THE FLEMISH INTERACTIVE COACHING MONITORING SYSTEM (FICOMS)

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Abstract

As large-scale coach education programmes receive a growing amount of attention and investment (e.g., human and financial resource), the case for increased understanding of their impact is a pressing matter. In this paper, we outline the creation of the Flemish Interactive Coaching Monitoring System (FICOMS) within the Flemish School for Coach Education (Belgium). FICOMS is a data warehouse consisting of multiple databases, which was set up in 2019 to integrate data on coach education and coach certifications (1960-present), active coaches within club-organised sports (2014-present) and sport clubs, sports participants and sports infrastructure. FICOMS provides a variety of interactive and externally facing dashboards with useful statistics on coach education and coaching in Flanders. For example, the evolution of drop out ratios of qualified versus non-qualified coaches in sports clubs and sports federations can be identified, as well as the evolution of the percentage of qualified coaches in a specific sport, sports federation, gender or regional differences. By describing the main characteristics of FICOMS and sharing some emerging insight and early possibilities, we aim to clarify the potential of this information technology for different stakeholders, such as governments, policymakers, sports federations, Olympic committees, education partners, municipalities and researchers.

Keywords: benchmarking, coach education, evaluation, monitoring, sports coaching, sports policy

34   **The Flemish Interactive Coaching Monitoring System (FICOMS)**

35   Coaches are central to both promoting sport within society and contributing to the

36   development of healthy and active populations (Erickson, Bruner, MacDonald & Côté, 2008).

37   Not only are coaches concerned with improving the athletic performance of individuals and

38   teams (Cushion, Armour and Jones, 2003), but also enhancing the personal well-being of

39   those who take part in sport (European Commission, 2020). As such, the role of the coach

40   should not be understated. Not simply because of the vast scope of their role, but also because

41   of the significant scale of the 'coaching workforce'. According to the International Council

42   for Coaching Excellence (2013), sports coaching occurs in nearly 200 countries, is delivered

43   by millions of coaches and received by an even greater number of participants. At a more

44   local level, according to a report by Lara-Bercial et al. (2017), it is suggested that in the

45   European Union (EU) alone, up to 9 million coaches are delivering sport to more than one

46   hundred million participants across all twenty-eight member states. To offer a comparison, the

47   EU is home to close to 6 million teachers, 1.6 million doctors and 1.6 million police officers

48   (Eurostat, 2019). Consequently, it can be argued that sports coaches are one of Europe's

49   largest workforces (European Commission, 2020).

50   Indeed, we support the argument made by others that while global interest in sports

51   coaching has never been higher, high-quality sports coaching is a shared international concern

52   (Callary & Gearity, 2019; International Council for Coaching Excellence, 2013). In direct

53   response to this concern, there has been an increase in the development of large-scale coach

54   education programmes worldwide, which seek to improve the quality of sports coaching

55   (Duffy et al, 2011). Although much of this early pioneering work was undertaken in Canada,

56   Australia and the UK during the 1990s, countries continue to develop their coach education

57   programmes and frameworks around the globe (Duffy et al, 2011; Campbell & Waller, 2020).

58   For example, in South Africa "more emphasis is being placed on the quality of coaching

59   through a proposed standardised series of qualifications" (Coopoo & Morris-Eyton, 2014, p.

60   3). Going further, coach education in South Africa "is being foregrounded by the

61   implementation of the South African Coaching Framework" (Morris-Eyton & Roux, 2019, p.

62   87). Meanwhile in Brazil, where sports coaching is a recognised professional activity

63   (Ciampolini et al, 2020, Milistetd et al, 2016), the majority of coaches are required to be

64   educated to degree level in a relevant subject (e.g., physical education) by law (Galatti et al,

65   2016). Finally, much more insight can be found within the International Sports Coaching

66   Journal 'Coaching in…' section; a burgeoning body of work which reflects the breadth and

67   depth of sports coaching activity around the globe. We have provided a brief summary of this

68   work in Table 1, which can be found below.

69   However, despite what appears to be a colossal amount of resource (i.e., financial and

70   human) invested into the design and development of coach education frameworks, little

71   attention has been paid to meaningful long-term monitoring and evaluation within this field.

72   By that, we mean evidence of a coherent and comprehensive monitoring and evaluation

73   system which accounts for input (i.e., coaches entering programmes), throughput (i.e.,

74   characteristics of those programmes) and output (i.e., sports coaching activity, coach drop

75   out) over time. Instead, coach education researchers have spent much time investigating

76   single programme-level issues including how coaches learn (Mallett, Trudel, Lyle & Rynne,

77   2009; Stodter & Cushion, 2017) and how coaches experience coach education (Piggott, 2012).

78   While this is undoubtedly beneficial (for example, this research has been translated into

79   guidelines to make improvements to specific programmes), we argue that the paucity of

80   research concerned with the monitoring and evaluation of coach education frameworks is an

81   issue. Yet, to our knowledge only a limited amount of this type of work has been undertaken

82   (e.g., Estonian Foundation of Sports Education and Information, 2020; sports coach UK,

83   2009). While policymakers and researchers mostly have a clear view on the quantities and

84   characteristics of coaches entering coach education programmes (i.e., input), successfully

85   completing these programmes and obtaining qualifications (i.e., throughput), few up-to-date

86   monitoring and evaluation systems are available to understand (for example) who is actively

87   coaching within the field and where (i.e., output). Methods used are most commonly surveys,

88   providing only a limited response to such questions at one specific snapshot in time (Santos et

89   al, 2019).

