Digitalizing the Football Experience

A study on Electronic Performance and Tracking Systems (EPTS) from the perspective of football athletes and training staff

Pavlos Bitilis [1], Niki Chatzipanagiotou [2]

[1] *Linnaeus University, Faculty of Technology, Department of Informatics, Växjö, 35195, Sweden*
[2] *Linnaeus University, Faculty of Technology, Department of Informatics, Växjö, 35195, Sweden*

Abstract

Personal Informatics (PI) are information systems that allow people to process activities with the usage of information technology, aiming to produce informational products (data) either for themselves or for others. Technologies that enable PI are becoming increasingly popular, assisting people in collecting personally relevant information about their body and their behaviour. In sports industry nowadays, a great variety of PI wearable tools offer support to athletes and training staff to improve their performance. An example of such tool is the Electronic Performance and Tracking Systems (EPTS), which is a combination of hardware and software that facilitates the collection, storage, analysis and management of professional athletes' fitness and health data. Although significant and broadly used, EPTS have not yet received much attention from researchers and, thus, understudied. Therefore, the purpose of this research paper is to explore and understand how professional football athletes and training staff make sense of the use of electronic performance and tracking systems (EPTS) in their everyday training and work. The paper explores perceptions, benefits and challenges that professional football athletes and training staff experience when using EPTS. For this, an interpretive qualitative focused ethnographic study was conducted. The data were collected through direct observations in the field and semi-structured interviews from purposively selected Greek professional football athletes and Greek training staff that use wearable EPTS in their everyday training and work. The collected data were analysed thematically to conclude to five themes, which represent the research findings. A theoretical framework, which is built upon relevant literature from the informatics field along with the theory of sensemaking was used to understand, interpret and discuss the research findings.

The research findings show that EPTS have radically changed the football daily routines for both professional football athletes and training staff members enabling them, and their football clubs, to improve individual and team performance. The use of EPTS has reshaped football athletes and training staff members' identities, making them more data driven and more accurate. EPTS build trust between professional football athletes and training staff offering them the evidence they need to justify decisions, instructions, and actions taken respectively. Visualization tools for presenting insights need to be further improved with the addition of in-field monitors and 3D presentations. Furthermore, it is important for training staff members to have ethical and consistent strategy on how EPTS data are derived, used and communicated. Through daily evaluation of their work, football players and training staff members are constantly improving their work identifying exemplary patterns of training and avoiding mistakes to be repeated, and in this way improve individual and team performance. The football athletes and the training staff members through communication among them, facilitated by visualization tools, are concerned with making situations, which have been collected in the form of data by the EPTS, meaningful to them. Making sense is a collaborative cognitive and ongoing process where individual football players and training staff members try to give meaning to collective experiences retrospectively. The data that are extracted from the EPTS help them in this process as they have the chance to examine them together, reflect on them, discuss them, make sense of them, share these meanings, and finally decide how to act based on them. To do this they raise past, tacit and private knowledge to make it explicit, public, ordered and simpler. In this way, the football athletes and the training staff members turn circumstances into well understood situations, which empower them to use their understanding to build more impactful experiences to improve their future performance. Thus,

the research contributes to the existing knowledge on personal informatics and adjusts them to elite team sport context. It also adds to the theory of sensemaking regarding how users make sense of PI tools that are related with their everyday routines at work. In addition, it contributes to football athletes, sport training staff members, and other interested stakeholders by suggesting a model for efficient use of EPTS technology into the everyday football practices and a model of sustainable use aiming to the overall improvement of team performance.
Keywords
Personal Informatics, Wearables, Electronic Performance and Tracking Systems, Football, Sensemaking Theory, Focused Ethnography

1. Introduction

Technology has transformed our lives shaping the activities we engage in, from the way we work and interact with our environment to the way we find pleasure [6], changing this way our everyday routines. Personal Informatics (PI) refer to technologies where individuals, according to personal motives and preference patterns, process activities aiming to produce informational products (data) either for themselves or for others [2]. Technologies and technological tools that enable personal informatics are becoming increasingly popular [21], assisting people in collecting personally relevant information about their body and their behaviour. PI tools are any combination of hardware and software that facilitates the collection, storage, analysis, and management of one's fitness, professional, or health data [8].

In sports industry, a great variety of PI wearable tools set out to offer support to athletes and improve performance. Football is a sport that has embraced technologies that enable PI since 2015 when the Federation Internationale de Football Association (FIFA) approved the use of wearables in football matches. Football as a sport encompasses kinematic, physiological, neuromuscular and tactical variables [22] that are determinants of training optimization and match performance improvement [3]. Coaches and training staff must thoroughly examine those parameters and observe players' behaviour during matches. An example of a complex personal informatics tool is the Electronic Performance and Tracking Systems (EPTS). EPTS is a technology that combines hardware and software to facilitate the storage, analysis, and management of one's data and which is used nowadays in football to monitor and improve the performance of individual players and team. EPTS mainly track player positions, but they can also be used in combination with microelectromechanical devices, heart-rate monitors, and other devices to measure load or physiological performance [12]. Performance data from players are increasingly being collected automatically during training and matches providing athletes, coaches and training staff with adequate knowledge for reducing injury risks, calculating appropriate training loads, personalizing training types, improving tactical behaviour, and supporting decision making. Although significant and broadly used, EPTS have not yet received much attention from researchers.

In the sports science field mainly quantitative research on performance enhancing under the use of EPTS have been conducted. Rossi et al. [23] addressed the efficacy of EPTS in injury forecasting in football providing a set of practical rules for evaluating and interpreting performance data in relation to injury risk. Rico-Gonzalez et al. [23] examined the accuracy and reliability of the local positioning measurement systems (LPS or LPMS) and global positioning systems (GPS), both components of EPTS, and proved that they are accurate and valid in determining the player position and estimating distance and speed. Souza et al. [26] tackled the association of match running performance from EPTS with football performance. Gamble, Chia and Allen [7] explored data driven decision making within a competitive football environment, assessing factors that drive athletes and staff performance. Linke, Link and Lames [12] assessed the measurement accuracy of EPTS in professional team sports; while Pettersen et al. [19] conducted a case study presenting their experience from using EPTS and indicated how EPTS can detect and find anomalies, trends, and insights vital for individual athletic and football

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EMAIL: pavlos.bitilis@iqvia.com (A. 1); niki.chatzipanagiotou@ics.lu.se (A. 2)
ORCID: 0000-0003-0548-6268 (A. 1); 0000-0002-5529-7767 (A. 2)


team performance development. Previous research findings show that there is not much research in the informatics field and human computer interaction (HCI) about the use of EPTS in football from the perspective of professional football athletes and training staff, who are the users of EPTS. HCI examines how humans interact with computers and how to design computer systems that are effective for people to use. EPTS is a relatively new technology and there is a need for a broader understanding of such technology from users' perspective in order to make its use more effective for users. The previous studies are mainly quantitative focusing on measuring users' performance when using EPTS, while they do not examine how users make sense and experience the use of EPTS in sports such as football, where the use of EPTS is, in a sense, obligatory. When it comes to EPTS, unlike daily wearables, such as smartwatches and bracelets, where people decide upon personal motives to use them, athletes and training staff (coach, trainer, ergo physiologist, physiotherapist, etc.) do not have the option of free choice. Football clubs in the elite level assume that the effective integration of EPTS in the daily procedures of the team, as well as in the training routines of the academy of the club, will be a strong competitive advantage for their future success and prosperity [16, 21, 7, 22]. This implies that professional football athletes and training staff may understand and experience the benefits and challenges from the use of EPTS differently than those found in previous related studies. Thus, we argue that it is of interest to examine further the use of EPTS from an HCI perspective following a qualitative approach and focusing on users in order for their 'voices' to be heard.

