welfare regulations for dairy farmers. This means that 91.67 per cent of the managers agreed that the SAIC must be responsible for these two things. The reason for any uncertainty could be due to the fact that even if the level of regulation is high, quality problems can still occur due to poor or ineffective implementation.

The responses to Item 59 indicate that the recommendation for animal welfare regulations is considered to be acceptable and practical by all of the managers. Similarly, in relation to Item 60, all managers agreed with the statement that the SAIC should introduce animal management training for dairy farmers.

#### 11.4.5. Food and Environmental Hygiene Department (FEHD)

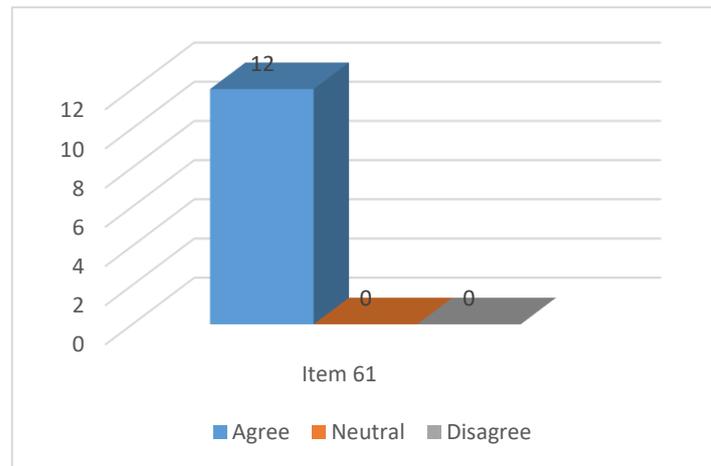


Figure 11.14: Managers' responses in relation to the FEHD.

The FEHD, too, has an important role to play with regard to managing quality in the Chinese baby dairy product industry. It is recommended in the framework that this government department should also be involved in inspections and audits at dairy farms, production facilities, distribution centres, warehouses and storage facilities related to the baby dairy product industry, at both regular and random intervals. This solution is considered feasible as all of the managers agreed with it.

#### 11.4.6. Ministry of Industry and Information Technology (MIIT)

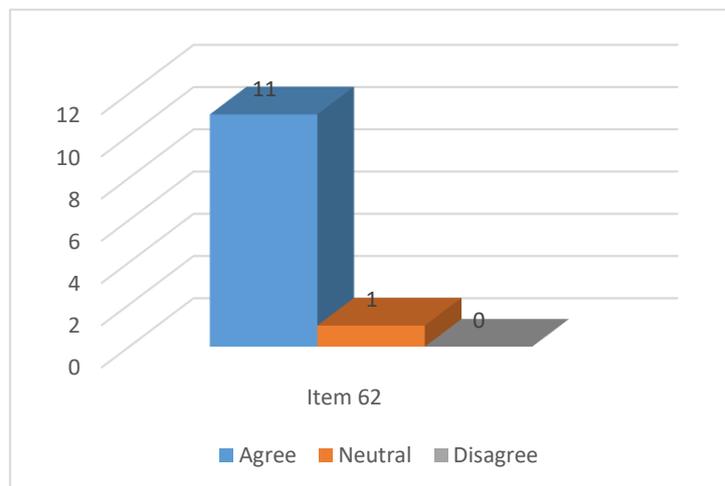


Figure 11.15: Managers' responses in relation to the MIIT.

For Item 62, only one of the managers was neutral about involving the MIIT in developing a traceability system. The reason for this uncertainty could be the manager's

understanding of the role of this government department. All the other managers agreed that the MIIT should work collaboratively with other departments to develop a traceability system.

### 11.5. Laws, regulations and standards

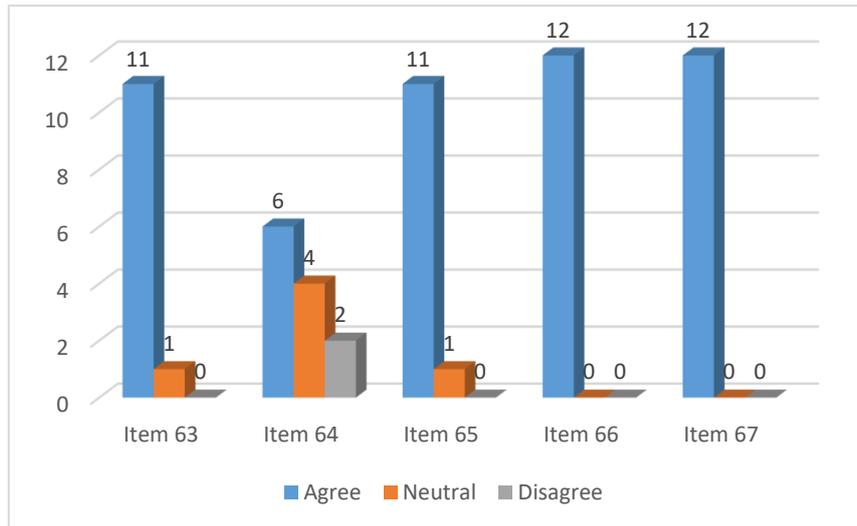


Figure 11.16: Managers' responses in relation to laws, regulations and standards.

For Items 63 and 65, only one of the managers was neutral about having penalties for non-compliance with laws, regulations and standards and making improvements in internal quality standards. In relation to these two items, the rest of the managers agreed that having penalties for non-compliance is a solution for quality-related problems and that internal quality standards should be revised with reference to national and international quality standards.

For Item 64, two of the managers disagreed with the effectiveness of self-developed internal quality standards while four were neutral about this. The reason that not all the managers agreed with this aspect is due to the fact that, despite almost all Chinese baby dairy product companies having internal quality standards, quality problems still occur. Instead of establishing internal standards, it is crucial that some third-party or government help be made available for the development of external quality standards. However, feedback from baby dairy product companies should be taken into account by those organisations developing standards so that stricter and better-quality standards can be produced; Chinese baby dairy product companies should not rely only on

internally developed standards. The role of external quality standards is more critical for the long-term development of the Chinese baby dairy product industry. Even though six managers still agreed that self-developed internal quality standards are useful, the framework presented cannot suggest self-developed internal quality standards as a solution on the basis of this result.

For Items 66 and 67, all of the managers agreed that all supply chain actors in the Chinese baby dairy product industry are equally responsible for the enforcement of laws, regulations and standards. Likewise, the recommendations presented for improving the endorsement of law were also accepted by all of the managers.

### **11.6. Summary**

In this chapter, the findings of the validation survey have been presented. The validation survey was conducted to examine which of the recommendations presented in the framework for the Chinese baby dairy product industry are not viable. The research has come to the conclusion that mostly all of the recommendations were accepted as being of benefit to the Chinese baby dairy product industry by the majority of the managers. Nevertheless, with regard to a few items, the managers demonstrated uncertainty in their responses. However, it needs to be said that the majority of the managers agreed with the solutions provided.

## **Chapter 12: Conclusions and Recommendations**

This chapter concludes the thesis by providing a summary of the research findings and examining to what extent all the objectives of this research have been met. The contribution of this research to the existing literature on the topic is also presented here. In addition, the chapter provides recommendations for the Chinese baby dairy product industry. Finally, the limitations of the research and suggestions for future research are discussed.