90   While we have made the case for the significance of sports coaching, the growth in

91   education programmes to support coaches and the considerable resource implications of this

92   work, central to our argument is that insights generated from monitoring and evaluation work

93   has great utility for a wide variety of sports coaching stakeholders. For example, where

94   organisations operate at an international level there is an opportunity for benchmarking (see:

95   North, 2016). For regional or local organisations, the data presents an opportunity to

96   understand which coaches are required where and what type of support should be provided for

97   whom. This type of work is not new and exists or is well developed within other sectors. One

98   closely related sector is sports participation, where monitoring and evaluation is

99   commonplace, carried out in sophisticated ways for a variety of purposes (e.g., Cushman,

100   Veal & Zuzanek, 2005; Gratton, Rowe & Veal, 2011). In the UK "NGBs 'earn autonomy'

101   (and increased public funding) through the creation of 'Whole Sport Plans' which are subject

102   to biannual review and ongoing monitoring and evaluation" (Piggott, 2012, p. 537).

103   Monitoring and evaluation is also the norm within international sport for development

104   settings, specifically as a means of developing evidence of 'what works' in "a field defined by

105   its claims as opposed to its results" (Harris, 2018, p. 796). It would seem that parallels could

106   be drawn here with the field of coach education. As such, within the present paper we wish to

107   not only advance calls for the type of work to be carried out, but also showcase The Flemish

108   Interactive Coaching Monitoring System (FICOMS). In doing this, we will demonstrate how

109   the long-term monitoring and evaluation of coach education and its impact in the field of

110   sports coaching in Flanders is both unique, has utility and can have wide-ranging impact

111   among a variety of sports coaching stakeholders (e.g., policymakers, sports federations and

112   local municipalities).

113   **Characteristics of FICOMS**

114   FICOMS has been active since October 2019 and connects different sources of historic

115   information, including pre-existing standalone databases, together into a single data

116   warehouse. The main databases and the most important connections between them are

117   illustrated in figure 1. The relationship between the different databases makes it possible to

118   monitor which coaches are active within club-organised sports in Flanders on a yearly basis

119   (data from 2014-2019) including the sports clubs or sports infrastructures with active coaches.

120   FICOMS also makes it possible to establish relationships between characteristics of coaches

121   and sports participation (data from 2014-2019). Since the Flemish School for Coach

122   Education (VTS) is responsible for coach education in Flanders (Vangrunderbeek & Ponnet,

123   2020), FICOMS gives full insight in relation to coaches obtaining new qualifications (data

124   from 1960-present) and the content of coach education programmes (data from 2010-present).

125   Within the present section, we intend to describe how the complex background structure of

126   FICOMS has been set up by linking four different databases in a data warehouse and then

127   adding three layers to it to make it possible for creating user-friendly dashboards.

128   Firstly, the database *SportsDB* contains more than 28,000 sports clubs and sports

129   federations in Flanders (https://www.sport.vlaanderen/waar-sporten/vind-een-

130   sportorganisatie/). This is always up to date, in real time, and contains a unique ID for each

131   and every sports club, name, abbreviation, legal form, date of incorporation, contact details,

132   address(es), phone, e-mail, website, social media, sports infrastructures that are used, sports

133   and disciplines, links/relations with other organisations (e.g., sports federations on Flemish,

134   Belgian, European or international level or sports services in the municipalities), target

135   groups, creation and modification dates, and much more.

136   Secondly, the database *Spakki*, contains data related to more than 22,500 sports

137   infrastructures (https://www.sport.vlaanderen/waar-sporten/vind-je-sportplaats/). The

138   database is always up to date, in real time, and similarly contains a unique ID for every sports

139   infrastructure, name, type of sports infrastructure, owner, website, address, location in a sports

140   domain (group of sports infrastructures), usage (schools, groups, individuals), surface, width

141   and height (or number of lanes, perimeter, etc.), sports clubs that use the sports infrastructure,

142   specific features (e.g., toilet, shower, parking, lighting), creation and modification dates, etc.

143   Links between sports clubs, sports federations, sports and sports infrastructures can be

144   drawn by linking both databases listed above. Next, linking coaches with sports clubs, sports

145   federations, sports or sports infrastructures, a third database (*CoachDB*, not publicly

146   available) was set up in 2013. For sports federations it became mandatory that same year (by a

147   decree on the recognition and subsidisation of sports federations) to give a complete digital

148   overview of all their active coaches on a yearly basis. The data on the coaches contains

149   personal details (name, surname, address, birth date, gender) for checks in the subsidisation

150   process, but was anonymised after processing and before uploading in the database where

151   every person is allocated a unique but encrypted ID. Besides the remaining data on gender,

152   age and residence, every coach (by its ID) is linked to one or more sports clubs, one or more

153   sports federations, one or more sports and possesses either no qualification, a Physical

154   Education (PE) qualification, a qualification from VTS or a combination of both.

155   At this point, a fourth database, 'Vlaams Opleidingen voor Trainers Administratie

156   Systeem' (*VOTAS)* (https://www.sport.vlaanderen/vts), plays an essential role. *VOTAS* is the

157   database of the Flemish government, managed by VTS, which contains every coach

158   qualification obtained since 1956 and every PE-qualification since 2008. Although not

159   systematic, also many PE qualifications before 2008 are registered in the database. In the

160   work of Vangrunderbeek & Ponnet (2020), different pathways for obtaining a qualification

161   are described, such as pathways for former elite athletes. Indeed, *VOTAS* contains a lot more

162   information than simply qualifications. Every coach education programme (with details on

163   modules, items, hours) and coaching course in Flanders is registered in the database, every

164   coach has to enrol for the course, grades are given by our coach developers through the

165   system, etc. Each sports federation has to list a unique VOTAS-ID for every qualified coach

166   and during the subsidisation process this information is checked and altered if necessary,

167   before uploading this information to the *CoachDB*. By combining *VOTAS* and *CoachDB*, it is

168   possible to know which coaches are qualified in what sport or sports federation, the

169   percentage of qualified coaches in each sport, which gender, age or regional differences exist,

170   etc.

