University of Central Lancashire
UCLan

Central Lancashire Online Knowledge (CLoK)

Title	Terminology and the understanding of culture, climate, and behavioural change – Impact of organisational and human factors on food safety management
Type	Article
URL	https://clok.uclan.ac.uk/id/eprint/31170/
DOI	https://doi.org/10.1016/j.tifs.2019.12.005
Date	2020
Citation	Sharman, N., Wallace, Carol Anne and Jespersen, L. (2020) Terminology and the understanding of culture, climate, and behavioural change – Impact of organisational and human factors on food safety management. Trends in Food Science & Technology, 96. pp. 13-20. ISSN 0924-2244
Creators	Sharman, N., Wallace, Carol Anne and Jespersen, L.

It is advisable to refer to the publisher's version if you intend to cite from the work.
https://doi.org/10.1016/j.tifs.2019.12.005

For information about Research at UCLan please go to http://www.uclan.ac.uk/research/

All outputs in CLoK are protected by Intellectual Property Rights law, including Copyright law. Copyright, IPR and Moral Rights for the works on this site are retained by the individual authors and/or other copyright owners. Terms and conditions for use of this material are defined in the http://clok.uclan.ac.uk/policies/

Journal: Trends in Food Science and Technology

Terminology and the understanding of Culture, Climate, and Behavioural Change – Impact of Organisational and Human Factors on Food Safety Management

Authors

N. Sharman[a,*], C. A. Wallace[a], L. Jespersen[b]

[a] University of Central Lancashire, International Institute of Nutritional Sciences and Applied Food Safety Studies, Preston, Lancashire PR1 2HE, United Kingdom.

[b] University of Guelph, Impasse Alphonse Albert 4, 2068 Hauterive, Switzerland.

[*]Corresponding author.

E-mail address: nsharman@me.com

Declarations of interest: none

Abstract

Background: The topic of food safety culture and climate is growing attention from industry, researchers, standards owners and certification bodies. Authors use the terms food safety culture and climate, however, there are no unified definitions to provide clarity on the meaning of these terms.

Scope and Approach: The objective of this study is to analyse the similarities and differences in current definitions and statements of Food Safety Culture and Food Safety Climate, and provide suggested clarifying definitions for both concepts, to bring a consistent approach to the field. The study evaluates the types of organisational cultures, climates and employees' behaviours which provide important differences and further insights into each of these.

Key Findings and Conclusions: Looking back at the origins of safety culture following the Chernobyl accident in the 1980's provides an understanding of how this laid the foundation for safety culture and climate in the UK. Reflecting on the increasing trend in Hazard Analysis and Critical Control Point (HACCP) breaches due to the increasing number of incidents reported to authorities, the study suggests an increased focus is needed on culture, climate, and behaviour in food businesses. A critical analysis of previous definitions, statements and common words currently used to describe culture and climate in published

definitions is provided. New definitions for food safety culture and climate based on factors shown to be important and are recommended for use by industry and researchers are proposed. The study assesses different types of culture, climate and employees, and suggests different employee behaviours impact the culture and climate of an organisation.

Keywords:
Food Safety Culture, Food Safety Climate, Behaviour, Organisational Culture/Climate, Human Factors

Highlights:

1. Provides critical analysis of published culture and climate definitions and statements
2. Identifies common words and factors used in published definitions
3. Proposes new definitions for food safety culture and food safety climate
4. Explores how types of culture and behaviours may impact food safety
5. Highlights future research requirements for enhanced food safety performance

Introduction

According to the World Health Organisation (WHO), one in ten of the global population experiences foodborne illness annually (WHO, 2017). Incidents (e.g., product withdrawal and recalls) have occurred across a number of countries (Table 1) and there is an increasing trend in the incidents notified to food authorities, with exception from the US Federal Food and Drug Administration (FDA), who have seen a declining trend.

Table 1: Number of Incidents (e.g., product withdrawal and recalls) notified to authorities during 2 different time periods (www.food.gov.uk, www.foodstandards.gov.au, www.fda.gov, www.fsis.usda.gov)

Location/Authority	2013/14	2016/17	% difference
Australia & New Zealand/ Food Standards Australia New Zealand **(**FSANZ)	42	72	+70
UK/Food Standards Agency (FSA)	1567	2265	+44
USA/United States Department of Agriculture (USDA)	75	122	+65
USA/US Federal Food and Drug Administration (FDA)	3844	2847	-26

To limit the risk of foodborne illness, all food manufacturers and caterers must have a food safety management system (FSMS) in place. In addition, all businesses have a culture (organizational and food safety); however the question remains: what type of culture is prevailing and how it can be understood and used to prevent foodborne disease outbreaks. Whilst some argue that a Hazard Analysis and Critical Control Point (HACCP) plan with effective prerequisites in place is the most effective way to manage food safety (Griffith et al., 2010a; Wilcock et al., 2011), the data in Table 1 suggest that food safety breaches continue to occur, and it must be recognised that HACCP is just one tool within an FSMS, (Wallace, Sperber and Mortimore, 2018). Also, without there being a compliance culture where employees are more likely to engage in behaviours that collectively contribute to organisational compliance (Interligi, 2010), there is room to improve culture maturity. In the food safety context, this means that all reasonable precautions and all due diligence need to be completed truthfully and actioned appropriately by all personnel at all times. Where people fail to adhere to the procedures which control the hazards identified in the HACCP

plan, consumers and products are put at risk, which may lead to recalls or foodborne illness (Powell et al., 2011; Jespersen and Huffman, 2014).