### **12.1. Summary of findings**

In this globalised world, the importance of quality management has increased for all industries. It has become imperative for all organisations to improve the quality of their products, services and processes, and using effective QMS, organisations are able to achieve a competitive advantage. In the past few years, it has been observed that various problems have occurred due to the poor implementation of QMS in China. In particular, the Chinese baby dairy product industry especially was forced to confront such quality issues, one of these being the melamine incident, which resulted in the disruption of the whole of this sector. Considering the harmful consequences of poor QMS, many Chinese companies have already taken steps to improve their quality practices. This research aimed to investigate critically the implementation of QMS in the Chinese baby dairy product industry and was based on ten research objectives. The conclusions for these objectives are given below.

#### 1) Objective 1:

The first objective of this research was to review QMS and quality standards (e.g. ISO standards and TQM) generally and their implementation specifically in the Chinese baby dairy product industry. It was found that baby dairy product companies were already using various processes and techniques for ensuring the quality of their products, e.g. sensors for quality control; KPIs; benchmarking; laws, regulations and standards relating to food quality and safety; critical control points for production processes; the CNCA for conformity assessment; continuous quality checks; inspections on all of the

supply chain actors; quality audits; cold chain processes; quality assurance systems; and QMS. From this research, it has been concluded that, after the melamine incident, companies operating in the baby dairy product industry have updated their QMS. Many of them are also using international standards and, in addition, they have their own internal quality standards. Nevertheless, the Chinese regulatory bodies also have a remarkable role to play in the implementation of QMS in the baby dairy product industry. Interviewees stated that steps to update and introduce further quality control measures are being taken in their organisations and, in addition, that their companies are now considering all of their supply chain actors when implementing QMS. Further analysis found that monitoring of all supply chain actors is not done as a matter of course in the baby dairy product industry.

## 2) Objective 2:

The second objective of this research was to review the recognition and awareness of external factors (i.e. the part played by the Chinese government, legislation, corruption, economic pressures) that are influencing the actions of selected companies involved in the baby dairy product industry. It has been concluded that the Chinese government has introduced relevant laws, regulations and standards for managing quality, but these are not being complied with effectively. Because of the problems with enforcing the laws, regulations and standards (e.g. due to a lack of interest in quality management, government officials were not performing their duties effectively and corruption prevailed), companies can avoid complying with them. It has been concluded that issues such as bribery and corruption that were found in the baby dairy product industry resulted in harmful consequences for the sector. Once the issues were identified, it was found that government efforts towards ensuring quality management were improving and that many actions had been taken to resolve issues such as corruption. In addition, there have been attempts to deal with issues of non-compliance with the laws, regulations and standards by imposing heavy fines on companies. As the awareness level of baby dairy product companies is increasing, they have become more inclined to improve the quality of their products and the implementation of effective QMS is a

step towards this.

### 3) Objective 3:

The third objective of this research was to identify key actors in the Chinese baby dairy product industry supply chain from procurement to end product. Because not all supply chain actors are integrated into the baby dairy product companies' quality management practices, many problems have arisen in the past, the prime example being the melamine incident which was a result of carelessness at the milk source. The dairy farmers at the pre-production stage did not realise that adding melamine could lead to harmful consequences for all stakeholders and, as a result, quality management issues emerged. From the analysis, it has been concluded that the Chinese baby dairy product industry's key supply chain actors are the government, suppliers, retailers, wholesalers, dairy processors, milk collection stations, farmers, the credit sector and research universities. It has been found that all of these supply chain actors need to collaborate with each other in order to improve the quality of baby dairy products, but the conclusion is that they are not collaborating with regard to the implementation of QMS.

### 4) Objective 4:

The fourth objective of this research was to identify and review the barriers to and drivers for the implementation of QMS that Chinese baby dairy product companies must address. Other than external system problems like weak traceability system and corruption, one of barriers to the effective implementation of QMS was found to be loopholes existing in the internal systems of the companies. For example, the commitment of significant resources and investment was also regarded as barrier. Furthermore, when employees resist implementation of QMS and top management is not focused on quality management, it is not possible to implement QMS properly. The heavy cost associated with the implementation process also becomes another barrier. Likewise, quality management needs advanced machinery and the adoption of new methods because laws, regulations and standards demand certain changes in working practices. So it can be concluded that the significant barriers to implementation of QMS

are: employee resistance; ineffective application of quality management processes; management orientation; ineffective leadership; inadequate resources; the high costs associated with the implementation of quality programmes; and ineffective management of QMS.

There are many barriers that impede the implementation of QMS, but there are also certain drivers which actually motivate the baby dairy product companies to implement them. It has been concluded that the most important drivers are the laws, regulations and standards which are related to quality management. Moreover, the increased competition from foreign baby dairy product companies in China is also a driver for implementing QMS. Further to this, the realisation that quality scandals, such as the melamine incident, could be harmful for companies' reputations has also acted as a driver for implementing QMS. The increased market pressure from competitors and customers has enabled many of the baby dairy companies to implement QMS. Because customers have now become more quality conscious, it has been concluded that external pressures from the government, customers and competitors are driving the baby dairy product industry to start implementing QMS. Furthermore, when top management becomes aware of all the benefits and advantages associated with quality management, they show more inclination to implement QMS. To sum up, the important drivers for implementing QMS are: managers' philosophy; managers' knowledge and education; economic and efficiency factors; marketing advantages; effective leadership; and the commitment of top management.

#### 5) Objective 5:

The fifth objective of this research was to collect data from selected companies and to audit the implementation of QMS in these companies in order to understand the measures they have already taken to further strengthen their QMS. It has been concluded that all baby dairy product companies are taking certain measures for improving their implementation of QMS. These measures include compliance with the relevant laws and obtaining certain quality certifications. Companies commonly use the new Food Safety Law, Assured Food Standards, SQF and ISO 9001:2008. Further to

this, there are other measures that are being taken by the industry to improve QMS. These include: reviewing of processes and procedures; training of employees; increasing awareness among employees and customers; implementation of laws and standards; reviewing QMS; benchmarking; use of GMP and KPI; and improved supply chain management and marketing activities.

#### 6) Objective 6:

The sixth objective of the research was to identify the challenges faced by the managers and employees of selected companies in the Chinese baby dairy product industry during the implementation of QMS. This research has concluded that there are various challenges which this sector is facing. The attitude and behaviour of both employees and managers is a challenge for the successful implementation of QMS. It is important to obtain the commitment of all managers and employees for the implementation of QMS, but this is a challenge that is not yet being effectively managed in many of the baby dairy product companies. In addition, the management faces challenges with regard to adhering to the laws, regulations and standards, which also makes it difficult to implement QMS. Furthermore, QMS are often not being adopted because of the costs associated with their implementation and encouraging adoption is a challenge. It has been found that the most important challenge for the baby dairy industry is in relation to the milk source and the analysis has shown that most of the problems have occurred at this pre-production stage. As it is the foundation of the baby dairy product industry, if this stage is not managed appropriately, it leads to many other quality-related problems. Therefore, it is of utmost importance to address this challenge if the Chinese baby dairy product industry is to become more successful and competitive. In addition, it has been found that the production stage involves many aspects which are currently not managed well and this causes further problems for the quality of baby dairy products. The commitment of supply chain actors and stakeholders is found to be a challenge too, as many problems occur with the distributors, warehouses and transportation companies. It has also been concluded that there is no coordination among all the stakeholders in the Chinese baby dairy product industry which is

challenging for quality management. Finally, the information-sharing technology currently available does not meet the requirements of the whole industry.