171   The complex structure in the background of FICOMS is described in the above

172   paragraphs. The real strength of FICOMS, we argue, is how complex information is translated

173   into easily understandable, interactive dashboards (foreground) with useful insights and

174   statistics on coaching in Flanders. As such, we have created a system (figure 2) with three

175   layers (data store, data model, data visualisation tool). The data store is developed to store the

176   data and perform calculations on the data. The data model is created for making relations

177   between dimensions and facts (calculations from data store). The data store and data model

178   refreshes automatically each day, so every calculation (and visualisation) on the data is

179   automatically updated. For data visualisation, Microsoft Power BI Pro and Embedded

180   functionality is used, because of the integration with other existing systems, possibilities

181   (bookmarks, export of data), visuals, design and ease of use. Our data and visualisations are

182   presented in layers to the many different users. The first layer is non-secure and shows

183   publicly available information to interested citizens, policymakers and researchers who want a

184   general overview. The second level is a secure, non-public layer which is accessible for

185   policymakers at municipality level or sports federation level, but is also a layer for in-depth

186   policy (e.g., Sport Vlaanderen, Minister for Sport, parliament). Data are anonymised for all

187   layers to be compliant with the General Data Protection Regulations (GDPR). It is worth

188   noting that all dashboards are interactive. For example, when one page on the dashboard

189   represents the number of active coaches on a yearly basis between 2014 and 2019, data filters

190   are added to that page so that a user can filter on gender, age category, qualified vs. non-

191   qualified, region, sport, sports federation, and each combination. This means that with one

192   page on a dashboard, a user can have dozens of graphs with very specific and tailored

193   information.

194   FICOMS has been developed to monitor input, throughput and output of coaching in

195   Flanders (figure 3) so that policymakers can intervene quickly when performance indicators

196   change. With regard to input, there is permanent monitoring of the background (i.e., age,

197   gender, residence, sport, sports club, sports federation, PE-background) of coaches starting a

198   coach education programme and the different pathways that coaches follow in their coach

199   education (Vangrunderbeek & Ponnet, 2020). FICOMS is installed to also monitor the

200   throughput, meaning the characteristics of coach education programmes (i.e., modules, items,

201   hours, success ratios) and coach developers (i.e., age, gender, residence, courses, theory vs.

202   practice hours), monitoring differences between sports and benchmarking the coach education

203   programmes with other countries. A Holistic Quality Control (HQC) is set up to follow up on

204   quality of courses, coach developers and exams. An important performance indicator for sport

205   policy in Flanders is how many coaches obtain a new qualification every year, with trends

206   over time, pathways or differences in gender, age, sports and regions. However, the most

207   difficult part is monitoring the output. This includes the characteristics of active coaches

208   within Flanders' sports clubs. For example: how many (qualified and non-qualified) coaches

209 are there active and which trends are concerning? How many sports clubs do/don't have a

210 qualified coach and are there differences between sports, sports federations, regions, gender,

211 age, etc? How many new coaches start (new) or stop (drop-out) coaching every year? An

212 example of a dashboard in English illustrating the possibilities of FICOMS can be found here:

213 https://www.sport.vlaanderen/kennisplatform/thema-trainers/db-coaches-active-in-flanders-

214 belgium/.

215 　　　Before describing the setting up of an interactive coaching monitoring system in

216 Flanders, we illustrated in the previous section that FICOMS – through its unique relationship

217 between four complementary databases – is able to give insights in relation to more than just

218 singular coach education programmes. We also highlighted the long-term monitoring and

219 evaluation possibilities and its impact for the stakeholders (e.g. policymakers, sports

220 federations and local municipalities) in the field of sports coaching in Flanders.

221 　　　　　　　　　　**How was FICOMS made possible?**

222 　　　Coach education in Flanders has a long tradition (Vangrunderbeek & Ponnet, 2020).

223 However, until 2019, it was only possible to monitor the input and throughput (figure 3) of

224 VTS and as such, understanding of coach education in Flanders was limited. Now, because of

225 FICOMS, it is possible to arrive at detailed insights on the characteristics of our coach

226 education programmes since 2010, the number of coaching courses since 1998, number of

227 coaches following a course and obtaining a qualification since 1960, etc. Details about

228 coaches following our courses, like their PE-background, previous qualifications, study

229 results, geographical information, etc. only became visible progressively since 2010.

230 Structured data collection on active coaches in the sports clubs in Flanders started only in

231 recent years. Before explaining the legal framework of the data collection and the

232 methodology of data collection and data processing, it is important to note that everything

233 started with traditional surveys of the sports clubs.

234   In 2003, a significant conference on the 'status' of sports clubs in Flanders was

235   organised by Sport Vlaanderen, the agency responsible for sports policy in Flanders under

236   supervision of the Minister of Sport. Sport Vlaanderen wanted to gather insights from the

237   sports clubs, sports participants, legal form of sports clubs, volunteers and active coaches. In

238   preparation for the conference, a survey was sent out to 19,032 sports clubs, of which 1,480

239   responded, and to the sports services of the municipalities where the response rate was

240   305/308 (or 99%). One of the main results presented at the conference was that in 2003 only

241   about 46% of the coaches of the sports clubs in the survey could be considered as qualified. It

242   is important to note however, that mainly larger, more established sports clubs where only one

243   sport is practiced, responded to the survey. The definition of a qualified coach was also not

244   clear and consequently, some coaches may have been counted as qualified although they were

245   not.

246   In 2012, a new large-scale survey was released to 15,272 active sports clubs in

247   Flanders with similar but also more detailed questions than in 2003. The response was 1,749

248   sports clubs (11.45%), a potential indication that the number of questions was too great and

249   that this way of data collection had reached its limits. Due to more specific questions (better

250   data collection) in this survey, the qualification percentage could be calculated more precise

251   and was pinned at 40.22%.