Whilst some preceding studies exist linking climate to (workforce) safety (e.g. Keenan, 1951; Zohar, 1980), a key reference to the term safety culture followed the 1986 Chernobyl accident, and subsequently this has been at the forefront of thinking with regards to health and safety (people safety) in the UK (www.hsl.gov.uk, Griffith et al., 2010a; Zohar, 2000). Decades have passed since the Chernobyl accident occurred, numerous papers have been published on the topics of organisational safety culture and climate and human factors pertaining to safety (Schein, 1985, 2017; Denison and Mishra, 1995; Denison, 1996; Hartnell et al., 2016; Reason, 2008, 2016). Where businesses operate in a high-risk environment the UK Health and Safety Executive provides guidance on how to manage health and safety. However, the application of organisational culture and climate in the food industry regarding consumer safety rather than personnel health and safety has been more recent. Regarding health and safety, Nayak and Waterson, (2017) report that there are many highly regulated industries around the world, including healthcare, nuclear and automotive. In China where coal mining is thought to be the riskiest industry, leadership has been found to support safety behaviour (Zhang et al., 2017). Likewise, in the food industry, when senior management drives a positive food safety culture, they are choosing to behave in a way that has the potential to reduce food safety incidents (Yiannas, 2009). Whilst learnings can be taken from other industries this study will focus on culture, climate, and behaviour with respect to food safety.

Culture and climate (including food safety culture and climate) have been gaining much attention by researchers and practitioners with Denison (1995), Schein (1997), Griffith (2010a, 2010b), Guldenmund (2000) evaluating both aspects. However, there are still no consistent definitions of food safety culture and climate for use by industry practitioners and researchers. Zohar was one of the first authors to discuss organisational climate in the safety domain in the 1980s (Zohar, 1980); however, since this early work, published research has conflicting views between the definitions of culture and climate, whether from an organisational, people safety or a food safety perspective. This could potentially cause confusion in organisations seeking to understand their culture and climate and further research is needed to see if this has an impact on the organisation when they are in the

process of changing their approach to food safety. Denison (1996) debated the differences between organisational culture and climate, highlighting that when people come from different research backgrounds the words culture and climate mean different things. Denison considered climate as a transient situation, considering the thoughts, feelings, and behaviours of employees. These perceptions are subjective, a moment in time, and thus management can use their power and influence to change them. In comparison, culture is considered as an evolved concept which is rooted in history, is complex and adhered to by all (Denison, 1996). Due to the depth that culture is ingrained within the organisation, it is difficult to manipulate and change the culture. Schein (1985, p19) defines culture as "A pattern of shared basic assumptions learned by a group as it solved its problems of external adaptation and internal integration, that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems". Jespersen et al. (2016) adopted this definition when developing the theoretical framework for a food safety specific maturity model and Griffith et al. (2010a) stated that Schein was probably the most influential writer in organisational culture. Yiannas (2009) believes organisations can choose to create a strong food safety culture, with leaders who are accountable for instigating it as they have the power and influence to create a positive food safety culture. Further, where there is a good Food Safety Management System (FSMS) with a positive compliance culture, it is possible to reduce the risks to the consumer (Griffith et al., 2010a). This may be due to a combination of leadership, communication and FSMS compliance, as illustrated in the study by De Boeck et al. (2018), who found that one company with multiple food processing sites had a better food safety climate than a one-site operating company. The multiple site company was stronger in leadership, communication and commitment and this suggests that it could be due to a larger workforce requiring a structured approach (De Boeck et al., 2018). In addition, Ball et al. (2009) and Hinsz and Nickell (2015) showed predictive validity between culture and behaviours, and Denison (1996) showed the same through his organisational culture work. Nevertheless, the role of a leader, worker behaviour and the routes to changing and strengthening food safety culture and climate towards a more effective management of food safety within food businesses remain unclear.

The first objective of this study is to compare and contrast current definitions and statements of culture and climate (i.e. organisational, safety, and food safety) and provide suggested definitions for both concepts. This will allow these two distinctly different but related domains to be clarified for future research and industry applications. The second objective is to review and discuss knowledge of different types of climates and cultures to provide information on typologies of culture and climate, and to outline important differences and further insights into the impact of employee behaviour on culture and climate.

Method

A literature review was conducted using databases Science Direct and Emerald Insight, and grey literature such as industry reports. The search used keywords to find relevant material, for example; Senior management effects on food safety culture, assessment of food safety culture, food safety climate, measuring food safety culture, change management, behavioural change. Inclusion criteria were: (i) articles published in English, with a preference for peer-reviewed articles, (ii) scope of the article includes information pertinent to objectives of this study, (iii) article includes safety culture and climate definitions in food and other industries, management of culture, behavioural changes.

Titles and abstracts were reviewed for relevance based on whether they met the objective and inclusion criteria. Fifty-six articles meeting the criteria from 1980 to the present day were obtained and reviewed. Relevant content from each paper was categorised under themes to enable comparison of the content. In addition, citations and reference lists of these papers were reviewed to identify earlier seminal papers in the fields, which were also obtained and reviewed.

Further categorisation of all definitions or statements was performed to enable a textual analysis to compare and contrast the definitions or statements.

Definitions from literature

Throughout the literature reviewed the terms culture and climate are defined and applied differently. Some authors believe they are intertwined e.g., Pettita et al. (2017), whilst

168 others e.g., Griffith et al. (2010a) and Denison (1995) discuss how they are different. Table 2
169 provides an overview of the historical development of culture and climate definitions or
170 statements quoted by authors working in the domains of organisational, safety and food
171 safety between 1968 and 2018.
172
173
174
175
176
177
178
179
180
181
182
183
184
185
186
187

188 *Table 2: Historical development of organisational, safety and food safety culture and climate definitions or statements*

Construct	Definition or Statement	Field	Reference
Culture and Climate	"the relatively enduring quality of the total organisational environment that a) is experienced by the occupants b) influences their behaviour, and c) can be described in terms of the values of a particular set of characteristics (or attitudes) of the environment"	Organisation	Tagiuri & Litwin (1968, p25) cited by Denison (1996, p626)
Culture and Climate	"A pattern of shared basic assumptions that the group learned as it solved its problems of external adaptation and internal integration, that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems".	Organisation	Schein (1985, p19)
Culture and Climate	"Belief and value structure members employ as they act in an organisation".	Organisation	Poole (1985, p101) cited by Denison (1996, p633)
Culture and Climate	"the product of multiple goal-directed interactions between people (psychological), jobs (behavioural) and the organisation (situational) situations. In particular, safety culture is the observable extent to which all organisational members put their effort in improving safety on a daily basis."	Safety	Cooper and Phillips (1995, p6)