#### 7) Objective 7:

The seventh objective of this research was to evaluate critically various standards relating to QMS that have been implemented by the selected Chinese baby dairy product companies. It has been concluded that there are various national (e.g. GB/T 19001 and GB/Z 27907) and international standards (ISO 9001, HACCP, GMP and FSSC 22000) that have been implemented in this industry and that now is the time to adhere to them as customers are now more conscious than ever before about quality. Furthermore, the availability of international brands means that they opt for those products which, in their eyes, represent quality. In order to maintain a strong market position, baby dairy product companies need to adhere to the relevant standards, such as ISO 9001, HACCP, GMP and FSSC 22000. When international standards are adopted, their translated version is being used without changing any other requirement or scope of the standard. In addition, the analysis of standards has shown that companies develop their own internal standards for fulfilling additional quality-related needs. This research has also concluded that international standards are more effective than national standards because they cover more aspects and provide guidelines for wider issues. This highlights the need for changes and modifications to the national quality standards. It has been concluded that large baby dairy product companies have realised the importance of these standards and the problem lies with smaller companies and farmers who have not realised their importance yet. The reluctance of small baby dairy product companies to implement relevant standards has led to many quality problems in the industry.

#### 8) Objective 8:

The eighth objective of this research was to analyse and evaluate current legislation that applies to the Chinese baby dairy product sector. It has been concluded that the laws, regulations and standards relating to quality management are of critical importance for

this industry. A lot of legislation relating to this sector exists and it has been found that efforts are being made by the Chinese government to improve its design and enforcement. However, this research has concluded that although the design of quality-related regulations is appropriate, there are various problems with their implementation. Due to a weak enforcement system, the Chinese baby dairy product industry has experienced many harmful consequences. Therefore, in order to improve the quality of baby dairy products it is important to solve any remaining problems with regard to enforcement of legislation.

9) Objective 9:

The ninth objective of this research was to evaluate the QMS in UK baby dairy product industry and compare with Chinese baby product industry. It is concluded that the U.K. baby dairy industry is somehow managing the QMS in a better manner. Mainly, the legislation and regulation system along with the traceability system of this industry is quite strong. This has enabled this industry to deal with the quality issues in a more proactive manner as compared to Chinese baby dairy product industry.

10) Objective 10:

The tenth objective of this research was to develop an integrated framework (with a focus on the pre-production stage) in relation to the information-sharing system, the role of the government, and laws, regulations and standards that will guide the implementation of QMS for all stakeholders. This objective of the research has been accomplished and a framework has been developed which will be recommended for use by the Chinese baby dairy product industry. As found from the research, most of the critical problems were found at the pre-production stage; therefore, the framework has only focused on the pre-production stage in recommending which aspects need to be considered by the baby dairy product industry in order to improve quality. For example, in the framework, recommendations for an information-sharing system are provided. In addition, there is a discussion as to how existing problems with the laws, regulations and standards could be addressed, and focusing more on their

implementation and enforcement stage. Recommendations regarding the role of Chinese government departments are provided too. The findings have focused on the roles which must be performed by all government departments where responsibilities are all specified. One aspect of this objective was to validate the framework using the quantitative measures. The framework presented has been validated by the managers of selected baby dairy product companies in order to ensure that it presents a true and accurate picture for solving quality-related issues. This objective of the research is also accomplished successfully as a survey was administered on the managers from baby dairy product industry of China and they have demonstrated their level of agreement with the solutions which are presented in the framework.

## **12.2. Recommendations**

On the basis of the research findings, certain recommendations have been presented to the Chinese baby dairy product industry and these aspects must be considered if the overall quality of baby dairy products is to be improved. It is firmly believed that the framework presented in this research should be utilised by the baby dairy product companies. The framework focuses on the pre-production stage, so the baby dairy product companies that have their own integrated dairy farms should implement the framework here. The baby dairy product companies that do not have their own dairy farms should communicate the recommended practices to their outsourced milk suppliers (small milk producers/dairy farms). The large baby dairy product companies should guide the small milk companies in using this framework and the small companies should make an effort to implement it on their dairy farms. This framework is not only about one party, but has outlined the role of all the various parties: dairy farmers, supply chain actors, baby dairy product companies and the government. All the relevant parties should take steps to implement the suggested measures. The government should also take a proactive role and, as suggested in the framework, it should bring about changes in its roles and responsibilities. Necessary changes should be made in the laws, regulations and standards relating to quality. As it has been found that the main problem lies with implementation, all parties should work collaboratively

to ensure implementation of and compliance with the relevant laws, regulations and standards. The government and other stakeholders should also collaborate in the development of an information-sharing system because this has the potential to solve many of the problems the Chinese baby dairy product industry is facing. A combined effort by all of the relevant stakeholders will help in achieving the quality objectives of the industry. Therefore, it is vital that all stakeholders take their roles and responsibilities (as identified in the framework) seriously.

The purpose of this framework is to help Chinese baby dairy industry to improve the quality through focusing on the pre-production stage. The implementation of the presented framework is expected to be started from the four case study companies. This research framework is being shared with them. This framework has clearly listed 67 measures for improving the quality problems, hence, it is expected that the baby dairy companies will incorporate all or a number of these measures in their internal policies and operational manuals to improve quality management. Once its utility is proved, it will be presented to government officials for implementation at broader level in this industry.

### **12.3. Contribution**

The contribution of this research is that it has minimised the research gaps which are highlighted in the literature review. A recent study of Niu and Fan (2015) had provided one suggestion for future research on the implementation of QMS in Chinese manufacturing industries. The authors used a small sized Chinese manufacturing industry and identified a research gap in that only small sized companies were used (Niu and Fan, 2015). Therefore, they suggested exploring the implementation of QMS using large sized companies (*ibid*). Hence, one contribution of this research is that it bridges the literature gap by considering large sized baby dairy product companies where multiple actors are used not only for questionnaire but for interviews and focus group discussions. As compared to the study of Niu and Fan (*ibid*), the sample size of present study is larger. In addition, this research has worked on another research gap regarding the impact of contextual factors (e.g. farmers' current situation, government

role, traceability system, enforceability of laws) on the implementation of QMS (Gianni, Gotzamani and Vouzas, 2017). It was suggested that future research must consider such factors in order to study the quality movement in China. The present study contributes to the literature in that it has focused significantly on contextual factors, especially the legal context, which indicates that the researcher has attempted to minimise the literature gap highlighted by previous researchers. Furthermore, on the contextual point, the previous studies also looked at quality management practices in China, but they considered the service sector and SMEs, respectively, for the empirical investigation. The authors recommended that an idea for future research would be to study quality management practices in a different Chinese industry. Hence, this study has minimised the contextual gap as well.

The implementation of QMS in many developing countries is a relatively new movement and there are many differences between the implementation of QMS in developing and developed countries. Previous studies conducted on quality management practices have revealed that quality management principles are least understood in China. Now, however, they are evolving in the country and the implementation of QMS in China has become an important research issue for both researchers and practitioners. Therefore, this study has shed light, both theoretically and practically, on evolving QMS in the Chinese baby dairy product industry. Previously, no study has focused on this sector, this is a contribution in existing literature. It has been proved by many researchers that China is lagging behind in quality management. Hence, it is argued that quality management researchers are required to perform a critical and active role in improving the quality management practices currently in force in Chinese industry. This research is making a contribution towards improving the quality management practices of the Chinese baby dairy product industry by developing an in-depth understanding of the issue that can be drawn on. Moreover, an integrated framework is proposed at the end of this research that will help in implementing QMS in baby dairy product industry.