Therefore, the purpose of this research paper is to explore and understand how professional football athletes and training staff make sense of the use of electronic performance and tracking systems (EPTS) in their everyday training and work. That is, the paper explores perceptions, benefits and challenges that professional football athletes and training staff experience when using EPTS. To achieve the aim of the research, the following research question is formulated: How do professional football athletes and training staff make sense of the use of electronic performance and tracking systems (EPTS) in their everyday training and work?

To address the aforementioned aim and research question, an ethnographic study was conducted among professional football athletes and training staff of elite football teams of the first category in Greece. The study generated findings interesting for the informatics and sports science research fields.

The rest of the paper is structured as follows. Following this introduction, the paper continues with section two, a brief literature review and the theory used in the research. Section three describes the methodological choices followed for the research. The findings are presented in section four followed by a discussion in section five. The paper concludes with section six which presents the conclusions of this research study.

2. Literature Review and Theory

2.1. Personal Informatics (PI) and Wearables in sports

Personal Informatics (PI) systems imply the engagement in self-tracking of any form of biological, behavioural or environmental information of individuals with the objective to develop self-sensing, self-awareness and individual performance. PI users obtain data-driven self-insights which can be used to improve behaviour patterns and actions. The use of PI systems is presented as a process consisting of five stages: preparation, collection, integration, reflection and action [10]. At preparation stage users decide what activity they want to track, how they will proceed with tracking and which application or technology artifact are going to use. Then, the stage of data collection occurs that brings users to the stage of integration, which is the process of transforming raw data collected from multiple resources into coherent visualizations and sheets that can be reflected. Finally, after the stage of reflection, where self-insights are produced, users reach the stage of action where insights are used targeting to behaviour change.

One of the most common examples of PI tools is wearables, which are computing devices that are worn in the body and can track personal parameters and biomechanics via sensors and are applicable to industries such as sports and healthcare. Wearable devices such as activity trackers have built-in sensors and, through connectivity (Bluetooth, internet connection), exchange data with a software that is installed in a connected device, without requiring human intervention. Those data can be used either by

the user or by their medical doctor (healthcare applications) or by their trainer (fitness applications). PI wearable tools are related to self-monitoring of an individual's or a team's actions, behaviour, and other parameters. Monitored behaviours must be compared to some norm or target, and then the deviations from those norms and targets are subsequently renovated [1]. Wearable systems improve the act of self-monitoring by allowing individuals to track data everywhere at any time, potentially enabling the arising of self-reflection and triggering process of behaviour change.

In sports domain, self-monitoring has been described as an activity that improves the athletes' performance [9]. The introduction of sensor technology to sports has allowed athletes to quantify and track their performance adding an information-based layer to athletic practices and particularly in practices involving competition. However, the integration of athletes' monitoring into sports requires an investment in terms of time and labour in order to gather and scrutinize the data, and efficiently make use of the knowledge derived from them [24]. Amateur athletes present different patterns of usage compared to elite ones. While elite athletes make sense of their data by leveraging their knowledge about their own body and sports practice [21]. Either for amateur or elite athletes, it is important to track athletes-specific contextual factors such as injuries, illnesses, sleep, stress and mood, as they allow coaches to tailor athlete's training program [29]. PI tools in sports are used in an instrumental and an experiential way [17]. The instrumental role entails quantifying performance and supplying data back to athletes, and the experiential role entails strengthening and enriching the sports experience [17]. PI wearable tools used in sports affect users' sport-aspects in three different ways [13]: They may enable the user to do something that would be impossible to do without technology (enabling). Alternatively, the user may improve his performance or routine taking advantage of wearable's support (improving). Finally, the user may act in a different way than how it was done without technology (augmenting).

2.2. Electronic Performance and Tracking Systems (EPTS) and football

Electronic Performance and Tracking Systems (EPTS) are used nowadays in football to monitor and improve the performance of players and team. EPTS mainly track player positions, but they can also be used in combination with microelectromechanical devices, heart-rate monitors and other devices to measure load or physiological performance [12]. They consist of two main parts: the wearable part of EPTS, which combines camera-based and wearable technologies that are worn between the shoulder blades supported by a vest that looks like a sports bra. The wearable part has many sensors that enable the measurement of velocity, distance covered, the parts of the field where the player was moving, the heartbeat, and the impact of a jump or a tackle [12]. The collected performance data from the wearable are sent real time to an information system that processes these data, and which constitutes the second part of EPTS. More specifically, EPTS primarily track player and ball positions and consist of three different forms of physical tracking devices: semi-automatic multiple-camera video technology (VID), local positioning measurement systems (LPS or LPMS), and global positioning systems (GPS). By combining data from multiple systems, the athlete's quantification gains significant validity [19]. Football teams implement all forms of physical tracking devices (VID, LPS/LPMS and GPS) in their everyday training and work, as well as in official matches, in order to maximize the value of the data collected. VID is a system for monitoring players behaviour and position and was the only EPTS used in football matches before 2015, when FIFA approved the use of wearables in football matches. VID is a PI tool for analysing the football athlete's behaviour and position based on multiple high-definition semi-automatic cameras that track players, placed around the soccer field in particular pattern. The system produces the trajectories of players around the pitch throughout the game and allows training staff to study the movements of individual players and the interactions between them [7].