Culture and Climate	"the relatively enduring quality of the total organisational environment that a) is experienced by the occupants b) influences their behaviour, and c) can be described in terms of the values of a particular set of characteristics (or attitudes) of the environment"	Organisation	~~Tagiuri & Litwin (1968) cited by~~ Denison (1996, p626)
Culture and Climate	"the attitudes, beliefs and perceptions shared by natural groups as defining norms and values, which determine how they act and react in relation to risk and risk control systems".	Safety	Hale (2000, p7)
Climate	"[…] a summary of molar perceptions that employees share about their work environments".	Safety	Zohar (1980, p96)
Climate	"shared perceptions among members of an organisation with regards to organisational policies, procedures and practices."	Organisation	Zohar (2000, p587)
Climate	"a Specific form of organisational climate, understood as individual perceptions of policies, procedures, and practices relating to safety in the workplace".	Organisation	Neal et al. (2000, p100)
Climate	A summary concept describing the employee's beliefs about all the safety issues.	Safety	Guldenmund (2000, p222)
Climate	"Employees' (shared) perceptions of leadership, communication, commitment, resources and	Food Safety	De Boeck et al. (2015,

	risk awareness concerning food safety and hygiene within their current work organisation".		p244)
Climate	"considered more temporal and more subject to the perception of individual employees of an organisation or company".	Organisation	De Boeck et al. (2018, p17)
Culture	"[…] a set of attributes that can be perceived about particular work organisations (maintenance, construction, and central repair shops) and which may be induced by the policies and practices that those organisations impose upon their workers and supervisors".	Safety	Niskanen (1994, p241)
Culture	Safety culture is a set of prevailing indicators, beliefs, and values that the organisation owns in safety.	Safety	Fang et al. (2006, p574)
Culture	"The aggregation of the prevailing, relatively constant, learned, shared attitudes, values and beliefs contributing to the hygiene behaviours used within a particular food handling environment."	Food Safety	Griffith et al. (2010a, p435)
Culture	Interplay of the food safety climate as perceived by the employees and the managers of a company (so called 'human route') and the context in which a company is operating, the current implemented FSMS, consisting out of control and assurance activities (so called 'techno managerial route') resulting in a certain (microbiological) output.	Food Safety	De Boeck et al. (2015, p243)
Culture	"Culture in general can be analysed at several different levels, with the term "level" meaning the degree to which the cultural phenomenon is visible to you as participant or observer.	Organisation	Schein and Schein

	These levels range from the very tangible, overt manifestations that you can see and feel to the deeply embedded, unconscious, basic assumptions that we are defining as the essence of culture or its DNA. In between these layers are various espoused beliefs, values, norms and rules of behaviour that members of the culture use as a way of depicting the culture to themselves and others."		(2017, p17)
Culture	"shared values, beliefs and norms that affect mindset and behaviour toward food safety in, across and throughout an organization".	Food Safety	GFSI (2018, p34)

Common words used in definitions or statements

The overview of definitions or statements found in the literature shows that many of the definitions combine culture and climate and relate to either organisation safety or food safety. Further analysis of the language used across the three fields: culture, climate or a combination; shows the top six words used in definitions are: perception (9) mainly used when defining climate, belief (7), values (5) and behaviours (5) are all seen in culture and in a combination of both culture and climate. Employees (8) are most commonly used when defining climate and finally shared (6) was evenly noted by construct. (Table 3).

Table 3: Common words used in definitions or statements and number of occurrences.

Common words	Culture and climate	Climate	Culture	Total
Influences	1		0	1
Behaviour	**2**		**3**	**5**
Values	**3**		**2**	**5**
Employees, workers, members, people	**1**	**5**	**2**	**8**
Characteristics/Attributes	1		1	2
Attitudes	2		1	3
Pattern	1			1
Shared	**2**	**2**	**2**	**6**
Assumptions	1		1	2
Perceive, Perceived, Perceptions	**2**	**5**	**2**	**9**
Belief	**2**	**1**	**4**	**7**
Norms	1		2	3
Policy		2	1	3
Procedures		2		2
Practices		2	1	3
Leadership		1		1
Communication		1		1

Commitment		1		1
Hygiene		1	1	2
Learned	1		1	2

Comparisons between culture and climate definitions or statements provided in Table 3 illustrate the complexity and potential for confusion. Phrases such as a 'shared set of assumptions, beliefs or attitudes' are common themes in the culture and climate definitions (Schein, 1985; Hale, 2000; Zohar, 2000; De Boeck et al., 2015; Niskanen, 1994; Fang et al., 2006; Griffith et al., 2010a; GFSI, 2018).

Niskanen (1994, p241) states that culture is "a set of attributes can be perceived about particular work organisations", the much earlier work by Tagiuri & Litwin (1968, p25) contributes "the values of a particular set of characteristics", and the Schein (1985, p19) definition mentions, "a pattern of shared basic assumptions".

Hale (2000) and Cooper and Phillips (1995) both intertwine culture and climate in their definitions. Hale (2000, p7) refers to safety culture as "attitudes, beliefs and perception shared by natural groups as defining norms and values", whereas Cooper and Phillips (1995, p6) define culture as "the product of multiple goal-directed interactions between people, jobs, and the organisational situations". Fang et al. (2006, p574) singularly defines culture and also refers to "a set of prevailing indicators, beliefs and values that the organisation owns in safety."