A multiple case study (six companies) approach was used in this research for analysing

the implementation of QMS in the Chinese baby dairy product industry. The previous studies either used a single case study or they relied on quantitative data, hence it was not possible to develop an in-depth understanding of the issues related to the implementation of QMS. This study is a contribution to the literature because it also minimises the methodological gap by considering multiple case studies. Moreover, it contributes to the literature by uncovering the linkages between key supply chain actors and barriers to and drivers for the implementation of QMS.

It has been found that many problems existed in the Chinese baby dairy product industry and events such as the melamine incident had become common. These problems were due to the ineffective quality management practices in the industry. This is a sector with a wide scope, and it was not possible to find the root cause of such quality issues. This research will be useful for industry practitioners as it has investigated QMS in the Chinese baby dairy product industry and found that it is most crucial to resolve quality issues at the pre-production stage. After finding the main problem areas, this research has presented a framework for managers in the Chinese baby dairy product industry. This framework provides guidance on managing the industry with regard to the implementation of QMS. Importantly, the framework has been validated by responses obtained from managers working in the industry. This is the major contribution of the research as it will have both practical and academic significance.

#### **12.4. Limitations and future research directions**

This research faced certain limitations which cannot be ignored and they must be incorporated in future research studies. This research has focused on the Chinese baby dairy product industry; therefore, its findings are not generalisable to other Chinese industries. Likewise, China is a developing country and its context is different from other countries. Therefore, the research findings could not be generalised to the baby dairy product industries of other countries because they have different contextual factors. Therefore, it is recommended that future researchers examine the implementation of QMS in other Chinese industries. Moreover, it is also recommended

that researchers from other countries should examine the implementation of QMS in their own countries. For example, researchers in developing countries, such as India, are encouraged to undertake similar studies. If similar results are found in the industries of other countries, this will improve the transferability of the present research framework. Another limitation of this research is that the framework focuses on the pre-production stage of the baby dairy product manufacturing process and the other 2 stages, production and post-production, have not been included because it was found that they have less issues. However, this does not imply that these two stages are not important; therefore, it is recommended to future researchers that they should aim for a broader scope and examine the other stages as well. In the production stage, advanced production equipment, the production process, the packing of final products, production performance appraisal, technology and management were all found to be important for improving quality in the Chinese baby dairy product industry. In the post-production stage, storage, distribution, transportation and management were all found to be important aspects related to quality management in this sector. Therefore, future researchers should explore the other two stages in more detail as this research has explored the pre-production stage in greater details.

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## Appendices

### Appendix A. Interview questions for managers: Phase 1

Dear Sir or Madam

I am a PhD student at the University of Central Lancashire in the UK. My research is a 'Study of the Impact of Quality Management Systems on Chinese Baby Dairy Product Industry', and is aimed at understanding the basic situation of China's baby milk quality and at analysing trends in this industry and its prospects for development in China.

In order to help me carry out this research, I would like to invite you to participate in either an interview or a questionnaire as follows.

If you would like to be interviewed, please indicate suitable dates and times by email. Or if an interview is not convenient, please help me answer the following questions and return these to me by email.

Could all interview and questionnaire participants please also return your signed consent forms to me by e-mail.

1. What kinds of quality control measures are used by your company? Do you think it is necessary to implement quality control measures in the company to ensure better and safer products?
2. Standards for food hygiene have been developed to ensure that the products produced under those guidelines are safer and better in terms of hygiene, quality and fortification. Has your company applied any specific standards to ensure product safety in your organisation?
3. How do you apply food quality control measures in your production process?
4. From the contaminated baby milk scandal that broke out in 2008 until now, what measures are being taken by your company to improve the quality of products?
5. It is a fact that, from the procurement of raw materials to the point of consumption, the responsibility lies with the company to ensure that the control

measures are implemented i.e., the measures that are suitable for achieving the appropriate level of public health protection. How is your company working with your supply chain to achieve the desired final results (Customer satisfaction)?

6. What difficulties are faced by your company in achieving the desired quality results?
7. What steps has your company taken to earn the trust of your local consumers so that they rely more on local products than on foreign-made baby formulas? Were these measures able to generate any positive impacts for the company?
8. What quality control measures have been introduced by the company in the past and what improvements have you brought to the system?
9. What is the benchmark in quality management systems in the current system?
10. It will be of great help if you will suggest any other measures that other companies could take to ensure food hygiene quality in the production of infant formula and dairy products.

## **Appendix B. Interview question for managers: Phase 2**

1. Could you introduce the current situation with regard to the quality management system of dairy products in your company?
2. What quality management system and standards are implemented in your company?
3. Please introduce the whole production process.
4. During production, which aspect causes the quality problems? How do you prevent these problems?
5. What expectations do the various stakeholders have with regard to the product's quality?
6. On the basis of the current situation in China, is quality management difficult to control?
7. What measures have been implemented to improve the product's quality and achieve the specified food hygienic and quality level which is set by the government?
8. How do you evaluate the current quality standards and relevant regulations?
9. Could you state the problems which are faced by the Chinese baby dairy product industry in recent years?
10. What challenges have been faced while implementing the quality management systems in your organisation?
11. What kinds of quality management measures/standards are used by your company/brand? How do you apply those quality management measures in your production process?

12. What kinds of certification about quality management have been gained by your company/brand?
13. From the procurement of the raw materials to the manufacture of the products, what kinds of measures are suitable for achieving the appropriate level of quality?
14. What main steps are contained in the whole production process? Which aspects do you think are the most significant during this process?
15. How does your company select and control the milk source?
16. What kind of milk source problems would appear to affect the quality of raw milk?
17. Is the milk source (raw milk) important for the quality of the final product? If yes, how does your company manage and supervise the quality of raw milk?
18. In terms of ensuring the safety of the milk source, what procedures are in place and what measures/standards are used?
19. Why do you think the following factors are important for milk source: breeding; production factors; human factors; technology; management; transportation and storage; and others? Please give some explanation for your viewpoints.
20. In your opinion, what are the compulsory factors needed for implementing the quality management system?
21. There are various standards and regulations that have been implemented in the baby dairy product industry. How do you evaluate them? Are there any positive or negative aspects of those standards and regulations? What are the challenges that are faced while implementing these standards and regulations?
22. Would you like to give any other opinion regarding quality management systems in the baby dairy products industry?

## **Appendix C. Interview questions for government officials**

### **Phase 1 (MPhil stage)**

1. What kinds of quality control measures are used by in Chinese baby dairy product industry? Do you think it is necessary to implement quality control measures in the company to ensure better and safer products?
2. Standards for food hygiene have been developed to ensure that the products produced under those guidelines are safer and better in terms of hygiene, quality and fortification. Do you believe that these are applied effectively by organisations in Chinese baby dairy product industry?
3. What problems do you see in implementation of the laws, regulations and standards of quality?
4. From the contaminated baby milk scandal that broke out in 2008 until now, what measures are being taken by your Chinese baby dairy product industry to improve the quality of products?
5. What barriers are faced by government in achieving the desired quality results?
6. What quality control measures have been introduced by the Chinese baby dairy product industry in the past and what improvements are brought to the system?
7. It will be of great help if you will suggest any other measures for Chinese baby dairy product industry to ensure food hygiene quality in the production of infant formula and dairy products.