252   While analysing the results of this survey of 2012, policymakers reported a

253   requirement for more precise data collection and more interactivity within the data. It was

254   suggested that the survey method offered only a high-level overview of active coaches,

255   qualification degree and sports clubs with active coaches. As such, it was not possible to

256   zoom in on regional differences, differences between sports or sports federations, gender and

257   age categories, in order to gather insights in the types of sports clubs with or without qualified

258   coaches; for policymakers this is essential information.

259   As a result, in 2013, a drastic change was made to the way in which data was

260   collected, for example it became mandatory by law to all subsidised sports federations to give

261   a full digital dataset of all active coaches and sports participants to Sport Vlaanderen once a

262   year at a specific date. Sports federations were given the time to start collecting data in a

263   structured way for every sports club which is affiliated to the sports federation. Consequently,

264   the data from 2013 (as a transition year) is rejected for further analysis because the data

265   quality was insufficient. Extra control mechanisms were inserted in the data collection process

266   to improve data quality to the desired quality standards. Data from 2014 onwards match the

267   data quality standards.

268   In the current law, applicable from 2017, two important modifications were made.

269   Firstly, subsidised sports federations are rewarded financially for good data quality and a

270   higher number of qualified coaches in relation with their qualification level. The same

271   obligation of giving a full digital dataset of coaches and sports participants is imposed to the

272   solely recognised (but not subsidised) sports federations since 2017. It is mandatory for sports

273   federations to use a template (Microsoft Excel) for the digital dataset of sports participants

274   and coaches, consisting of following data fields (columns): name and unique ID of the sports

275   federation, unique ID of member (coach or sports participant), name, address, birth date,

276   gender, unique ID or sports club (link with *SportsDB* and extra information, see previous

277   section); sport, recreational or competitive sports participant or not sporting member,

278   indication if the person is a coach. Only for the coaches in the dataset, an extra data field with

279   the unique ID in *VOTAS* can be added. With this unique ID, the link with the *VOTAS*-database

280   and the qualifications of the coach is established. It is not desirable for sports federations to

281   provide us with the information on the qualifications of the coaches. Sport Vlaanderen (by

282   VTS) owns the database with all the qualifications and it is preferable, because of control

283   mechanisms in the subsidisation process and correctness of the data, that the qualifications are

284   added to the dataset centrally. It is important to point out that a person can have multiple lines

285   in the digital dataset, for example practicing or coaching more than one sport or being active

286   in more than one sports club. However, when the total numbers of sports participants and

287   active coaches in Flanders are counted, they are only counted once.

288   By law, Sport Vlaanderen is allowed to use personal data during the subsidisation

289   process, but after checks and calculations directly related to the subsidisation process, data on

290   coaches and sports participants is anonymised. This is carried out by way of a data cleaning

291   and anonymisation process. In the time period (e.g., data from 2019) between delivering the

292   dataset to Sport Vlaanderen (it is obliged for sports federations to do this no later than January

293   31, 2020) and the end of the subsidisation process (June 30, 2020), most of the work in the

294   data cleaning process is year-over-year corrections where coaches from the previous year are

295   matched with the same coach in the current year, within or between sports federations. This is

296   a really important step because personal data is not uploaded (e.g., name, birthday, address) to

297   *CoachDB*, but an encrypted unique key for every person (UniquePersonID) which cannot be

298   traced back to personal data. During upload, birthdays are translated to year of birth and

299   address is translated to a municipality. Data is anonymised but the number of unique coaches

300   or sports participants can be counted, using calculations based on the UniquePersonID. A

301   second major part of the data cleaning process is linking the information of *CoachDB* with

302   *VOTAS* and adding the flag 'qualified' or 'non-qualified' for every coach and listing for every

303   UniquePersonID the PE-qualification or VTS-qualification. Because this information is stored

304   in different fields, information can be combined. By this subsidisation process, data cleaning

305   and connections between the databases *SportsDB*, *CoachDB* and *VOTAS*, Sport Vlaanderen

306   combines the data of all active coaches and their qualifications in more than 17,000 sports

307   clubs affiliated with more than 70 sports federations, coaching in more than 100 sports and

308   disciplines. Because it is mandatory, not a single sports federation has ever skipped a year and

309   so longitudinal data is now available from 2014 to 2019. It is argued that this is a unique

310   feature of the work.

311   Data quality and completeness is essential for both policy purposes and ongoing

312   scientific analysis. A lot of effort has been invested in improving data quality over the last

313   years, this includes: providing a template file, data improvement by sports federations,

314   feedback on data problems encountered by Sport Vlaanderen to the sports federations, huge

315   investments in data cleaning by Sport Vlaanderen, and modifications in the subsidisation

316   process to reward sports federations for better data quality. Problems cannot be completely

317   avoided considering the volume of coaches or sports participants, but error margins are

318   monitored annually and interventions are made if necessary. Due to this, the data is

319   considered reliable, yet it should be noted that it has taken a period of eight years to achieve

320   this. Equally, over that period of time, it has become clear that sports federations require

321   reward for their efforts in contributing to a clean and comprehensive dataset. Consequently,

322   interactive dashboards are offered to sports federations at no-cost and have been used by them

323   to develop their own internal policy. Collaborating in this way to bring about desirable

324   outcomes for all stakeholders is seen as a win-win situation.

325   As explained in the above paragraphs, FICOMS is located against the unique backdrop

326   of Flanders and it is often many of the features of this context (e.g., the law) which make it

327   work. However, we argue that there is much to learn about the principles of FICOMS and

328   suggest that similar effective monitoring and evaluation systems can be designed elsewhere

329   with similar results. The focus of the following section is to demonstrate emerging insight and

330   early possibilities of FICOMS by presenting a number of very brief introductory case studies

331   (CS) around specific areas of work. For example, the number of coaches obtaining

332   qualifications (CS1), bridging the gap between qualified and non-qualified coaches in sports

333   clubs (CS2) and finally, the drop out of coaches from sports coaching roles (CS3).