Some of the safety climate definitions also reference shared perceptions in relation to the working environment, rather than the deep-rooted values and beliefs seen in the culture definitions (Zohar 1980, 2000). Nayak and Waterson (2017) suggest culture can be considered as how people behave and climate is more about how they feel.

Working towards a definition of food safety climate

The summary of the definitions or statements detailed in Table 2 provides some insight into the evolution of safety climate. The terms used to define safety climate have themes around behaviours in the working environment, people, procedures and policies. Authors such as Zohar (1980, 2000) and Neal et al. (2000) contribute definitions specifically for safety climate: Zohar (2000) and Neal (2000) have similar definitions that focus on the organisation

and how the employees perceive the policies, procedures, and practices. Neal et al. (2000) specifically link the definition to safety in the workplace but Zohar (2000) suggests it's for every member of the organisation. Tagiuri and Litwin (1968) refer to the whole organisation considering how the climate is experienced by others and influences behaviours. Poole's (1985) definition refers to how members act in an organisation, whereas Schein's (1985) definition waits until a system has worked multiple times so it can be considered as valid, which is then seen as the correct way to perceive, think and feel in those situations. Hale (2000) has a similar definition: once attitudes, beliefs, and perceptions are shared it will "determine how they act and react to risk and risk control systems." A common thread in these climate definitions is perception and its role in how individuals act and interact. Denison (1996) argues that unlike organisational culture, organisational climate is less concerned about the evolution of social systems over time and more concerned with the impact that organisational systems have on groups or individuals. Organisational climate can also be considered in relation to the organisation's basic values and behaviour, which can be objectively measured through observable practices in the organisation (Schein, 1985). Denison cited Litwin & Stringer (1968) who consider the way in which social environment is experienced by others and how climate encompasses both organisational conditions and individual reactions, whereas Schein (1985) considers there to be more emphasis on how the social environment is created by others. Denison (1996, p624) builds on this stating climate "portrays organizational environments as being rooted in the organisation's value system" and considers climate to be temporary due to the members of an organisation and how they perceive the social environment. Denison (1996) argues there are three distinct approaches to study climate which consider 1) the perceptual measurement of individual attributes, 2) perceptual measurement of organisational attributes and 3) the multiple measurements of organisational attributes combining perceptual and objective measures. Thus, perception is a key factor of organisational climate as people's perceptions may change based on information and other conditions around them. The first approach considers the psychological climates, through studying the individual's perception of their working environments, whereas approaches two and three are more targeted to the climate within the organisation.

Working towards a definition of food safety culture

The summary of the definitions or statements detailed in Table 2 provides some insight into the evolution of culture. Schein defined culture as three layers considering the surface, intermediate layer and deep-rooted, where the surface is represented by artefacts and symbols that can be seen, the intermediate layer consists of values and beliefs, and the deepest culture is considered as the core assumptions (Schein 1997). Culture can be considered as what distinguishes one group or organisation from another (Nyarugwe et al., 2016; Hofstede, 2001).

Organisational culture is the beliefs of an organisation, its values, attitudes and how they drive safety standards throughout the business (Pettita et al., 2017). Griffith et al. (2010a) use similar language, defining culture as "the aggregation of the prevailing, relatively constant, learned, shared attributes, values and beliefs".

Schein (1997) discusses how culture is built on an evolution of social systems over time. Thus, to understand the deeply rooted people's viewpoint from within an organisation, i.e. the culture, researchers need to ascertain a deep understanding of the underlying assumptions and not just perception at a given point in time.

As discussed earlier, if we consider culture as values, beliefs and core assumptions and climate as regarding the impact that the organisation's systems have on people, it can be seen that the definitions detailed in table 2 for culture and climate often are intertwined, focusing on the organisation's systems and how employees should adhere to them. Whereas, De Boeck (2015) defines culture by linking it with climate, and Griffith et al. (2010a) defines culture but by linking this with hygiene behaviours, the latter could be part of the organisation's systems, thus introducing an element of climate.

Through the review and analysis of culture and climate definitions found in literature it can be said that culture and climate differ in three areas; time, sociology, and psychology (Table 4). As there are many cross-overs in definitions between food safety culture and climate, the analysis of the common words used in definitions, the three factors of culture and climate definitions was considered to be an appropriate route to creating proposed new definitions that would differentiate between food safety culture and climate in order to encourage clarity for research and industry application.

Table 4: Three factors of culture and climate definitions

	Time	Sociology	Psychology
Climate	Temporary	Individual	Attitude, perception
Culture	Long term	Group, organisation	Belief, behaviour, assumption

Proposed Definitions for food safety culture and food safety climate

Based on the literature review and analysis, the following definitions are proposed:

Food safety culture is defined as a long-term construct existing at the organisational level relating to the deeply rooted beliefs, behaviours and assumptions that are learned and shared by all employees, which impact the food safety performance of the organisation.

Food safety climate is defined as a temporary construct existing at the individual level, relating to the perception and attitudes of individuals and how they influence others in an organisation to adhere to the food safety management systems and practically apply these in their working environment.

Establishing typologies for culture and climate and the impact of employee behaviour on food safety.

The behaviour of others is driven by how the management commit to demonstrating the values and following the rules (Wilcock et al., 2011). There are some thoughts that the management's approach to food safety behaviour could influence the food safety climate at work or the employees' food safety behaviour (De Boeck et al., 2017; Griffith et al., 2010a; Jespersen et al., 2016). Pettita et al. (2017) proposed five different types of organisational cultures, each typified by a particular behaviour (Table 5).