## **Phase 2 (PhD stage)**

1. Please describe the situation with regard to safety and quality management systems in the Chinese baby dairy product industry.
2. What effective measures have been used to manage and control the safety and quality of Chinese baby dairy products?
3. With regard to regular supervision and inspection, what aspects require the most attention. What steps and products are included? If quality and safety problems occur, how are they dealt with? What is the situation as far as the law is concerned?
4. How do you evaluate the level of quality management in the Chinese baby dairy product industry?
5. Can you identify the main legislation for baby dairy product industry?
6. What do you think about the role of the law and enforcement departments in the melamine incident? Did they work effectively?
7. Is legislation enforced appropriately in baby dairy product industry?
8. What are the challenges of implementing the legislation?
9. What are your suggestions for implementing the relevant legislation in the baby dairy product industry?
10. What are the advantages of applicable legislation, in terms of quality management in the baby dairy product industry?
11. Would you like to add anything related to quality management system in the baby dairy product industry?

## **Appendix D. Focus group questions**

These are the standards and legislation that are used for quality management in the baby dairy product industry. Please answer the questions taking these standards and this legislation into consideration.

- 1) ISO 9001
- 2) Hazard Analysis and Critical Control Points (HACCP)
- 3) Good Manufacturing Practices (GMP) guidelines
- 4) Food Safety System Certification (FSSC) 22000
- 5) Food Safety Law of the People's Republic of China
- 6) Food Additive Laws
- 7) Food Production Licence
- 8) Food Safety National Standards

1. What are the reasons for implementing these standards and legislation?
2. What are the difficulties that you might face while implementing these standards and legislation?
3. What are the expectations from these standards and legislation?
4. How would you describe the advantages of using these standards and legislation?
5. How would you describe the disadvantages/challenges of using these standards and legislation?
6. What are your recommendations regarding implementation of these standards and legislation?

## **Appendix E. Interview questions for UK companies**

1. What kinds of quality management measures/standards are used by your company/brand? How do you apply those quality management measures in your production process?
2. What kinds of certification to do with quality management have been gained by your company/brand?
3. From the procurement of the raw materials to the manufacture of the products, what kinds of measures are appropriate for achieving the appropriate level of supply chain?
4. What main steps are contained in the whole production process? Which aspects do you think are the most significant during this process?
5. Where are the cattle pasture/farm and the production plant? How does your company select and control the milk source?
6. What kind of milk source problems would appear to affect the quality of raw milk?
7. The milk source (raw milk) is important for the quality of the final product. How does your company manage and supervise the quality of raw milk?
8. In terms of ensuring the safety of the milk source, what procedures are in place and what measures/standards are used?
9. Do you think the following factors are important for the milk source: breeding; production factors; human factors; technology; management; transportation and

storage; and others? Please give some explanation for your viewpoints.

10. What challenges have been faced by managers of your company while implementing quality management systems in the whole of your production chain?
11. In your opinion, what are the compulsory factors needed for implementing quality management systems?
12. There are various standards and regulations that are implemented in the baby dairy product industry. How do you evaluate them? Are there any positive or negative aspects of those standards and regulations? What are the challenges that are faced while implementing these standards and regulations?

## Appendix F. Validation questionnaire

This questionnaire is designed for the managers who have taken part in this study. As you have been already interviewed for this research, your participation would be much appreciated. Please show your level of agreement with the statements given below. Taken together, the statements constitute the solution to the identified problem of quality management in the Chinese baby dairy product industry.

### Pre-production stage

	Agree	Neutral	Disagree
<b>Dairy farm management</b>			
1. With regard to the problem of contaminated feed, a systematic feed management plan is required. Adequate water and feed as per the requirements of individual cows (adequate maintenance of energy levels through a combination of fibre, vitamins and minerals, protein, carbohydrates and fats) should be given. In addition, strict cleanliness measures with regard to how the cows are fed should become part of the daily routine.			
2. Cows' feed must contain the optimum combination and amount (i.e. 15 kg per day) of fodder crops (i.e. sesbania, leucaena and calliandra), wheat, maize and Napier grass, along with stems and banana leaves. This will ensure cows' growth and development, weight gain, milk production and reproduction.			
3. The systematic feed management plan should have the following elements: <ul style="list-style-type: none"> <li>• basal diet – sufficient amount of nutrients for meeting cows' daily basic energy requirements;</li> <li>• protein through white clover, bean straw and lucerne – this is needed for microorganisms in the stomach that convert the roughage into nutrients;</li> <li>• 60 litres of water per day.</li> </ul>			

4. Due to farmers lacking requisite expertise, using the services of professional experts for implementation of a systematic feed management plan would be beneficial.			
5. Many problems occur because of lack of information and awareness, so baby dairy product companies need to cooperate with research institutions in order to obtain up-to-date information regarding best practice for cows' feed.			
6. The cleanliness of storage facilities for feed needs to be maintained as this is essential for preventing disease.			
7. Proper guidelines are not often available, therefore instruction manuals for storage facility managers and small dairy farmers should be developed as these will help in dealing with quality problems.			
8. Large milk companies that have technologically advanced equipment could share this with the small dairy farmers in order to address the problem of small farmers lacking capacity.			
<p>9. Physical characteristics and quality of cows should be matched with their environment. For example, if an automatic milking system is introduced, cows must have following characteristics:</p> <ul style="list-style-type: none"> <li>• overall, they must be productive and healthy;</li> <li>• they must have correctly placed teats along with healthy legs and feet;</li> <li>• they must have the right temperament.</li> </ul>			
10. An automatic milking system should be used as it can both enhance the efficiency of the milking process and, at the same time, reduce the chances of contamination during it.			
11. Cows that are to be used with automatic milking systems need to possess certain characteristics and be of a certain temperament (consideration of fearfulness, activity and sociability factors). These			

elements should be taken into account when selecting stock.			
12. On-farm monitoring programmes and risk management procedures should be introduced to monitor and control quality in order to detect potential quality problems before they actually occur.			
13. The quality of the cows determines the quality of the final products of baby dairy manufacturing companies; therefore, cows on dairy farms must be from superior breeds known for both quantity and quality of milk, and controlled by an animal management plan.			
14. Baby dairy product companies must include the following aspects in an animal management plan: <ul style="list-style-type: none"> <li>• minimum acceptable level of environment for the cows;</li> <li>• minimum acceptable level of quality of feed for the cows.</li> </ul>			
15. The fodder must be free from mycotoxins (including aflatoxins), mammalian protein pesticides and other harmful substances. As long as dairy farms and baby dairy companies comply with national regulations, they will be able to avoid such substances being found in the fodder.			
16. Modern animal husbandry practices can improve the quality of cows; therefore, these should be adopted for enhancing the quality of the milk.			
17. The promotion of modern animal husbandry practices requires the participation of a number of stakeholders: <ul style="list-style-type: none"> <li>• professional experts;</li> <li>• the government;</li> <li>• large milk companies;</li> <li>• skillful employees.</li> </ul>			
18. The government should improve the health of cows and prevent disease by specific legal controls along with biosecurity measures.			