LPS and GPS, which are also adopted in football training since 2015, can also be used at football matches. LPS and GPS are both based on radio-frequency technology and the wearable dimension of these systems requires from the football player to wear a device normally mounted on player's upper back containing additional sensors. On the one hand, LPS wearable emits signal to local receivers that are placed in specific pattern around the field. On the other hand, GPS devices are passive receivers of signals from overhead satellites [22]. Consequently, GPS cannot be used in indoor football stadiums

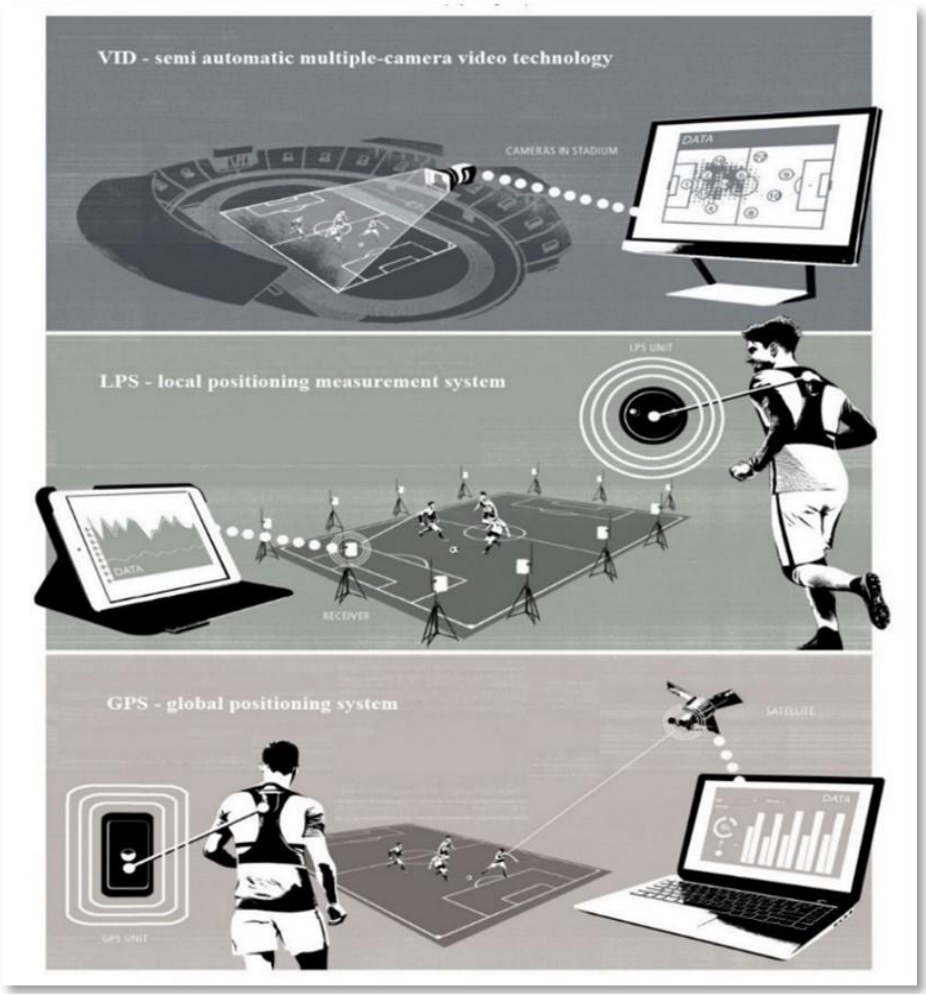

Figure 1: Forms of Electronic Performance and Tracking Systems (adapted from Fifa.com)

and indoor training facilities. All three components of EPTS - VID, LPS, and GPS - are sending data to a central chip (a reception antenna with wireless technology). The data are stored on a central computer and are available for editing, interpretation, and visualization through multiple devices such as tablets and mobile phones.

Data obtained from EPTS can be separated in four different categories of variables. That is, physiological, kinematic, neuromuscular, and tactical [12]. Physiological variables are related with the biological stressors experienced by the football player during training or match, such as heartrate and oxygen saturation. Kinematic variables are those related to external workload, such as movement patterns, total distances covered and relative distances. Neuromuscular variables, that is, acceleration, turns, changes of direction and jumps, are obtained with the help of sensors such as triaxial accelerometers, gyroscopes, and magnetometers. Tactical variables are related to football tactics and the football player's position in relation to the ball or opponents, and can be obtained from VID.

These data are important for both training staff and football players. Physiological variables are vital for training staff to individualize football player's training, and for the players to evaluate their own condition and health status [23]. Kinematic and neuromuscular variables are also helpful for football players and the training staff to identify players' weaknesses and work accordingly targeting to improve those variables. Football coaches are benefited from tactical variables assessing the overall tactical position of the football team and recognizing which player should improve his tactical behaviour and in what way [7]. With the use of EPTS, football players gain an overall knowledge on their football performance and become aware of their weaknesses. In addition, football training staff assesses better the condition of every player, plans training accordingly and improves the tactical behaviour of the team.

2.3. Sensemaking Theory

Sensemaking is related to the human being as an actor and is concerned with making things, that have already happened, meaningful to human actors [29]. It is the cognitive process of people making retrospective sense of the situations, in which they find themselves and, therefore, give meaning to their collective experiences and form reality. Thus, it is a collaborative process of creating shared meanings and understanding out of different individuals' perspectives and varied interests. In that sense, the theory of sensemaking can be used to understand how professional football athletes and training staff make retrospective sense out of situations through their collective experiences, and how they create shared meanings and advanced understanding of their everyday training and work using EPTS.

Weick [29] brought together the seven properties of sensemaking - identified in his earlier work in 1979 - to create a robust explanation of how organizational actors create order from the abundance of experiences and interactions encountered every day. The seven properties of sensemaking, constitute, firstly, identity. The organizational actors' understanding of themselves (identity) shapes what they enact and how they interpret events, which also affects what outsiders think of them (image) and how outsiders treat them, which stabilizes or destabilizes organizational actors' identity [29]. Identity is one of the two basic properties - the second is plausibility described later in the text - that differentiate sensemaking from basic cognitive psychology. Secondly, retrospection provides the opportunity for sensemaking because it influences what organizational actors notice and, hence, attention and interruptions to that attention are related to the process of sensemaking [29]. Thirdly, organizational actors express enactment within their environments through dialogues and narratives [29]. Through narrative accounts, organizational actors understand what they think, organize their experiences, control and predict events [29]. Fourthly, sensemaking is a social activity, meaning that plausible stories are retained, preserved and/or shared [29]. The social norms that shaped organizational actors, as well as the people who are currently interacting, influence their interpretation of the world. The social activity includes both the speakers themselves and the narratives [29]. Fifthly, sensemaking is ongoing in that individual organizational actors simultaneously react and shape their environments. Organizational actors project themselves onto the organizational environment, observe the consequences and, consequently, learn about their identities and the accuracy of their accounts of the world [29]. Sixthly, organizational actors extract cues from the context that support their decisions about what information is relevant and what explanations are acceptable [29]. The extracted cues are practically simple, offering familiar structures that provide points of reference to organizational actors for linking ideas to broader networks of meaning [29]. Finally, organizational actors favor plausibility over accuracy in accounts of events and contexts [30]. That is, sensemaking is more a matter of plausibility and sufficiency than accuracy and completeness [29]. Organizational actors' cognitive and perceptual resources make it impossible to fully know or understand. Hence, the sensemaking process is limited to what works for organizational actors in a specific context in order to take action [29]. Plausibility, as said earlier, is the second basic property - with identity being the first - that differentiate sensemaking from basic cognitive psychology.