Table 5: Types of organisational cultures and behaviours typically demonstrated by leaders and/or employees (adapted from Pettita et al., 2017)

Type of organisational culture	Description of behaviour
Autocratic	Direct superior/leader, is the source of safety instructions and directions for employees

Bureaucratic	Each employee follows the safety standards set by the top-level bureaucratic leaders
Co-operative	Where all employees work together to ensure they all achieve the safety outcomes
Technocratic	Where employees are focused on results because they are measured by the results
Clan-patronage	This operates with two groups, one who the dominant 'in-group' and the other who tries to be in the in-group are the 'out-group'

Autocratic leaders would give direction about the delivery of safety directives and provide feedback on non-conformances highlighting errors to avoid. This would be a good quality to have, as it ensures they are meeting standards and identifying errors in their system. A hierarchical business is more likely to have *Bureaucratic leaders* who set the safety standards that each employee will follow, therefore there is less reliance on supervisors to enforce the rules as employees are compliant. Conversely, *Co-operative leaders* rely on supervisor enforcement to ensure all employees work together to achieve safety standards. When a *Technocratic organisational* climate is predominant, i.e. a results-driven climate, it could drive behaviour which creates short-cuts, hides errors or skips safety steps. *Clan-patronage leaders* could have ways of working on a day to day basis which may differ from the behaviour during a specific day, e.g. a visit/audit. Clan-patronage are neither positive nor negative safety climates and are not associated with being compliant. This type of behaviour can be dangerous as they display the Hawthorne effect when they are being observed: they appear on the outside to be compliant yet when the external person leaves, the business returns to poor practices which may affect the safety of the products (Pettita et al., 2017). The authors argue that certain cultural types (autocratic and bureaucratic) can suppress the effect of safety climate, as it weakens the relationship between direct supervisor enforcement and employee compliance. Because of this strong management approach, a positive safety culture and high levels of compliance are seen regardless of supervisor enforcement. Pettita et al. (2017) also state that cooperative organisational climates create a positive safety culture, however, in contrast, technocratic organisational climates are associated with negative safety climates and are found to have less compliance. Kapp (2012) showed that with a positive safety climate, employee safety compliance

behaviours improve. Within other industries, such as nuclear, where safety is critical Martinez-Corcoles et al. (2011) reviewed how safety culture was affected in a nuclear plant. The research found that plant safety behaviours had a direct impact on the general safety behaviours, which is no surprise in this industry because not following the correct safety behaviour could result in a catastrophe. Similarly, Pettita et al. (2017) claim that supervisor enforcement is significantly related to employee safety compliance and the overall safety climate has a direct effect on employee compliance. If rules were not consistent for all workers' then workers would revert to old habits. (Wilcock et al., 2011).

Types of culture and behaviours

Some authors report that new employees will normally adopt the dominant behaviour of others which can have a positive or negative effect depending on what type of culture is dominant (Griffith et al., 2010a; Yiannas, 2009). This suggests that it is important for a business to recognise which behaviours each employee exhibits, so that when new employees join the organisation, they are learning from those who show an appropriate understanding and attitude; however, further research is needed in this field.

In addition to the types of climates identified by Pettita et al. (2017), Denison and Mishra (1995) and Hartnell et al. (2016) provide behavioural traits for different types of organisational cultures (Table 6).

Table 6: Types of organisational cultures and behaviours typically demonstrated by leaders (adapted from Denison and Mishra (1995) and Hartnell et al. (2016).

Type of organisational culture	Description of behaviour
Mission culture	Provides a purpose and meaning, and a host of noneconomic reasons why the organisations work is important. Defines the appropriate course of action for the organisation and its members. Focuses on the dynamics of external adaptation. Indicators of integration, direction and vision, and predictors of profitability.
Involvement cultures	Focus on the dynamics of internal integration.

	Flexible, open, responsive and strong predictors of growth.
Task-oriented cultures	Facilitating task accomplishment by defining role relationships among group members, by clarifying expectations and performance standards, and by encouraging the use of standardised rules and regulations to enhance consistency and predictability.
Relationship-oriented cultures	Emphasize interpersonal support and positive relationships by encouraging group members' involvement in decision making, implementing group members' suggestions, demonstrating respect for group members, and treating group members as equals.

Denison and Mishra (1995) identified that when an organisation demonstrates both a *mission culture* and *an involvement culture* this will have a positive impact as it creates and develops the skills of a team. Hartnell et al. (2016) reviewed the different organisational culture profiles and concluded that all typologies of organisational cultures promote *task-oriented* or *relationship-oriented* values. In relationship cultures, individuals influence their colleagues by working as a team to generate ideas, make decisions and communicate well with each other (Hartnell et al., 2016).

To embed a food safety culture a combination of these cultures and values would be the preferred team, thus, this could be useful in food safety performance, but more research is needed to understand the interrelationships of culture types.

Types of commitment employees exhibit and behaviours

Having discussed types of culture and climate and how they impact employee behaviours, it is also necessary to consider how employees may impact culture, climate, and behaviour-change initiatives. A key factor linking employees to the organisation is commitment (Meyer and Allen, 1991) and a wide body of research exists in this area, although not directly linked to food safety culture and climate. Whilst it is outside the scope of this paper to review in detail, it is useful to consider commitment concepts that may play a role. Meyer and Allen (1991) proposed a three-component model of commitment in organisations; affective, normative and continuance commitments, of which employees

might display one or a combination of commitment types. Affective commitment is displayed where employees want to remain within a business, their attendance is high, they complete tasks to their best ability and will do extra tasks to support the business. In normative commitment, employees attend work as they feel they are obliged to and that it is part of their duty. Employees exhibiting continuance commitment are aware of the costs of leaving the organisation and are thus continuing to work in the business because they need to do so, usually for financial gain. This means that they may do the bare minimum required to remain employed (Meyer and Allen, 1991; Meyer and Herscovitch, 2001; Herscovitch and Meyer, 2002). This research identified that affective and normative mindsets were more susceptible to behavioural changes. Herold et al. (2008) conducted research based on the model developed by Meyer and Allen (1991); although not applied specifically to the food industry it did look at organisations' general workforce and argued that affective commitment represents a positive attitude to change. However, whilst the different types of commitments may provide greater insight into the types of people working in food manufacturing factories, these factors are not working alone and would be further influenced by factors such as personal, job and organisational characteristics, demographic factors and leadership. This illustrates the complexity of the integration of culture, climate, and behaviours at the individual level. Whilst there is some research investigating the moderating role of burnout and job stress in food safety climate and behaviour (De Boeck et al., 2017) and indications of differences between workgroups and roles at different organisational levels (Jespersen et al., 2016), the impact of employees, roles and sub-cultures such as workgroups on food safety culture and climate is largely unstudied.