<p>19. The movement of stock, vehicles and people between dairy farm sites can become a source of epidemic disease in cows; therefore, proper disinfection procedures must be carried out.</p>			
<p>20. Once epidemic diseases have been identified, premises and area restrictions should be enforced in order to prevent the spread of infection.</p>			
<p>21. Only those individuals making essential visits should be allowed on to dairy farms to prevent the spread of disease, and this applies to day-to-day operations, not just when disease has been identified.</p>			
<p>22. Animal health programmes should be introduced by the large baby dairy product companies. Such plans must have details about:</p> <ul style="list-style-type: none"> <li>• selection of animals;</li> <li>• control of disease;</li> <li>• person responsible for implementation;</li> <li>• cleanliness measures;</li> <li>• schedule for vaccination and medication;</li> <li>• disposing of fallen stock;</li> <li>• health maintenance measures.</li> </ul>			
<p>23. Small dairy farmers are unable to manage quality themselves; therefore, the local livestock production officer and a similar person from a large milk company should be brought in to offer advices.</p>			
<b>Control over dairy farms</b>			
<p>24. Dairy farms owned by baby dairy product companies provide better opportunities to regulate the following important aspects of animal management:</p> <ul style="list-style-type: none"> <li>• quality of cows;</li> <li>• quality of feed given to cows;</li> <li>• growth and development of cows;</li> <li>• appropriate environmental conditions;</li> </ul>			

<ul style="list-style-type: none"> <li>• the milking process;</li> <li>• cleanliness;</li> <li>• disease prevention.</li> </ul>			
<p>25. An optimum level of control over third-party dairy farms will also be useful for resolving all quality-related problems occurring at the source stage. In particular, there is a need to inspect the raw milk in order to avoid quality problems.</p>			
<b>Quality of raw materials</b>			
<p>26. Quality problems often occur because of suppliers; therefore, raw materials must be obtained from certified suppliers.</p>			
<p>27. The internal quality assurance/control/inspection department must inspect the quality of all raw materials purchased for use in the production process because this will help in reaching the goal of improved quality management systems (QMS).</p>			
<b>Animal management plan</b>			
<p>28. A proper formal animal management plan outlining internal rules and regulations for managing dairy farms in relation to the following aspects can resolve quality issues as follows:</p> <ul style="list-style-type: none"> <li>• feed quality level;</li> <li>• feed amount;</li> <li>• availability of water;</li> <li>• milking process;</li> <li>• raw milk storage and transportation.</li> </ul>			
<b>Role of dairy farmers</b>			
<p>29. Awareness programmes promoted by the government could help in encouraging dairy farmers to comply with the relevant quality-related laws, regulations and standards. The goal is to achieve the highest possible compliance from all parties.</p>			

Quality and safety inspections			
30. It is the responsibility of the quality assurance/control/inspection department to arrange inspections on everything from the raw materials to the final product. Inspections should determine whether or not products meet the criteria specified by the latest laws, standards and regulations.			
31. Increasing the sample coverage and frequency of inspections could help in reducing quality problems.			
Technology in the pre-production stage			
32. The use of the following technologies is helpful for reducing quality issues and problems: <ul style="list-style-type: none"> <li>• automatic milking system;</li> <li>• robotic feeding system;</li> <li>• advanced inspection system;</li> <li>• cleaning and hygiene technologies.</li> </ul>			

### Information-sharing system

	Agree	Neutral	Disagree
33. An improved information-sharing process between the following parties will reduce quality problems: <ul style="list-style-type: none"> <li>• dairy farmers;</li> <li>• milk collection stations;</li> <li>• government departments;</li> <li>• baby dairy product companies;</li> <li>• suppliers;</li> <li>• wholesalers;</li> <li>• distributors;</li> <li>• retailers.</li> </ul>			
34. From the raw materials to the end product, it is important to ensure that information is shared in a transparent way between all supply chain actors because this could be helpful in eradicating			

quality problems.			
35. The Chinese government will have to invest in a traceability because many of the small supply chain actors are not economically capable of doing so.			
36. The traceability system could be developed by assigning user IDs to all products moving in and out of a company.			

### **Role of the government**

	Agree	Neutral	Disagree
37. The government should take steps to control corruption in the baby dairy product industry.			
38. The government should provide subsidies and tax rebates to those supply chain actors prepared to put an effort into developing a traceability system as this will encourage all supply chain actors to get involved in managing quality.			
39. In implementing a traceability system, training in how to use it would be another step forward for quality management in the Chinese baby dairy product industry.			
40. For the long-term development of the baby dairy product industry to a stage where there are no quality issues, one single authority should be held responsible for the quality and safety of food.			
41. All government departments (i.e. Ministry of Agriculture, Ministry of Water Resources, General Administration of Quality Supervision, Inspection and Quarantine, State Administration for Industry and Commerce, Food and Environmental Hygiene Department and the Ministry of Industry and Information Technology) need to collaborate and coordinate in order to develop better QMS in the baby dairy product industry rather than simply			

passing the buck.			
<b>Ministry of Agriculture</b>			
42. The quality of feed should be under the supervision of the Ministry of Agriculture. By making this department responsible for feed and dairy farm management, quality problems related to feed and dairy farms will decrease.			
43. Certain aspects of QMS (i.e. growing feed for cows, breeding and dairy farm management) not covered by the new Food Safety Law 2015, should be added to the responsibilities of the Ministry of Agriculture.			
44. The use of pesticides on cows' feed could lead to unfortunate consequences; therefore, this must be avoided and responsibility for addressing this issue should lie with the Ministry of Agriculture.			
45. The Ministry of Agriculture should take responsibility for designing laws, standards and regulations suitable for dairy farms.			
46. The Ministry of Agriculture should control the use of those chemicals and fertilisers which could prove harmful for cows as this could become a problem for quality in the baby dairy product industry.			
47. If the Ministry of Agriculture were to introduce loan schemes, animal facility management programmes, awareness programmes and licensing systems this would reduce quality problems at the source stage of the baby dairy product manufacturing process.			
48. The Ministry of Agriculture should allow farmers to lease advanced machinery related to dairy farming.			
49. The Ministry of Agriculture should invest in growing hay and silage for animal fodder as it does other crops.			
50. The Ministry of Agriculture should develop agro-parks, where			

the same type of integrated supply chain can be applied to the crops as is being introduced in the baby dairy product industry.			
51. The Ministry of Agriculture should introduce an animal facility management programme for regulating breeders, dealers and farmers concerned with dairy farming.			
52. The Ministry of Agriculture should start a licensing system for supply chain actors supplying raw materials for the baby dairy product industry and companies should only be allowed to deal with those suppliers that have a licence.			
53. The Ministry of Agriculture should educate dairy farmers regarding animal husbandry such that their new practices ensure a minimum occurrence of quality problems.			
<b>Ministry of Water Resources</b>			
54. The Ministry of Water Resources should ensure that the quality of water that is provided to dairy farms and baby dairy product manufacturing facilities is satisfactory (no pollutants) because this will be beneficial for quality management in the industry.			
<b>General Administration of Quality Supervision, Inspection and Quarantine</b>			
55. Dairy farms and small milk collection stations should be added to the scope of AQSIQ with regard to product licensing procedures and quality and safety inspection procedures, which it has responsibility for.			
56. AQSIQ should: <ul style="list-style-type: none"> <li>• provide licences only to those enterprises that can control the quality of the raw materials;</li> <li>• organise rigorous inspections which every baby dairy company has to pass before its products can be released on to the market. The scope of these inspections should also cover the sources of the raw milk.</li> </ul>			