The aforementioned seven properties interact and intertwine as individual organizational actors interpret events. When trying to interpret events (to make sense out of events), organizational actors create frames, which are relatively large and lasting. They also create or extract cues; a cue is smaller and tentative and makes connections. Weick [29] mentions only one connecting device, the narrative. Organizational actors' interpretations become evident through narratives, written and/or spoken, which convey the sense that they have made of events, as well as through visual representations and associated material practices [2]. By reflecting on each of the seven aspects of sensemaking, organizational actors that have gone through a certain experience are able to make sense of it and evaluate the impact it had on them. In this way, organizational actors turn circumstances into situations that are well comprehended in words (narratives). These situations serve as starting points for action. Therefore, the process of sensemaking helps organizational actors understand not only the impact certain experiences have, but also what makes these experiences have this particular impact. Then organizational actors become empowered to use their understanding to build more impactful experiences in the future.

Sensemaking theory has received some criticism from scholars. One of the most common critiques is that it focuses on the study of retrospective sensemaking and neglects the prospective one [24]. The

notion of prospective sensemaking though is not completely denied. Instead, the theory implies that future-oriented sensemaking derives from retrospective sensemaking. This is a view that we also adopt as organisational actors tend to create and project images of future situations in their subjective meanings and interpretations. Following this, another critique is that sensemaking theory is too focused on subjectivism [24]. The counterargument is that organisational actors cannot enact their own wishes to their context as the context has certain properties that cannot be enacted. It is the concept of enactment itself that allows organizational actors to understand what they think, organize their experiences, control and predict events. Thus, we are aware of sensemaking theory limitations; however, by providing a holistic account of the situation and organisational actors' meanings, and constantly reflecting of own interpretations we try to overcome the criticism.

The literature review formed the theoretical basis of this paper by presenting the main concepts of personal informatics (PI), wearables and EPTS, and how these are used in sports and, particularly in football. The literature review along with the theory of sensemaking [29] helped us understand, analyse and discuss the research findings, but also acted as a driving force in the overall planning of the data collection. Additionally, the theory of sensemaking acted as an inspiration in the formulation of the interview guide.

3. Approach and Methodology

For this research, the qualitative approach was chosen because, according to Myers and Avison [15], it is the appropriate research approach for understanding people and the social and cultural context within which they live or work. Creswell [5] suggests that if a concept or phenomenon needs to be explored and understood because little research has been done on it, or because it involves an understudied sample, then it merits a qualitative approach.

We adopted ethnography as it is the most appropriate methodology for collecting data in real settings in which EPTS are to be used [4]. Ethnography is a qualitative methodology that studies people and cultures based mainly on observations and interviews. Focusing on detailed observation of people in their natural daily routines and work helped us explore and answer the research question. In this research, professional football players and training staff are the users of EPTS, and they are the source of information. Consequently, this is another strong indicator to use ethnography because participants' point of view are key concepts in ethnography [4]. In ethnographic methodology, results come out of data and in-depth understanding of human behaviour. Thus, ethnography offers a deeper understanding on the context of the use of technology. Traditional ethnographic research usually requires a substantial amount of time [4]. We managed to compensate this limitation with our previous experience and, thus, followed a focused ethnographic research. The first author's experience in the football domain as a football athlete ensured contacts and easiness in recruiting research participants, who were willing to open up and share their experiences. The second author's experience in ethnographic studies allowed deep understanding of the participants' behaviour. While, both researchers good collaboration enabled the success of the ethnographic research.

3.1. Participants

The technique for selecting participants was purposive [18]. It was important to form the participants' sample and make sure that those contacted will benefit the research by providing rich information. For this, we required that the participants currently play or work for football teams, which use EPTS in their daily football routines, and that they have at least one year of experience with EPTS. Only male football players were expected to participate in the research, since women's football in Greece is at premature stage and EPTS is not yet implemented, and, therefore, gender had to be included in the sample criteria. Had the participants be of different gender, the research findings may vary. Thus, we concluded to a sample size of eight participants. Three participants are Greek male professional football players that have played or currently play for professional football teams in Greece. Five participants are male members of training staff in professional football teams in Greece. The specific

participants, due to meeting all sampling criteria, they were a rich source of information that allowed reaching saturation after the seventh interview.

3.2. Data Collection

The ethnographic approach entailed two methods of collecting data: direct observations and individual semi-structured interviews.

During direct observation, the researcher visits the participants, observes them as they work, and takes notes [4]. After getting permission from a football club in Athens, Greece to attend their training sessions, the observations were made in three different sessions at separate days lasting two hours each. The chosen dates were deliberate so as to be able to observe a meeting of the training staff after a football match; a training session from the stands sitting next to the EPTS analyst; and a training session from the football bench being among the football players. The participants were observed while they were working, additionally taking into consideration their attitudes and behaviour. The observations provided rich data about the use of EPTS in the daily work of the training staff members. That is, how they collaborate when using EPTS, how they make sense out of their use, and how they communicate the information from the EPTS. Additionally, the observations provided rich data regarding the use of EPTS by football players when wearing them (sensor of GPS and LPS); and the work of the analyst with EPTS (the GPS, LPS and VID parts). The observation notes were both descriptive including descriptions about the participants, the physical setting and the specific situation or activity. They were also reflexive, including the researcher's thoughts on what was observed. That was, benefits, problems that emerged from the use of EPTS, the participants' impressions, hunches, and feelings when using EPTS.

The same participants were present both in observations and interviews. Interviews are a type of conversation that is used to identify individuals' interpretations and the meanings they assign to their realities [4]. Individual semi-structured interviews were conducted in order to receive deeper answers on our questions or follow up on certain questions related to information that had been observed. For is, an interview guide was used, which consisted of several key questions that helped to define the areas to be explored, but also allowed us and the participants to diverge in order to pursue an idea or response in more detail. The semi-structured interviews provided deeper insights into the participants' perspectives. Furthermore, notes were taken during the interviews, and the body language, gestures and face reactions of the participants were taken into consideration and were included in the transcribed text. All interviews were audio recorded with the participants' consent and were transcribed verbatim into accurate text to allow analysis of the collected data. In addition, the guidelines of the Swedish Research Council [27] were followed to assure the participants of confidentiality and inform them about their volunteer participation and the details of the research.