In practice, when there are significant changes to a Food Safety Management System (FSMS), for example a review of HACCP implementation or changes to procedures, this can be a challenge to implement especially when managers/supervisors need to break old habits and create new ones. Their behaviours when implementing change are important so that they set a good example for the workers (Wilcock et al., 2011; De Boeck et al., 2017). Any lack of motivation amongst the management will impact on the employees, potentially resulting in poor food safety culture. (De Boeck et al., 2017; Nayak and Waterson, 2017). Zohar and Tenne-Gazit (2008) also discuss how behaviours change when employees are

under pressure to meet production orders and supervisors change their behaviour and ignore safety procedures. Safety Compliance is driven by training and how management behaviour commits to demonstrating the values and following the rules (Wilcock et al., 2011). Griffith et al. (2010a) claim that workplace culture affecting employee behaviour is largely ignored in the food industry, but widely used in other industries such as aviation and nuclear. Thus, when any changes are required in the food industry these need to be frequently monitored through internal audits to ensure old habits are broken and the changes are implemented.

Future Research Requirements

Where there is a positive organisational climate it may enhance the relationship between safety leadership and employee safety behaviours (Kapp 2012; Probst, 2015; Pettita et al., 2017, Yiannas, 2009;). This may result in a positive attitude from the employees that could contribute to improved food safety compliance and the strengthening of food safety culture and climate. This may, in turn, impact the business' complaints and prevent any incidents that would create a product recall; however, there is no data to suggest this. Further research is needed to provide a greater understanding of how this positive culture and climate can be created.

Where different mindsets are identified, e.g. affective, normative and continuance employees described by Meyer and Allen (1991), Meyer and Herscovitch (2001) and Herscovitch and Meyer (2002), employees' approach to work and adapting to any changes may be a challenge, such that food safety behavioural changes and food safety management systems initiatives may be impacted. Further work could determine how each group benefits using different change management techniques, because what works for one group may not work for the others. This could then lead to tools and interventions that help the continuance group to be as motivated as the affective group and overcome potential resistance or poor engagement with change activities.

Whenever any business wants to enable any changes, there needs to be 'buy-in' from the employers and employees. A company needs to make the decision to change and how this is managed will affect the workforce. Herscovitch and Meyer (2002) discuss that many employees and employers can find change stressful and recognise that the connection between commitment and coping could be more complex. De Boeck et al. (2017)

investigated the effects of job stress and burnout in the relation between food safety climate and food safety behaviour but did not examine how change can affect the workforce. They concluded that burnout and job stress did not affect food safety climate and food safety compliance (De Boeck et al., 2017) but, as this was only conducted for two vegetable processing plants with a small sample size (n=85), further research with a large sample size at various food manufactures may show different results. For example, perhaps the job stress at a ready meals factory may be higher than at a vegetable processing plant due to the multiple number of processes that are involved to create a complex product with different components that all need to be assembled at the correct time, whereas in a vegetable processing plant they may have one process and one raw material to pack. Therefore, the inherent risks with process complexity as well as the product food safety risk will likely be different, and it would be beneficial to explore whether the results on the impact of job stress and burnout on climate and behaviour may differ.

Where businesses have installed CCTV to monitor the employees' behaviours this has been found to have a rapid effect on changing behaviours (Powell et al., 2011; Powell et al., 2013), because when employees are observed it can improve safety compliance and can restore customer confidence if there has been an ongoing issue (Powell et al., 2011; Powell et al., 2013). This may also be due to 'The Hawthorne Effect' defined by Elton Mayo, where staff follow the procedures in areas when they know they are being observed (Hsueh, 2002) and positive effects can be seen due to close supervision. However, Evans and Redmond (2018) reported on video observation of handwashing and showed both positive and negative behaviours, suggesting that participants may have forgotten that they are being observed or that they do not understand the required behaviour or fail to comply for other reasons. Further research using this technique would be beneficial to gain data on employee behaviour as part of food safety culture and climate.

To ensure the climate remains stable and consistent during a period of change, all communications should be delivered to a team and be clear and frequent, otherwise this will create confusion and may impact the climate of the business negatively, instead of promoting a positive climate change. The research conducted by Zohar and Polachek (2014) found that when messages were frequently delivered by supervisors to a team it had a positive effect on employees' safety climate and team related behaviours. Similar results were identified by Wilcock et al. (2011) who found ways to communicate with the teams to

make effective changes in a process. Zohar and Polachek (2014) argue that it does not matter what type of climate is in a business but when managers' priorities are set, they should improve the climate by changing employee understanding of the kinds of behaviour that would be supported or rewarded at the workplace. Further research is required to establish the most effective methods of communication and whether employees will be more willing to change if there is a benefit or reward to the employee to comply.

Whilst this paper has considered the culture and climate of the business, future research should consider national culture and how this can impact on behaviours and ultimately the organisational culture. This may be particularly relevant in businesses with a multicultural workforce. Many studies from the safety culture and climate fields have been useful in developing an understanding of food safety culture and climate. However, the topic of safety culture is normally associated with health and safety of employees and is thus dealing with an immediate and visible risk within the business. In food safety, the risk of harm is to the consumer who may be detached from the food business employees due to the temporal and physical distances of the food supply chain. It is not known whether this distance has any impact on food safety culture and behaviour and, therefore, further work would be beneficial.