State Administration for Industry and Commerce			
57. SAIC should enhance the level (up to international level) of laws, regulations and standards for quality-related issues.			
58. SAIC should introduce animal welfare regulations for dairy farmers in order to improve practices in this area.			
59. Animal welfare regulations should target: <ul style="list-style-type: none"> <li>• freedom from hunger, thirst and malnutrition;</li> <li>• freedom to express behaviour as per the normal pattern;</li> <li>• freedom from any discomfort;</li> <li>• freedom from disease, pain and injuries;</li> <li>• freedom from distress and fear.</li> </ul>			
60. SAIC should introduce essential animal management training for all dairy farmers in order to ensure they are following best practice.			
Food and Environmental Hygiene Department			
61. The Food and Environmental Hygiene Department must carry out inspections and audits at dairy farms, production facilities, distribution centres, warehouses and storage facilities related to the baby dairy product industry at both regular and random intervals.			
Ministry of Industry and Information Technology			
62. The Ministry of Industry and Information Technology should work collaboratively with other departments to develop a traceability system.			

Laws, regulations and standards

	Agree	Neutral	Disagree
63. Penalties for not complying with laws, regulations and standards (and prompt enforcement) are one of the solutions for dealing with the non-compliance of stakeholders.			

<p>64. Self-developed internal quality standards are useful for quality management in the baby dairy product industry.</p>			
<p>65. Internal quality standards must target omissions in the national quality standards and, these, in turn, should be more aligned with the better international standards.</p>			
<p>66. Enforcement of laws, regulations and standards is needed with regard to all supply chain actors in the baby dairy product industry. All supply chain actors have equal responsibility for complying. Non-compliance by one supply chain actor can result in serious consequences for quality management in the baby dairy product industry.</p>			
<p>67. Many of the quality-related problems could be resolved with an improved and enforceable system of laws, regulations and standards which should revolve around:</p> <ul style="list-style-type: none"> <li>• enhanced awareness;</li> <li>• strict consequences for non-compliance;</li> <li>• performance evaluation of all supply chain actors;</li> <li>• proper guidance programmes for compliance;</li> <li>• motivational programmes for compliance;</li> <li>• inspections.</li> </ul>			

## **Appendix G: Participant information sheet (MPhil stage)**

**Study title:** Study of the Impact of Quality Management Systems on Chinese Baby Dairy Product Industries

### **Invitation to take part in this study:**

You are kindly invited to take part in this research study. Before you decide whether or not to take part, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully.

### **Purpose of the study:**

The purpose of this study is to identify the basic situation of China baby milk quality, to analyse this industry trends and prospects of development in China. The evaluation will identify best practice, and will enable the development of quality management guidelines which will benefit the relevant customers.

### **Why you have been invited to participate:**

As part of the research we would like to invite some managers of selected companies to participate either in an Interview or Questionnaire. We would like to gather information on the appropriateness of the quality management and whether or not this is, in your experience, able to support the production activities.

### **Do I have to take part?**

You do not have to take part. This is entirely voluntary. If you do decide to take part you will be given this information sheet to keep and be asked to sign a consent form. If you decide to take part you are still free to withdraw at any time and without giving a reason. This is for both phases of the study.

### **What will happen to me if I take part?**

You will be interviewed if you agree. The interview should take approximately 15 minutes. The interview will be written recorded for transcription, and all information used will be anonymous.

If you are not convenient for interview, please help me to answer the questionnaire and return back to me by email.

There are no costs or risks associated with this activity.

### **Can I withdraw from this study?**

You will be able to stop the interview at any time, and you do not have to answer any questions, but it will not be possible to remove the data from the study after the final analysis has been undertaken.

### **What are the possible benefits of taking part?**

You will be able to inform the research by sharing your experience of milk quality for

relevant people. This will inform the research findings and design and policy recommendations for quality management system.

**Will what I say in this study be kept confidential?**

UCLan activities which involve personal data of any kind, in any way, must comply with the Data Protection Act 1998 (DPA). Hence you will be asked to provide explicit consent if you decide to participate in this study. All information collected during the interview will be kept strictly confidential (subject to legal limitations). Confidentiality, privacy and anonymity will be ensured in the collection, storage and publication of research material in accordance with the University's policy on Academic Integrity. All data collected as part of this research will be kept securely in paper or electronic form for 5 years.

**What should I do if I want to take part?**

All you need to do is sign the consent form and agree a time with us to be interviewed.

**What will happen to the results of the research study?**

The anonymised results will be disseminated widely: at a research seminar and a conference, and a paper will be published in an academic journal. We will send you a copy of the final report.

**Who is organising and funding the research?**

This is self-funded research activity.

**Who has reviewed the study?**

This research has been approved by the University Research Ethics Committee.

**Contact for Further Information**

If you have questions about this study and the interview, please contact Dr. Liben Jiang, Grenfell-Baines School of Architecture, Construction and Environment, University of Central Lancashire, Kirkham Building, Tuson Street, Preston PR1 2HE.

tel: +44 1772 895789. email: [ljjiang2@uclan.ac.uk](mailto:ljjiang2@uclan.ac.uk)

**What do I do if I have any issues or complaints**

If you have any complaints about this research or researchers, please contact Professor Akintola Akintoye, Dean, Grenfell-Baines School of Architecture, Construction and Environment, University of Central Lancashire, Harris Building, Corporation Street, Preston PR1 2HE. tel: +44 1772 893211. fax: +44 1772 892916. email: [AAkintoye@uclan.ac.uk](mailto:AAkintoye@uclan.ac.uk)

**Thank you for taking the time to read this information sheet.**

## **Appendix H: Participant information sheet (PhD stage)**

**Study title:** Study of the Impact of Quality Management System on Chinese Baby Dairy Product Industries

### **Invitation to take part in this study:**

You are kindly invited to take part in this research study. Before you decide whether or not to take part, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully.

### **Purpose of the study:**

The purpose of this study is to identify the basic situation of China baby milk quality, to analyse this industry trends and prospects of development in China. The evaluation will identify best practice, and will enable the development of quality management guidelines which will benefit the relevant customers.

### **Why you have been invited to participate:**

As part of the research we would like to invite some managers of selected companies to participate either in an Interview or Questionnaire. We would like to gather information on the appropriateness of the quality management and whether or not this is, in your experience, able to support the production activities.

### **Do I have to take part?**

You do not have to take part. This is entirely voluntary. If you do decide to take part you will be given this information sheet to keep and be asked to sign a consent form. If you decide to take part you are still free to withdraw at any time and without giving a reason. This is for both phases of the study.

### **What will happen to me if I take part?**

You will be interviewed if you agree. The interview should take approximately 15 minutes. The interview will be written recorded for transcription, and all information used will be anonymous.

If you are not convenient for interview, please help me to answer the questionnaire and return back to me by email.

There are no costs or risks associated with this activity.

### **Can I withdraw from this study?**

You will be able to stop the interview at any time, and you do not have to answer any questions, but it will not be possible to remove the data from the study after the final analysis has been undertaken.