334   **Emerging Insight from FICOMS**

335   Case study 1 (CS1) demonstrates that in 2019, more than 7,000 coaches entered one of

336   the 230 coach education programmes of VTS. With a success rate of around 86%, 6,028 of

337   them obtained a VTS-qualification. The success rate is depending on the sports and level

338   (Aspirant-Initiator to Trainer A). The current most popular sports in coach education are:

339   soccer, tennis, gymnastics, horse riding, athletics, hockey, basketball, swimming and

340   volleyball. Close to 64% of the coaches obtaining a qualification are male. The average age of

341   coaches is almost 30 years but increases for the higher levels of coach education programmes

342   (figure 4). The most popular pathway for obtaining a coach qualification is following a

343   regular course under supervision of coach developers and with an exam and apprenticeship at

344   the end of the course. Between 2015 and 2019, 26,326 coaches (89% of all qualifications)

345   chose this track, 13,820 following a coach education programme at the level of Initiator.

346   Almost 11% of the coaches obtaining a VTS-qualification have a PE-qualification (Sport

347   Vlaanderen, 2020).

348   Case study 2 (CS2), concerned with active coaches operating in sports clubs,

349   illustrates that in 2019 only 8,234 (<50%) of the 16,982 sports clubs affiliated with the sports

350   federations have active coaches (https://www.sport.vlaanderen/kennisplatform/thema-

351   trainers/db-coaches-active-in-flanders-belgium/). In sports clubs of walking, recreational

352   cycling or jogging and indoor soccer, it is clear that hardly any coaches are active. The

353   number of sports clubs with coaches increased from 7,360 in 2014 to 8,234 in 2019 (+11.9%)

354   and the number of sports clubs with at least one qualified coach increased from 4,797 in 2014

355   to 5,699 in 2019 (+18.8%). This is a positive evolution for quality at sports club level. To put

356   this in perspective, organised sports participation in Flanders increased with 16.9% from 2014

357   to 2019 (increase from 1,239,625 to 1,448,514 sports participants). The number of sports

358   clubs with sports participants increased with 10.6% from 2014 to 2019. During recent years, it

359   was often claimed in Flemish media that there is a lack of qualified coaches in Flanders (e.g.,

360   Decré, 2019; Le Bacq, 2019). FICOMS has been used to analyse the available data and

361   identify an increase of 22.6% in active coaches and an increase of 37.5% in qualified coaches

362   from 2014 to 2019 (figure 5). It has been difficult to measure exactly how much of an issue

363   the lack of qualified coaches is. However, FICOMS revealed some insights how the gap is

364   being partially closed due to a greater number of sports clubs with (qualified) coaches and the

365   ratio of the amount of coaches versus amount of sports participants that increased from 0.0466

366   to 0.0489 (+4.9%). Another parameter which is monitored closely through FICOMS, is the

367   average number of coaches in sports clubs, which increased from 4.27 in 2014 to 4.57 in 2019

368   (+7.0%) and the average number of qualified coaches in sports club which increased from

369   1.71 in 2014 to 2.06 in 2019 (+20.5%). The policy of increasing the number of active

370   qualified coaches can only succeed if there is positive balance between new qualified coaches

371   and drop out of (qualified) coaches. It is observed with FICOMS that more coaches are

372   engaging with coach education every year, leading to more coaches in sports clubs obtaining a

373   coach qualification. In 2014 there were 1,254 sports clubs with at least one coach obtaining a

374   new qualification; in 2019, this number increased to 1,414 sports clubs (+12.8%).

375   Case study 3 (CS3) with FICOMS revealed that the average drop out of coaches in

376   2019 is 20.6%, where it peaked at more than 23% in 2016, so drop out is decreasing slowly

377   (figure 6). During analysis of coach drop out, FICOMS made it possible to look at the profile

378   of qualified vs. non-qualified coaches. In 2014, non-qualified coaches were on average 2

379   years older than qualified coaches (41.2 vs. 39.2 years old). In 2019, qualified coaches instead

380   were on average 2 years older than non-qualified coaches (39.7 vs. 37.7 years old). As such,

381   this is an indication that in the period between 2014 and 2019 more non-qualified coaches

382   stopped coaching (drop out) than qualified. Gender differences reveal that female coaches are

383   more than 9 years younger than male coaches (32.5 vs. 41.8 years old), there are less female

384   qualified coaches (28.1%) than female non-qualified coaches (37.8%) and the drop out of

385   female coaches is higher than for male coaches. The drop out of non-qualified coaches is

386   significantly higher (26.1% vs. 13.9%) than for qualified coaches, which is an important

387   reason for the increase in the qualification ratio of our coaches in Flanders between 2014

388   (40.3%) and 2019 (45.2%).

389   Within this section, by means of three case studies, we have illustrated the early

390   possibilities of FICOMS. By this we mean, how FICOMS can generate detailed appropriate

391   insight which can be used for stakeholder action/intervention. For the first time, insight is

392   available in relation to the throughput and output of our coach education system in Flanders.

393   Consequently, it becomes possible to monitor the characteristics of all the coaches obtaining

394   qualifications (CS1), if and which sports clubs are bridging the gap on qualified coaches

395   (CS2) and monitor the evolution of the drop out of coaches (CS3).