3.3. Data Analysis

The collected data from the observations and interviews were brought together and were analysed thematically. This method of data analysis was selected to avoid focusing on pre-formed categories that may risk the interpretation of the data. Thematic analysis is a coding process, which unfolds in six (6) steps [11]: The analysis started by reading and re-reading the transcribed interviews and observation notes to become familiar with the data. Then, primary codes descriptive of the data were produced and assigned on items or parts of the text. A codebook.xlsx file was created with approximately 400 initial codes. The codes were written in cells of different color. The codes that appeared more than once were deleted, reaching in this way a total of 345 codes. Then, the codes were revisited several times until we reached a manageable number. The codes were analysed to identify categories. Specific codes were related to specific categories and, thus, 47 categories were produced. Afterwards, the identified categories were examined to extract central concepts (or themes). Themes are defined as patterns in the data sets, related to the posed research question, which give insights to the phenomenon in focus. Through this process the raw data became structured. An iterative process followed until the concepts (themes) were finalised, after being considered in the context of the research question and research aim,

to conclude to five concepts, which represent the research findings and are elaborated in the next section.

4. Findings

Five concepts (themes) emerged from the analysis of the collected data:

1. The Use of EPTS in Football
2. Reshape Existing Identities and Form New Ones
3. Make Sense through Communication
4. Build Trust through Evidence and Evaluation
5. Challenges

4.1. Concept 1: The Use of EPTS in football

The analysis of the data collected from the interviews and the observations showed that the use of EPTS had significant impact on the way a training session is organized. Participant 6 said *"EPTS helps you organizing a more effective training for today, for tomorrow and even for the next season"*. EPTS were observed to facilitate the process of every football player to be trained based on their needs. As participants said, football training must be personalized. Participant 1 highlighted that with the use of technology (EPTS) you can work more specifically on the weaknesses of an athlete. In addition, the analysis made on opponent's previous games, which is based on the provided information by the EPTS, affects the organizing of the weekly training sessions. Participant 6 explained *"We adapt our training to each opponent's tactical plans and according to the characteristics of opponent's players. If our defender will have to face a strong and/or a slow opponent attacker, we must prepare him for that during the week"*. Participant 7 said that the decision of the coach is very much influenced by how the team behaved in the previous match and added *"You see the formation. What did not go well? The cooperation between players in our formation did not go well. VID help us identify those problems."* So, the training becomes also more opponent-oriented.

EPTS have tackled the problem of training evaluation. An example was described by Participant 2 *"We had a disagreement with another member of the staff. I insisted that a specific drill (football exercise) is very exhausting for the players, while he insisted that it is a drill of low pace. With the help of the data that we collected from the GPS, I was able to justify my opinion and we finally classified that drill as a demanding one."* Participant 2 also added that after each training, the meeting for the analysis of the data from the GPS starts and the staff members focus on the players' training by watching it. He continued by explaining that specific targets for the training have been set in terms of kilometers per player, heart rate, training loads, and staff members want to confirm whether players trained according to the set targets. Participant 7 highlighted *"All workouts should be recorded. The targets of every workout should be clear. We analyse the workouts in comparison to the targets that have been set"*. Evaluation of the training leads to a classification of every different drill in categories. Participant 7 pointed out *"We have the evaluation of the training. We make a library of exemplary training sessions, drills etc. That will help us in the future. We need that archive in order to present the drill to a new player or a new member of the training staff. It is also useful for us in the process of organizing the training of the week or the month"*. The long-term goal of the training staff is to be able to create own coaching methodology and coaching style, as Participant 8 said. Through the evaluation process, the training staff members add value to their coaching methodology and style. The use of EPTS has enhanced football, both for the professional football athletes and the training staff, as it allows the analysis of the collected data. The data collected from the EPTS provide information to the training staff and athletes, which is used to organize the training sessions based on individual players' needs and, at the same time, the overall needs of the team.

4.2. Concept 2: Reshape existing Identities and form new ones

The football player identity has been reshaped by developing new characteristics like discipline, professionality, self-control and the will to learn about their bodies and the measurements. Football players have become more disciplined according to participants. Participant 1 *said "I can't hide and do not try as much as I should, I can't 'steal' kilometers...I must be disciplined, give 100%. That keeps me constantly at high level"*. Also, Participant 4, when asked about what comes to his mind when thinking about EPTS' use, he replied *"more discipline"*. Football players have also become more educated and, therefore, more demanding regarding their health-related information. Participant 7 said that players nowadays have access to a lot of information available on Internet, YouTube etc., and they want to know their results from VID in order to compare themselves to players they look up to or players of the same tactical position. As Participant 2 said *"The players' attitude towards the measurements has been changed, they ask for their data, they want to check if numbers are improved, even if they do not know much about the different variables"*. Some players through their experience in the field have also developed the skill to evaluate their data. *"I now have the experience; I know how to evaluate my measurements"* said Participant 5. EPTS give the professional football players the opportunity to compete with themselves, retain high standards in their performance, and significantly influence the way they work out. Participant 5 said *"When you see for example that in the last match you run 11 kilometers, you are motivated to run the same kilometers or even more in the next matches; you want to have a steady high performance"*.

From the analysis of the collected data, a new identity in regard to the training staff members emerged, the video analyst. Participant 7 said that the specialized knowledge and expertise of the analyst supports the coaching process and the training evaluation. Participant 7 continued *"I always felt that we do not give the right information to our players. We used to talk in general and we needed to be more precise regarding our instructions to players. Supported by EPTS and the interpretation of the data provided by the analyst, we have the proofs that we want"*. Participant 2 added *"…coaches receive so much information. They do not want to bother much about GPS measurements. The coach waits for the analyst to inform him about the results. So, the analyst's presentation must be clear and understandable"*.

The training staff, because of the use of EPTS, undertake new responsibilities, which change the way they carry out their daily training routines. New responsibilities like EPTS charging and maintenance have occurred. Participant 3 said *"I take care of the GPS system which means that it needs charging, some set ups are needed, I prepare the system so that I can give everyone the specified GPS"*. The coach of the team, as observed, is the decision maker and the staff leader. Participant 1 said *"The coach will judge you according to the numbers. If he doesn't consider numbers, the team's bad results will be ignored. There are coaches who take them (meaning the numbers) less into account"*. Participant 4 added that his coach supports that if a player does not run, he does not play. Participant 2 noted that some coaches are still afraid of technology. While Participant 7 said that he had spoken with a coach who told him that football analysis has changed him as a coach and, not only that, but it has changed the way he coaches and also has changed the whole coaching process. The aforementioned illustrate the different identities that exist among football players and training staff and how these have been reshaped by the use of EPTS in their everyday training and work.

4.3. Concept 3: Make Sense through Communication

4.3.1. Make sense of EPTS use through Communication

Communication is triggered by EPTS use and, at the same time, communication is a driving force for the successful use of EPTS. Participant 2 equated EPTS value with the value of personal communication between the players and the staff. The football team's meetings are the place where the EPTS use is discussed and evaluated and, therefore, meetings are increased because of the use of EPTS. As observed, pre-training communication with the football players is very important for the assessment of their current physical and mental condition. During these meetings, the training staff discusses with

the football players if they feel any pain or if they experience any personal problems that may affect their performance. As Participant 1 pointed out *"The player is a human being, not a robot. He may have a bad day, or he may experience a problem. Maybe he has some family issues..."*. Participant 2 said that *"You can often misunderstand the data produced by EPTS. Two things are important so that you avoid mistakes. One is personal experience and the other and very significant is communication with the player"*. Communication among the players and training staff allows them to understand the provided by the EPTS information and make better use of it for the benefit of the team.