Conclusion

Whilst HACCP breaches continue to occur, and the trends indicate that the reported incidents notified to the authorities are increasing, organisations need to understand what is causing this to happen. This requires an understanding of food safety culture and climate, which has been problematic because of the lack of accepted definitions.

Common words used in existing definitions and statements were found to be perception, values, employees, shared, belief and behaviours. Using the word analysis, the three factors involved in culture and climate definitions were identified as: time, sociology and psychology. New definitions have been proposed to provide consistent use of language for both industry and academia, as follows:

> Food safety culture is defined as a long-term construct existing at the organisational level relating to the deeply rooted beliefs, behaviours and assumptions that are

learned and shared by all employees which impact the food safety performance of the organisation.

Food safety climate is defined as a temporary construct existing at the individual level, relating to the perception and attitudes of individuals and how they influence others in an organisation to adhere to the food safety management systems and practically apply these in their working environment.

Further, the study discussed different types of organisational cultures and behaviours typically demonstrated by leaders and employees, and how this influences the rest of the workforce. In reviewing different types of organisational cultures and climates, it was identified that an ideal team would include a combination of mission and involvement cultures together with task and relationship cultures. A team with all these behaviours and styles would influence, communicate well, develop the skills of the team and keep them on track so that their goals are achieved.

Acknowledgements

Funding: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

References

Ball, B., Wilcock, A., & Aung, M. (2009). Factors influencing workers to follow food safety management systems in meat plants in Ontario, Canada. International journal of environmental health research, 19(3), 201-218. doi:10.1080/09603120802527646

Cavazza, N., Serpe, A. (2009). Effects of safety climate on safety norm violations: exploring the mediating role of attitudinal ambivalence toward personal protective equipment. *Journal of Safety Research,* 40, 277-283.

Clarke, S. (2006). The relationship between safety climate and safety performance: A meta-analytic review. *Journal of Occupational Health Psychology,* 11, 315-327

Cooper, M.D., and Phillips, R.A. (1995). Killing two birds with one stone: achieving quality via total safety management. *Leadership and Organization Development Journal,* 16, 3-9

De Boeck, E., Jacxsens, L., Bollaerts, M., Vlerick, P. (2015). Food safety climate in food processing organisations: development and validation of a self-assessment tool. *Trends in Food Science & Technology,* 46(2), 242-251.

De Boeck, E., Mortier, A.V., Jacxsens, L., Dequidt, L., Vlerick, P. (2017). Towards an extended food safety culture model: Studying the moderating role of burnout and job stress, the mediating role of food safety knowledge and motivation in the relation between food safety climate and food safety behaviour. *Trends in Food Science and Technology*, 62, 202-214.

De Boeck, E., Jacxsens, L., Mortier, A.V., Vlerick, P. (2018) Quantitative study of food safety climate in Belgium food processing companies in view of their organizational characteristics. *Food Control,* 88, 15-27.

Denison, D.R. (1996). What is the difference between organizational culture and organizational climate? A native's point of view on a decade of paradigm wars. *Academy of Management,* 21, 619-654.

Denison, D. R., & Mishra, A.K. (1995). Toward a theory of organizational culture and effectiveness. *Organization Science,* 6, 204-223.

Evans, E.W. and Redmond, E.C. (2018). Video observation of hand-hygiene compliance in a manufacturer of ready-to-eat pie and pastry products. *International Journal of Environmental Health Research*, DOI: 10.1080/09603123.2018.1558183

Fang, D.P., Chen, Y., Louisa, W. (2006). Safety climate in construction industry: a case study in Hong Kong. *Journal of Construction, Engineering and Management.* 132, 573-584

Food Standards Agency. http://webarchive.nationalarchives.gov.uk/20180411170446/https://www.food.gov.uk/about-us/data-transparency-accounts/busreps/miscbusrep. Accessed 30.05.18

Food Standards Agency. Food Alerts News. https://www.food.gov.uk/news-updates/news/food-alerts Accessed 30.01.17

Food Standards Agency. Food Recall Statistics. http://www.foodstandards.gov.au/industry/foodrecalls/recallstats/Pages/default.aspx Accessed 22.07.18

Global Food Safety Initiative. (2018). *A Culture of Food Safety*. *A position paper from the global food safety initiative, V*1.0, https://www.mygfsi.com/news-resources/news/news-blog/1419-a-culture-of-food-safety.html Accessed 10.12.18

Griffith, C. J., Livesey, K. M., & Clayton D. A. (2010a). Food Safety Culture: the evolution of an emerging risk factor? *British Food Journal,* 112, 426-438.

Griffith, C. J., Livesey, K. M., & Clayton D. A. (2010b). The assessment of food safety culture. *British Food Journal*, 112, 439-456.

Guldenmund, F. W. (2000). The nature of safety culture: a review of theory and research. *Safety Science*, 34, 215-257

Hale, A.R. (2000). Cultures confusions. *Safety Science,* 34, 1-14

Hartnell, C. A., Lambert, L. S., Kinicki, A. J., Fugate, M., & Corner, P. D. (2016). Do similarities or Differences between CEO leadership and organizational culture have a more positive effect on firm performance? A test of competing predictions. *Journal of Applied Psychology,* 101, 846-861.

Health and Safety Laboratory. What is safety culture? http://www.hsl.gov.uk/products/safety-climate-tool/what-is-safety-culture Accessed 12.02.17.

Herold, D. M., Fedor, D. B., Caldwell, C., & Liu, Yi. (2008). The effects of transformational and change leadership on employees' commitment to a change: A multilevel study. *Journal of Applied Psychology,* 93, 346-357.

Herscovitch, L., Meyer, J. P. (2002). Commitment to Organizational Change: Extension of a three-component model. *Journal of Applied Psychology,* 87, 474-487.

Hinsz, V. B., & Nickell, G. S. (2015). The prediction of workers' food safety intentions and behavior with job attitudes and the reasoned action approach. *Journal of Work and Organizational Psychology*, 31, 91-100.