396   **Limitations and future directions**

397   At the end of this article describing the possibilities and early insights of FICOMS, it

398   is important to point out what we perceive to be the main limitations. The 'I' in FICOMS

399   represents interactivity. Currently, data are shown in tables, graphs and maps where some

400   interactivity is possible, but we wish to expand this with functionality to export data, print pdf

401   reports, add tooltips and provide drill-through or zoom-in possibilities on specific data. This

402   will represent necessary major improvements for researchers, sports federations, sports

403   services at the municipalities and policymakers. At present, data is only obtained from

404   coaches of the sports clubs linked with recognised sports federations. Information is missed

405   on fitness clubs, some of the outdoor facilities and the non-organised sports sector.

406   Additionally, it is not possible to monitor the amount of training hours for every coach and

407   which athletes/teams are coached by which coach. Being able to do this would be beneficial

408   because we can then calculate the proportion of training hours with qualified coaches in

409   relation to the amount of training hours with non-qualified coaches.

410   Within this paper we have made the case that FICOMS is already a powerful tool and

411   an essential instrument for policymakers, sports federations, sport services at the

412   municipalities and researchers in Flanders. However, while we believe that this represents a

413   significant story for monitoring and evaluation in coach education, plans exist to extend this

414   work even further. At short notice, there is a desire to use FICOMS to monitor the impact of

415   certain events (e.g. COVID-19) on coaches entering (input) our coach education system, the

416   number of coaches obtaining qualifications (throughput) and on sports coaching in the sports

417   clubs (output) in Flanders. FICOMS can be utilised for in-depth analysis, drawing conclusions

418   and altering our coach education programmes where necessary, all in an agile and responsive

419   manner. Further, FICOMS will be integrated with other data sources presented in figure 1,

420   such as data on elite sport, sport at/after school, talent detection programmes, sport in nature,

421   sport at work, etc. There is an intention to understand what the common characteristics are of

422   people doing sport in an organised context (e.g. sports clubs) and in a non-organised sports

423   context (e.g. at/after school, in nature, at work, etc.). By finding common characteristics, we

424   can give policy advice to stimulate people transitioning from one context to another under

425   supervision of coaches if applicable.

426   Next, there is an ambition to accelerate the process of importing new data on coaches

427   in FICOMS to give sports federations, policy makers, researchers and sports services at the

428   municipalities quicker insights in trends. At present, there is access to data of six consecutive

429   years, but along with importing more years, a longer-term analysis can be done. This will

430   make it possible to evolve FICOMS from a descriptive tool to a predictive or prescriptive tool

431   using new methods like artificial intelligence, interactive correlation plots or regression

432   analysis, etc.

433   Finally, there is desire to benchmark the Flemish data with international data on the

434   characteristics of coaches; for example, gender differences, qualification level and in the most

435   popular sports, drop out of coaches.

436   **Conclusion**

437   Within the present article we have described why FICOMS has been developed and

438   how it has assisted Sport Vlaanderen (along with many other stakeholders) to understand the

439   impact of the coach education system within VTS. By describing the main characteristics of

440   FICOMS and the early insights by means of three case studies, we wanted to illustrate that the

441   insights generated are not only useful in Flanders but have a huge potential for different

442   stakeholders, such as governments, policymakers, sports federations, Olympic committees,

443   education partners, municipalities and researchers. Nevertheless, there are some current

444   limitations and considerations to be taken into account and these have been described. Within

445   our future work we intend to share a much more detailed series of case studies similar to those

446   considered with brevity above.

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532   **Table 1**

533   *Papers published within ISCJ section 'Coaching in…' (2014-2020)*

N°	Coaching in	Continent	Year & Issue	Authors
1	South Africa	Africa	2014 (1), 33-41	Jerry Segwaba, Desiree Vardhan and Patrick Duffy
2	Singapore	Asia	2014 (2), 94-102	Koon Teck Koh, Wenxiang Foo, Goken Sakamoto and Adrian Low
3	Brazil	South-America	2014 (3), 165-172	Michel Milistetd, Pierre Trudel, Isabel Mesquita and Juarez Vieira do Nascimento
4	Poland	Europe	2015 (1), 50-63	Ryszard Panfil, Marcin Krawczynski, Piotr Marek and Lukasz Panfil
5	Sweden	Europe	2015 (2), 187-191	Marie Hedberg
6	New Zealand	Oceania	2015 (3), 330-338	Lynn Kidman and David Keelty
7	Ireland	Europe	2016 (1), 65-74	Fiona Chambers and Robin Gregg
8	Portugal	Europe	2016 (2), 178-183	Rui Resende, Pedro Sequeira and Hugo Sarmento
9	Brazil	South-America	2016 (3), 316-331	Larissa Galatti, Otavio Baggiotto Bettega, Vinícius Zeilmann Brasil, Antonio Evanhoé Pereira de Souza Sobrinho, Rachael Bertram, et al.
10	Finland	Europe	2016 (3), 332-343	Kirsi Hämäläinen and Minna Blomqvist
11	Russia	Europe/Asia	2017 (1), 90-94	Vladislav A. Bespomoshchnov and Leonid V. Mikhno
12	United States	North-America	2017 (2), 220-234	Bradford Strand, Shannon David, Katie J. Lyman and Jay M. Albrecht
13	Mexico	North-America	2017 (3), 345-352	Ciria Margarita Salazar C., Pedro Julian Flores Moreno, José Encarnación Del Río Valdivia, Lenin Tlamatini Barajas Pineda, Julio Alejandro Gómez Figueroa and Martha Patricia Pérez López
14	Botswana	Africa	2018 (1), 79-83	Tshepang Tshube and Stephanie J. Hanrahan
15	Ireland	Europe	2018 (2), 183-191	Niall O'Regan and Seamus Kelly
16	Spain	Europe	2018 (3), 281-292	Sebastián Feu, Javier García-Rubio, Antonio Antúnez and Sergio Ibáñez
17	Spain	Europe	2019 (1), 110-125	Sergio J. Ibáñez, Javier García-Rubio, Antonio Antúnez and Sebastián Feu
18	United States	North-America	2019 (2), 220-225	Lori A. Gano-Overway and Kristen Dieffenbach
19	Brazil	South-America	2019 (3), 339-348	Larissa R. Galatti, Yura Yuka Sato dos Santos and Paula Korsakas
20	Brazil	South-America	2020 (1), 82-88	Patricia Gaion, Michel Milistetd, Fernando Santos, Andressa Contreira, Luciane Arantes and Nayara Caruzzo
21	United States	North-America	2020 (1), 89-94	Lori Gano-Overway, Pete Van Mullem, Melissa Long, Melissa Thompson, Bob Benham, et al.
22	United States	North-America	2020 (2), 239-251	Bradley Fawver, Garrett F. Beatty, John T. Roman and Kevin Kurtz
23	Belgium	Europe	2020 (3), 380-389	Hans Vangrunderbeek and Hans Ponnet