4.3.2. Communication is facilitated by video and visualization tools

Video and visualization tools were observed to facilitate the communication among football players and training staff. The video analysts analyse the data provided by the EPTS and show it to the football team members with the support of visualization tools. In this way, on one hand, football players can watch a match and retrospectively identify their mistakes during that match. On the other hand, coaches can watch a match and retrospectively analyse it along with football players in order to improve performance. Participant 4 provided an example *"I saw in the video from the match that I was not in the right position when the ball was on the left line. In the next match one week later, I was in the right position and scored a goal"*. Participant 6 said *"Apparently, players do not fully understand by just getting instructions. Videos are needed to help them identify, understand and improve specific details. Sometimes we prepare for them a video of exemplary reactions from elite players that play in the same tactical position*". One of the benefits of videos, as Participant 6 said, is that video enables repetition and facilitates the communication and cooperation among the members of the football team. Participant 7 said *"A player reached a velocity of 36 Km/h during the game. The trainer wanted to know when that happened. We matched the timeline of the GPS system with the timeline of the VID system, and we detected how the player managed to reach such velocity"*.

A need for improved visualization tools was observed during the discussion with the participants. Participant 2 said *"...the software of visualization tools should be improved. That is where companies should pay attention. To be honest, most of the coaches do not want to see numbers! They prefer an easy well-prepared graph that illustrates a lot of collected information"*. Participant 3 pointed out the need for a monitor in the training ground so that the analysts and the rest of the training staff can easily demonstrate to the players mistakes happening during trainings *"I feel that it would be important to have a monitor available on the field. Live analysis of the training, accurate corrections by the staff with the use of video"*. Participants 7 and 6 shared the same opinion.

Concluding, the use of video was observed to significantly facilitate the analysis of the opponent. The video analysis also helped in identifying and understanding own mistakes when it comes to football players, however, improved visualization tools are suggested by the players and the training staff.

4.4. Concept 4: Build Trust through Evidence and Evaluation

Trust emerged from the analysis of the collected data as a significant factor that affects the relationships among football players and training staff. *"To get a 100% from a player, you must gain his trust"* said Participant 2. In addition, mutual trust has been developed among the members of the football team (players, training staff, and coach-manager). Participant 3 said that *"We trust the data from the GPS and the coach trusts our analysis, he trusts our evidence"*. There was a lot of doubt and ambiguity in the way training staff used to organize and perform the training process. Although some players had always trust in their trainers, in our research it was observed that most of them did not. The use of EPTS provided evidence for the training staff members to support and justify their training suggested plans. The provided evidence through the use of EPTS helped in building relationships of trust among the members of the football team. Participant 4 said that *"EPTS has helped trainers to explain their work and I believe that most football players now appreciate the work of the trainers"*. Participant 7 said that a player's mistake can be presented with the help of the video, if what you say is correct, you automatically gain the trust of the player, and the player develops confidence on the training process.

Evidence reinforces trust. Participant 7 said that by showing evidence to the fellow colleagues and players, and by sharing this knowledge with them, helps everyone to evolve. It creates relationships of trust and a prosperous ground for work. Let us not forget that football is a team sport and teamwork, and team spirit are necessary. Participant 7 added that technology, in that sense, brings closer training staff members and football players. Participant 3 added *"…Why do you say this, why do we have to do this, why do we have to get trained in this pace? Now we are able to explain to the players based on evidence why they have to do something."* Participants 7 described that he is usually on the stands with his computer. If he observes something worthy, he tags the time slot from the video, crops it, and sends it live to the other members of the staff at the bench with comments attached. He shares an image of what is happening real-time.

Besides evidence, trust is reinforced through evaluation of the training process and of the football player's physical condition. Participant 3 said that now training staff works more focused and targeted to an aim, they know what they are doing and where they are heading. Participant 5 said that *"no one can tell you that you did not try, your effort is depicted in numbers"*. Participant 2 said *"Daily evaluation of players and staff have increased the level of trust among the team".* In addition, players' said that now with the use of EPTS and the ongoing evaluation of their physical condition, and of the followed training process, trust is achieved, which leads to fairness.

4.5. Concept 5: Challenges

4.5.1. The challenge to maintain perceptiveness

Some participants discussed the different approaches that training staff has regarding the use of EPTS and underlined the significance of staff's perceptive ability. They indicated that data alone cannot be translated without human talent. For example, some coaches rely mainly on data provided by the EPTS, while some others are still 'afraid' to use technology to a wide extent. Participant 4 described an incident when a coach complained about him that he did not run as much as he could and should and that he did not train as much as he should. For this reason, the coach decided to not include him in the first five matches of the season. When Participant 4 checked his results from the EPTS, he realized that they were the same with the average of other players. He discussed it with the coach to show him that he deserved to be included in the upcoming matches. We also observed that the coach of the participant decided to exclude him from the first eleven because of own perception. While Participant 3 said that there is a risk of focusing only on seeing numbers, which he believes is a big problem, seeing only numbers and not being able to use own talent. Participant 3 added that *"The human eye is always necessary; the human talent of the coach is necessary. The best assessment of the current condition of the player is the one we do. Because the system sees only numbers. With the questionnaires and the communication with the players we exploit better the data we collect"*. Participant 3 stressed the significance of reading behind the data. He indicated that training staff must not be trapped into the numbers. That comment implies the need for accurate analysis of the data by the training staff in order to facilitate the preparation of the match. It also implies the significance of the perceptive ability of the training staff. Perceptive ability is the key for accurate analysis of the data provided by EPTS.

4.5.2. The challenge to diminish any rivalries occurred

Participants suggested that it is important to be careful with the analysis and presentation of data provided by the EPTS regarding the football players' performance. EPTS allow the identification of individual performance. However, although football is a team sport, when it comes to discussing individual mistakes made by the football players during a match, caution should be taken. Participant 6 noted that training staff members must be very careful when they have a video that contains 8-9 mistakes from the same player. It is better to show and discuss the player's mistakes in private. He suggested to not show them in front of the whole club. Participant 3 added that he always informs the players in private. Participant 1 said that *"We usually ask each other how our numbers were? How*

many kilometers you run today? You compare your numbers with the others', and this sometimes creates rivalry". On the other hand, Participant 5 said that he does not believe that there is a question of unfair competition or that they are moaning with each other about anything. He believes that EPTS have created a climate of healthy competition and that is another motivation for the player. Therefore, caution should be taken to use the data provided by the EPTS in a way so that rivalries among the football team members are not caused.