### **What are the possible benefits of taking part?**

You will be able to inform the research by sharing your experience of milk quality for

relevant people. This will inform the research findings and design and policy recommendations for quality management system.

**Will what I say in this study be kept confidential?**

UCLan activities which involve personal data of any kind, in any way, must comply with the Data Protection Act 1998 (DPA). Hence you will be asked to provide explicit consent if you decide to participate in this study. All information collected during the interview will be kept strictly confidential (subject to legal limitations). Confidentiality, privacy and anonymity will be ensured in the collection, storage and publication of research material in accordance with the University's policy on Academic Integrity. All data collected as part of this research will be kept securely in paper or electronic form for 5 years.

**What should I do if I want to take part?**

All you need to do is sign the consent form and agree a time with us to be interviewed.

**What will happen to the results of the research study?**

The anonymised results will be disseminated widely: at a research seminar and a conference, and a paper will be published in an academic journal. We will send you a copy of the final report.

**Who is organising and funding the research?**

This is self-funded research activity.

**Who has reviewed the study?**

This research has been approved by the University Research Ethics Committee.

**Contact for Further Information**

If you have questions about this study and the interview, please contact Dr Liben Jiang, The School of Engineering, University of Central Lancashire, Kirkham Building, Preston PR1 2HE. tel: +44 1772 895789. email: [ljiang2@uclan.ac.uk](mailto:ljiang2@uclan.ac.uk)

**What do I do if I have any issues or complaints**

If you have any complaints about this research or researchers, please contact Professor Ian Sharrington, Research Director, the School of Engineering, University of Central Lancashire, Preston. PR1 2HE. tel: +44 1772 893322. email: [Isherrington@uclan.ac.uk](mailto:Isherrington@uclan.ac.uk)

**Thank you for taking the time to read this information sheet.**

## Appendix I: Consent form (MPhil stage)

**Full title of Project:** Study of the Impact of Quality Management System on Chinese Baby Dairy Product Industries

**Name, position and contact address of Researcher:**

Qingxin Chen

PhD Candidate

The Grenfell-Baines School of Architecture, Construction and Environment

University of Central Lancashire

Kirkham Building, Tuson Drive, Preston. PR1 2HE.

Tel: 07557342308

Email: qxchen@uclan.ac.uk

	Please initial box
I confirm that I have read and understand the information sheet, dated 1st January 2014 for the above study and have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.	<input type="checkbox"/>
I understand that my participation is voluntary and that I am free to withdraw at any time, without giving reason.	<input type="checkbox"/>
I agree to take part in the above study.	<input type="checkbox"/>
I agree that my data gathered in this study may be stored (after it has been anonymised) in a specialist data centre and may be used for future research.	<input type="checkbox"/>
I understand that it will not be possible to withdraw my data from the study after final analysis has been undertaken	<input type="checkbox"/>
I agree to the interview not being tape recorded	<input type="checkbox"/>
I agree to the use of anonymised quotes in publications	<input type="checkbox"/>
Will you be willing to take part in Phase 2	<input type="checkbox"/>

\_\_\_\_\_

Name of Participant

\_\_\_\_\_

Date

\_\_\_\_\_

Signature

\_\_\_\_\_

Name of Researcher

\_\_\_\_\_

Date

\_\_\_\_\_

Signature

**Appendix J: Consent form (PhD stage)**

**Full title of Project:** Study of the Impact of Quality Management System on Chinese Baby Dairy Product Industries

**Name, position and contact address of Researcher:**

Qingxin Chen  
 MPhil/PhD in Environment Management  
 The School of Engineering  
 University of Central Lancashire  
 Kirkham Building, Preston PR1 2HE.  
 Tel: 07557342308      Email: qxchen@uclan.ac.uk

	Please initial box
I confirm that I have read and understand the information sheet, dated 1st January 2016 for the above study and have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.	<input type="checkbox"/>
I understand that my participation is voluntary and that I am free to withdraw at any time, without giving reason.	<input type="checkbox"/>
I agree to take part in the above study.	<input type="checkbox"/>
I agree that my data gathered in this study may be stored (after it has been anonymised) in a specialist data centre and may be used for future research.	<input type="checkbox"/>
I understand that it will not be possible to withdraw my data from the study after final analysis has been undertaken.	<input type="checkbox"/>
I agree to the interview not being tape recorded.	<input type="checkbox"/>
I agree to the use of anonymised quotes in publications.	<input type="checkbox"/>
Will you be willing to take part in validation process?	<input type="checkbox"/>

\_\_\_\_\_  
 Name of Participant

\_\_\_\_\_  
 Date

\_\_\_\_\_  
 Signature

\_\_\_\_\_  
 Name of Researcher

\_\_\_\_\_  
 Date

\_\_\_\_\_  
 Signature

## Appendix K: Ethics approval (MPhil stage)



24 February 2014

Liben Jiang / Qing Xin Chen  
Grenfell-Baines School of Architecture, Constructions and Environment  
University of Central Lancashire

Dear Liben / Qing

**Re: STEMH Ethics Committee Application**  
**Unique Reference Number: STEM 158**

The STEMH ethics committee has granted approval of your proposal application ‘**Study of the Impact of Quality Management System on Chinese Baby Dairy Product Industries**’. Please note that approval is granted up to the end of project date or for 5 years, whichever is the longer. This is on the assumption that the project does not significantly change, in which case, you should check whether further ethical clearance is required.

We shall e-mail you a copy of the end-of-project report form to complete within a month of the anticipated date of project completion you specified on your application form. This should be completed, within 3 months, to complete the ethics governance procedures or, alternatively, an amended end-of-project date forwarded to [roffice@uclan.ac.uk](mailto:roffice@uclan.ac.uk) quoting your unique reference number.

Yours sincerely

Tal Simmons  
Chair  
**STEMH Ethics Committee**

*NB - Ethical approval is contingent on any health and safety checklists having been completed, and necessary approvals as a result of gained.*

## Appendix L: Ethics approval (PhD stage)



2nd February 2016

Liben Jiang/Qingxin Chen  
School of Engineering  
University of Central Lancashire

Dear Liben/Qingxin,

**Re: STEMH Ethics Committee Application**  
**Unique Reference Number: STEMH 428**

The STEMH ethics committee has granted approval of your proposal application 'Study of the Impact of Quality Management System on Chinese Baby Dairy Product Industries'. Approval is granted up to the end of project date\* or for 5 years from the date of this letter, whichever is the longer.

It is your responsibility to ensure that:

- the project is carried out in line with the information provided in the forms you have submitted
- you regularly re-consider the ethical issues that may be raised in generating and analysing your data
- any proposed amendments/changes to the project are raised with, and approved, by Committee
- you notify [roffice@uclan.ac.uk](mailto:roffice@uclan.ac.uk) if the end date changes or the project does not start
- serious adverse events that occur from the project are reported to Committee
- a closure report is submitted to complete the ethics governance procedures (Existing paperwork can be used for this purposes e.g. funder's end of grant report; abstract for student award or NRES final report. If none of these are available use e-Ethics Closure Report Proforma).

Yours sincerely,

Kevin Butt  
Vice Chair

**STEMH Ethics Committee**

\* for research degree students this will be the final lapse date

*NB - Ethical approval is contingent on any health and safety checklists having been completed, and necessary approvals as a result of gained.*