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535 **Figure 1**

536 *Database structure behind FICOMS*

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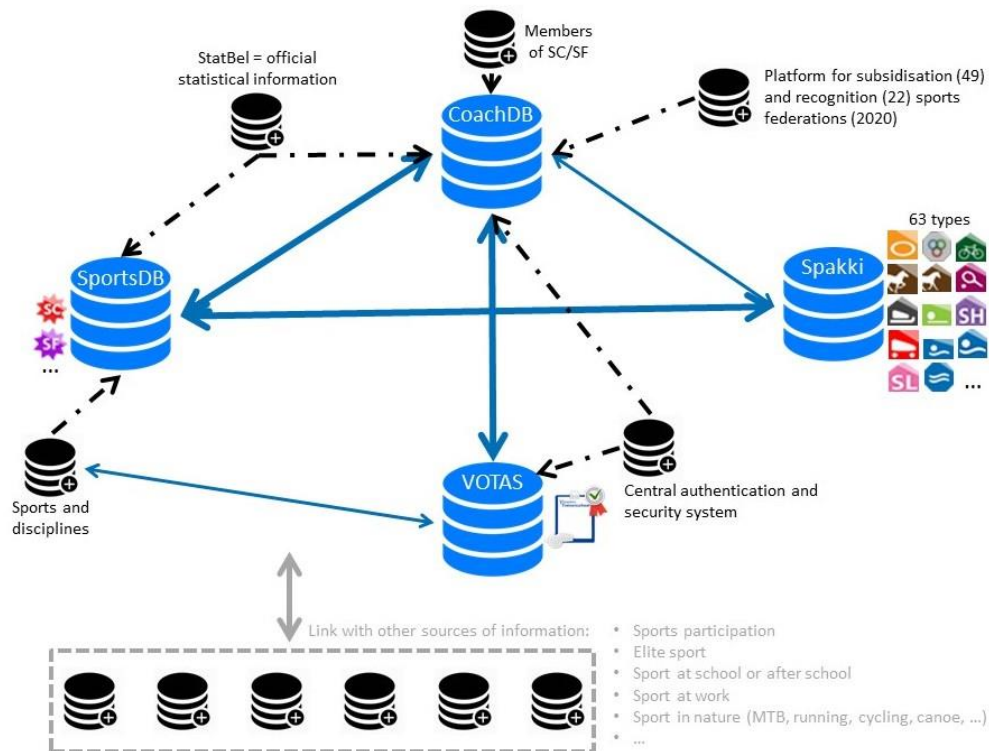
539 **Figure 2**

540 *From data to visualisation*

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542 **Figure 3**
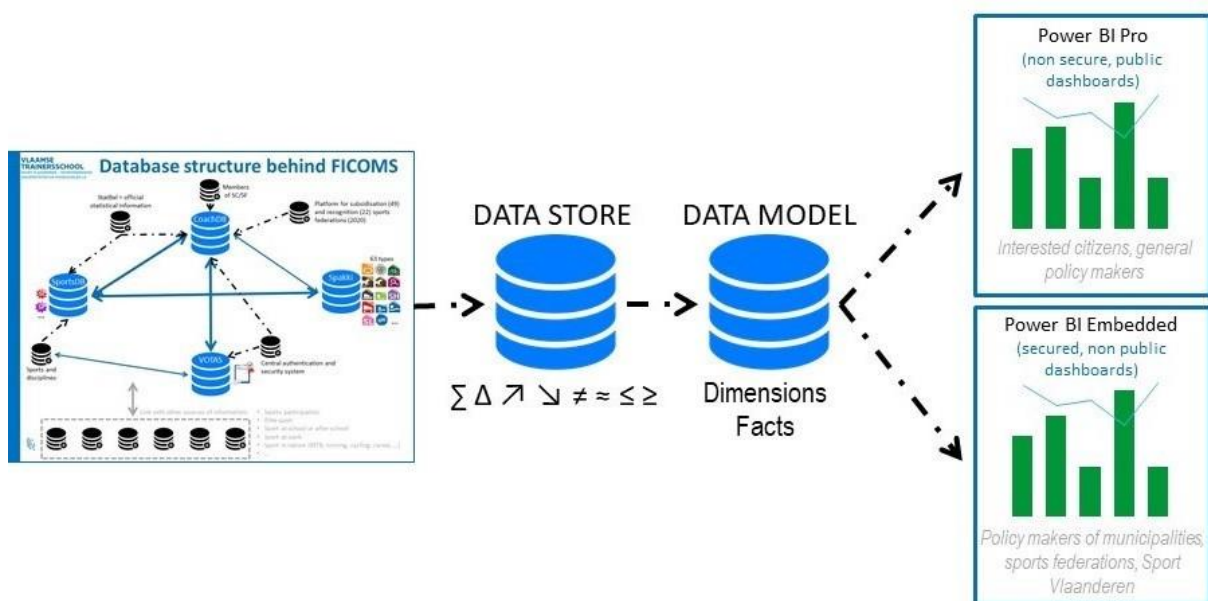
543 *Monitoring input, throughput and output via FICOMS*