5. Discussion

The research findings show that football athletes and training staff members have their own knowledge background on EPTS and their own experience on using EPTS. The participants were observed to make sense of EPTS differently, and, thus, exhibit various behaviours and attitudes towards the use of EPTS, ranging from non-technology enthusiasts to technology enthusiasts. Their different stance towards technology was depicted in the way each of them uses EPTS and through the benefits and/or challenges they experience from that use. That is, depending on the participants' enthusiasm towards technology, some perceive the same situations in regard to the use of EPTS as benefits, while others perceive them as challenges. This is also related to the obligatory use of the EPTS since, if you sign and work for a football club that uses EPTS, you are obliged to use it, which is the case in the elite football teams.

No matter individuals' attitudes towards technology, the research findings show that the use of EPTS enhances football, both for the professional football athletes and the training staff, as it allows them the analysis of the data collected from the EPTS parts (VID, LPS, GPS), which provides useful information that is used with the aim to improve the team's performance. That is, the football athletes and the training staff members through communication among them are concerned with making situations, which have been collected in the form of data by the EPTS, meaningful to them in order to use them latter in improving the team's performance. Findings no3 and no4 showed that the research participants perceive and understand EPTS as a communication enabler. James, Wallace and Deane [8] research found that individuals decide upon personal motives on how they will use a PI tool, wearable or not. Likewise, our research findings show that the football athletes and training staff members are mainly motivated by performance.

Football players use EPTS aiming to develop and maintain high standards of performance and to compete with one's own self. The football players also acknowledge a sense of security because they feel they can improve, based on the information from the EPTS on monitoring and reporting their performance, which extends Kirschenbaum et al. [9] findings, who related self-monitoring of athletes with improved performance. The football players ask for information collected from EPTS from the training staff, and leverage their knowledge on assessing their measurements. Some football players also express feeling a boost because they are wearing and making use of the new technology of EPTS, in line with Mencarini et al. [13] findings about the aspects that EPTS can affect users.

While data provided by the EPTS offers the training staff members the evidence they need to organize training sessions in such a way in order to improve individual football players' and the team's performance, as shown in finding no1 and similarly with Wakefield, Neustaedter and Hillman [28]. The training staff members' work has changed as now they are able to control and analyse quickly vast amounts of information, which was previously addressed as problem by Saw, Main and Gastin [25]. This leads to the continuous assessment of the training, which, consequently, leads to improved training methodology. The accurate analysis of the EPTS data also adds to the perceptive ability of the training staff members, as shown in the finding no5, and allows them to organize effective training sessions. However, it is not only the quantification of data that matters, as said by Pettersen et al. [19], but the previous knowledge of the training staff and the way the data are presented. This implies an instrumental and an experiential role of EPTS, confirming Nylander et al. [17] findings. Further, the analysis of the EPTS data should be presented in a way to avoid rivalries among the football players. The findings show that this is practically a cognitive process, where individual football players and training staff members make sense of specific situations retrospectively. The data that are extracted

from the EPTS helps them in this process. That is, specific situations are experienced during a football match or during training, which, at that time, the football players or the training staff do not have the time to fully process. While, when they get the data from the EPTS, they have the chance to watch them together, reflect on them, discuss them, make sense of them and finally decide how to act based on them. This process allows the football athletes and training staff members not only to understand the impact of certain situations, but what made those situations to have the particular impact.

The use of the advanced technology of EPTS [12, 23, 7, 22] is described in five stages [10]. The findings of our research expand previous research by finding and adding an extra stage, related to the evaluation of action stage. The action stage implies the organizing of the training, the personalization of the targets, and the discussion with the football players. While the added stage of evaluation, which emerged through our findings, describes the assessment of the actions taken. Through the process of evaluation, the training staff continuously improve their work and achieve effective EPTS use. In the following figure2, the updated stages of EPTS use are presented. On the preparation stage, training staff through meetings decide what they want to track. For example, they may plan a drill for assessing tactical behaviour with the help of VID, decide to maximize football players' speed, etc. In collection stage, the data from the EPTS are collected according to plans and targets set by the training staff at the meeting. The data exported from the EPTS, are reported and presented to the players and other team members through visualizations, which represent the third stage of integration. Then, in the reflection stage the information from the exported EPTS data is discussed in order to identify weaknesses in the players' performance and to find patterns of exemplary trainings. In the action stage, the training staff after having planned and organized their training plan accordingly, they communicate this training plan to the players, providing certain instructions. The new added stage of evaluation shows the need of the

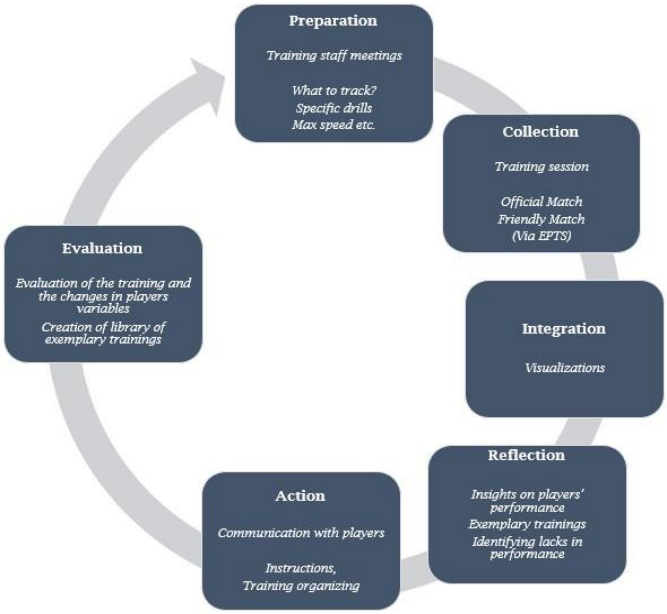

Figure 2: The Updated Stages of EPTS Use (Adapted from Li, Dey and Forlizzi [10] and extended by the authors)

players and training staff to come together after having applied the training plan to evaluate their decisions and check whether they were successful or not, based on the new data from the EPTS. The stages-cycle starts again. As said, this last stage emerged from our research findings as it was observed and confirmed by the participants interviews that each day of the football team starts and ends with the football players and training staff members evaluating the information extracted from the EPTS and their training patterns. So, as shown in figure 2, the updated stages of EPTS use are presented as an ongoing process that is repeated on a daily basis for the football team.

Football players, who showed enthusiasm for EPTS, have developed the ability to observe, make sense, and analyse their personal data. When it comes to training staff members, the findings show that they have positive inclination towards the use of EPTS, as, benefited by the information they get from EPTS, they achieve a more specialized and personalized on individual players outcome of their work,

strengthening in this way the football athlete-trainer relationship, also found by Michahelles and Schiele [14], and their work position as well. Additionally, the data provided from the EPTS, supports the training staff members to diminish ambiguity and build relationships of trust with the football players and the rest of their colleagues in the football team. This was also expressed by football players too. Trust is also built from the continuous evaluation, as shown in finding no4, since football players having the information from the EPTS as a proof for their suggested training routine, they trust more easily their trainers' work and, at the same time, they know that their effort can be proved and, thus, is recognized. This changes football players' attitude and their working routine. The findings showed that players have become more disciplined in order to improve their own performance and address the needs of the team and, consequently, the football club's needs. Findings no3 and no4 showed that the research participants perceive and understand EPTS also as a reason for fairness and discipline. Furthermore, during the Covid-19 pandemic, EPTS offered the training staff the ability to monitor each player separately, which would not have been possible without the data collected from EPTS and, in particular, from the GPS use.