Hofstede, G. (2001). Culture's Consequences – Comparing Values, Behaviours, Institutions and Organizations Across Nations, Thousand Oaks, Sage Publications.

Hsueh, Y. (2002). The Hawthorne experiments and the introduction of Jean Piaget in American Industrial Psychology, 1929-1932, *History of Psychology*, 5, 2, pp 163-189.

Interligi, L. (2010). Compliance culture: A conceptual framework. *Journal of Management and Organization ,*16, 235-249.

Jespersen, L., Griffith, M., Maclaurin, T., Chapman, B., & Wallace, C. A. (2016). Measurement of food safety culture using survey and maturity profiling tools. *Food Control,* 66, 174-182.

Jespersen, L. & Huffman, R. (2014). Building food safety into the company culture: a look at Maple Leaf Foods. *Perspectives in Public Health,* 4, 134

Kapp, E. A. (2012). The influence of supervisor leadership practices and perceived group safety climate on employee safety performance. *Safety Science,* 50, 1119-1124.

Keenan, V., Kerr, W., Sherman, W., 1951. Psychological climate and accidents in an automotive plant. *Journal of Applied Psychology*, 108-111.

Martinez-Corcoles, M., Gracia, F., Tomas, I. & Peiro, J.M. (2011). Leadership and employees' perceived safety behaviours in a nuclear power plant: a structural equation model. *Safety Science,* 49, 1118-1129.

Meyer, J. P., & Allen, N. J. (1991). A three-component conceptualization or organizational commitment. *Human Resource Management Review,* 1, 61-89.

Meyer, J. P., & Herscovitch, L. (2001). Commitment in the workplace: Toward a general model. *Human Resource Management Review,* 11, 299-326

Nayak, R., & Waterson, P. (2017). The assessment of food safety culture: An investigation of current challenges, barriers and future opportunities within the food industry. *Food Control,* 73, 1114-1123.

Neal, A., Griffin, M. S., & Hart, P. M. (2000). The impact of organisational climate on safety climate and individual behaviour. *Safety Science,* 34, 99-109.

Niskanen, T. (1994) Safety climate in the road administration, Safety Science, 17 (1994) 237-255.

Nyarugwe. S. P., Linnemann. A., Hofstede. G. J., Fogliano. V. and Luning, P.A. (2016). Determinants for conducting food safety culture research. *Trends in Food Science & Technology*, 56, 77-87.

Petitta, L., Probst, T. M., Barbaranelli, C., & Ghezzi, V. (2017). Disentangling the roles of safety climate and safety culture: Multi-level effects on the relationship between supervisor enforcement and safety compliance. *Accident Analysis and Prevention,* 99, 77-89.

Powell, D. A., Jacob, C., & Chapman, B. (2011). Enhancing food safety culture to reduce rates of food borne illness. *Food Control,* 22, 817-822.

Powell, D. A., Erdozain, S., Dodd, C., Costa, R., Morley, K., & Chapman B. (2013). Audits and inspections are never enough: A critique to enhance food safety. *Food Control,* 30, 686-691.

Probst, T. M. (2015). Organizational safety climate and supervisor safety enforcement: multi-level explorations of the causes of accident under-reporting. *Journal of Applied Psychology,* 100, 1899-1907.

Reason, J. (2008). *The Human Contribution*, Routledge (Taylor and Francis Group), UK.

Reason, J. (2016). *Organisational Accidents Revisited*, Ashgate, Farnham, UK.

Schein, E.H. (1985). Organizational Culture and Leadership. San Francisco: Jossey-Bass

Schein, E.H. (1997). The concept of "client" from a process consultation perspective: A guide for change agents. *Journal of Organizational Change Management*, 10, 202 - 216

Schein, E.H., & Schein P. (2017). Organizational Culture and Leadership: Wiley

Tagiuri, R. & Litwin, G. (1968). Organizational climate: Explorations of a concept. Boston: Harvard Business School

U.S. Food and Drug Administration. Archive for Recalls, Market Withdrawals & Safety Alerts. https://www.fda.gov/Safety/Recalls/ArchiveRecalls/default.htm. Accessed 22.07.18

United States Department of Agriculture. Food Safety and Inspection Service. https://www.fsis.usda.gov/wps/portal/fsis/topics/recalls-and-public-health-alerts/recall-summaries/recall-summaries-2016. Accessed 22.07.18

Wallace, C. A., Sperber, W., & Mortimore, S. E. (2018). Food Safety for the 21st Century: Managing HACCP and Food Safety throughout the Global Supply Chain: Wiley-Blackwell
WHO, (2017). Fact sheets: Food Safety. https://www.who.int/en/news-room/fact-sheets/detail/food-safety

Wilcock, A., Ball. B., Fajumo. A. (2011). Effective implementation of food safety initiatives: Managers', food safety coordinators' and production workers' perspectives. *Food Control*, 22, 27-33.

Yiannas, F. (2009). *Food safety culture: Creating a behaviour-based food safety management system.* New York: Springer.

Zhang, S., Shi. X., & Wu. C. (2017). Measuring the effects of external factor on leadership safety behaviour: Case study of mine enterprises in China. *Safety Science*, 93, 241-255.

Zohar, B. (1980). Safety climate in industrial organisations: theoretical and applied implications. *Journal of Applied Psychology*, 65, 96-102.

Zohar, D. (2000). A group level model of safety climate: testing the effect of group climate on micro accidents in manufacturing jobs. *Journal of Applied Psychology,* 85, 587-596.

Zohar, D., & Tenne-Gazit, O. (2008). Transformational Leadership and Group Interaction as Climate Antecedents: A social network analysis. *Journal of Applied Psychology,* 93, 744-757.

Zohar, D., & Polachek, T., (2014). Discourse-based intervention for modifying supervisory communication as leverage for safety climate and performance improvement: A randomized field study. *Journal of Applied Psychology,* 99, 113-124.