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546 **Figure 4**
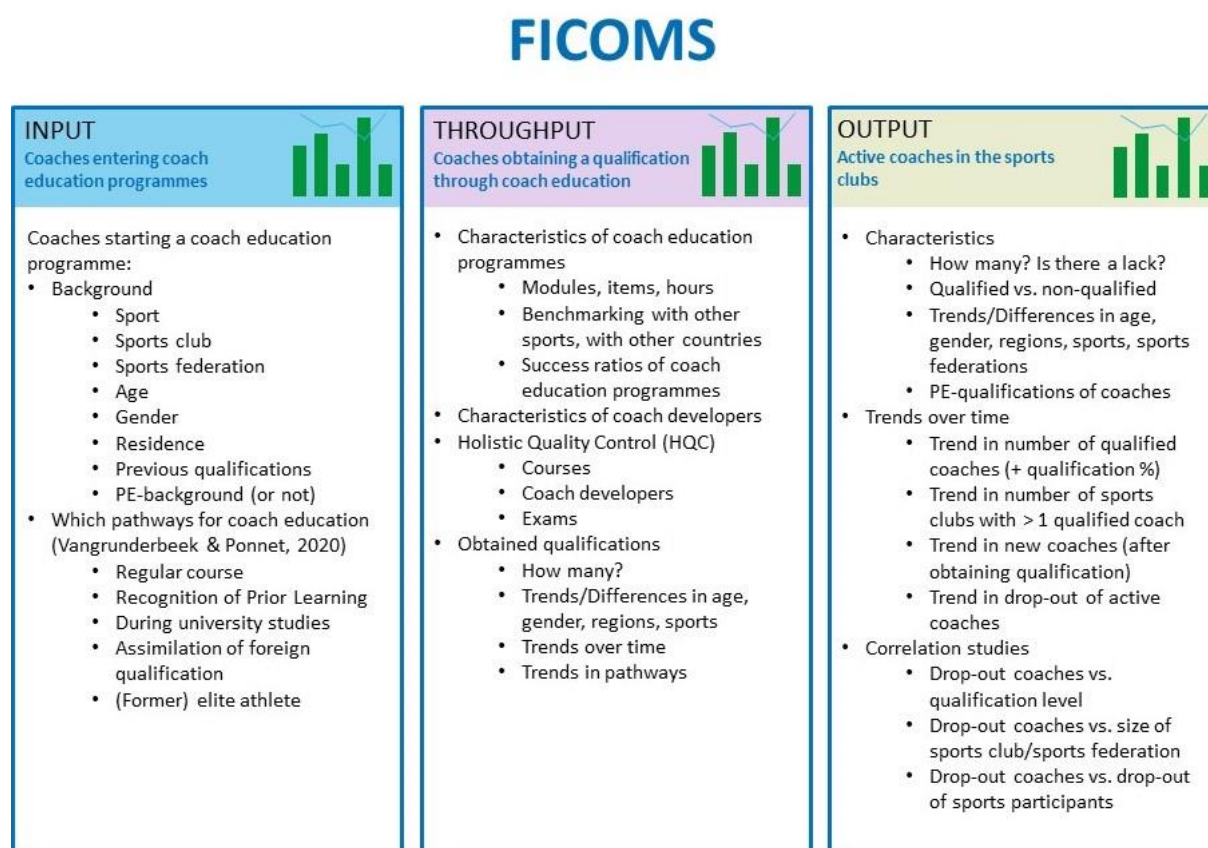
547 *FICOMS dashboard on coach education insights (2019)*

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550 **Figure 5**
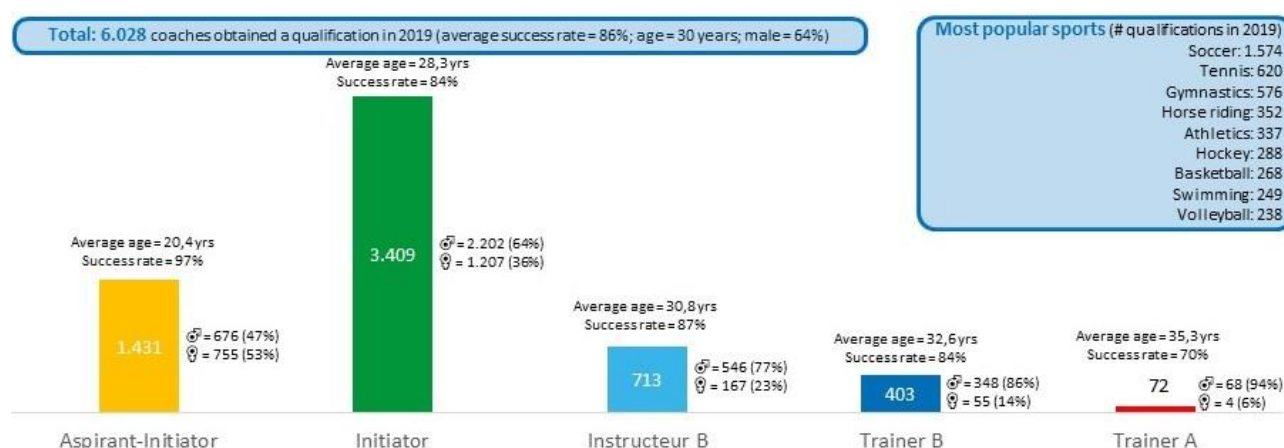
551 *FICOMS dashboard on active, qualified and non-qualified, coaches operating in sports clubs*

552 *(2014-2019)*

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555 **Figure 6**

556 *FICOMS dashboard on average drop out of qualified vs. non-qualified; male vs. female*

557 *coaches (2014-2019)*

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