Coming back to the communication among football players and training staff members in order to make sense of situations, the findings show that through this collaborative process, which is supported by EPTS, they give meaning to their collective experiences. Continuing, they share these meanings and form new plans of action. To share understanding, though, the football players and training staff members need to raise knowledge out of the past, tacit, private, random and complex, in line with Rapp and Tirabeni's [21] findings that elite athletes leverage their knowledge and experience in order to make sense of their collected data from EPTS. In this way, the participants manage to relate this knowledge to a current situation and make it explicit, public, ordered and simpler.

More specifically, the findings show that the football athletes and the training staff members have an understanding of their own identities, which affects and shapes their understanding of certain situations and how they interpret them, in line with Weick [29]. What they, themselves, think of their identities, consequently, affects how others - inside or outside the team - think of them. For example, a player based on the data from EPTS regarding his performance, creates a certain idea of himself. Have the player show confidence in himself, his skills and his performance, it motivates him to perform well during match or training. The coach, or other staff members, understand when a player has good or not performance and they act towards him accordingly. In addition, as shown in finding no2, re-shaped or new identities may emerge from the use of EPTS, such as the trainer's and VID analyst's respectively. Continuing, the football players and training staff members were observed to make sense through retrospection of experienced situations, and pay attention to those that are considered important for them and the team, while they discard the rest. To make sense of those situations to assess them as important, the football players and the training staff members discuss, try to understand the situations, organize their experiences, control, and predict future situations, events, and actions. In the process of making sense, all team members (football players and training staff) participate, communicate, and interact - it is a social activity - and together they decide which situations are important to keep and preserve those which help them improving their future performance. Understanding how to use EPTS in a football team with the aim of improving its performance is an activity that provides a more ordered social reality by reducing ambiguity, in line with Weick, Sutcliffe and Obstfeld [30]. This is an ongoing process as the football players and training staff members meet daily to discuss the data extracted from the EPTS and how they will use them. In addition, to decide what information is relevant to keep, they link meanings and ideas and connect them to broader meanings and contexts. For example, the findings showed that they compare their previous training routines and knowledge on training process with the differences that occurred in their routines from the use of EPTS. In this process, the visualization of the EPTS information, as shown in finding no3, is considered important for the training staff members in order to present it in an understandable way to the football players and other team members. Extending the findings of Rapp and Cena [20], the football players and training staff urged the need for improved visualization tools that secure effective EPTS data sharing and reflection. The training staff have been benefited from the VID in terms of assessing mistakes in tactical positions, adopting Bandura's [1] suggestion that in order to assess a behaviour, in our case behaviour either in the football match or training, that behaviour must be compared to some norms, in our case exemplary tactical performances.

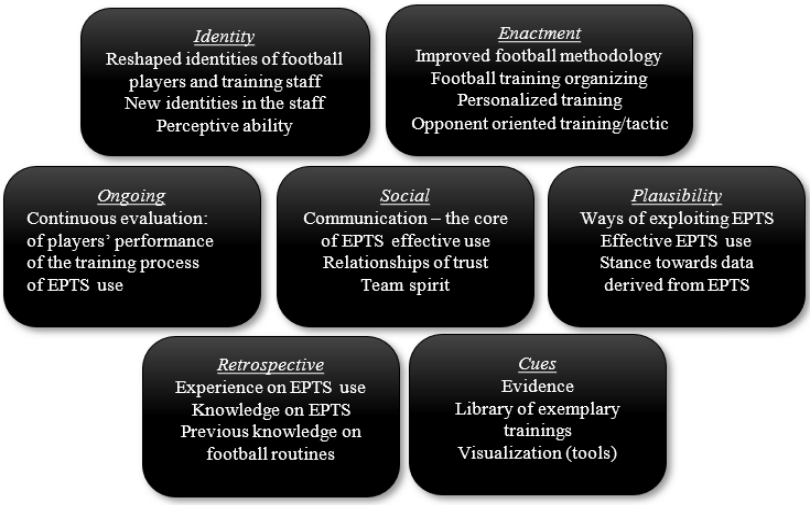

Figure 3: The 7 Properties of Sensemaking Adjusted to EPTS Use (Adapted from Weick [29] and extended by the authors)

However, the findings show that this process is limited to their common context, that is, their team. Meaning, the planned actions work in this specific context.

Based on our findings, a situation is discussed through interactive exchanges of the football players and the training staff members in order to produce an improved view of situations, including the involved team members, the technology used (the EPTS), their elite football club and its history and their team in a finite time and place. The aforementioned 'steps' that football players and training staff members take to make sense, interact and intertwine with their connecting 'device' being the communication among the involved team members. The football players and the training staff members' interpretations become evident through communicating narratives, which convey the sense that they have made of situations, as well as through visual representations and associated material practices. By reflecting on each of the steps of making sense, the players and training staff members that have gone through a certain experience are able to make sense of it and evaluate the impact it has on them. In this way, they turn circumstances into situations that are well understood. These situations serve as starting points for their action plans. Then players and training staff members become empowered to use their understanding to build more impactful experiences to improve their future performance.

Figure 3 illustrates the seven intertwined and interrelated properties of sensemaking theory adjusted to the research findings. The research findings have been categorized under the relevant property. As shown, there are different roles in a football club and every member have their own perspectives regarding the use of EPTS. Their perspectives depend on the different roles (football players, training staff members, including coaches) and on personal motives. The research findings show that EPTS are mainly understood as a way to improve individuals' and team's performance, as well as for growing the training staff members' knowledge and experience.

6. Conclusion

This paper has presented how professional football athletes and training staff make sense of the use of electronic performance and tracking systems (EPTS) in their everyday training and work, including experiences, perceptions, benefits and challenges. A qualitative focused ethnographic study was conducted and data were collected through direct observations in the field and individual interviews from eight purposively selected professional football athletes and training staff of elite football teams in Greece. The collected data were analysed thematically to conclude to five concepts, which represent the findings of this research. A theoretical framework, which incorporated main concepts such as personal informatics, wearables, and Electronic Performance and Tracking Systems used in sports

science along with the theory of sensemaking was applied to understand, analyse and discuss the research findings.

The research findings show that EPTS have radically changed the football daily routines for both professional football athletes and training staff members enabling them, and their football clubs, to improve individual and team performance. The use of EPTS has reshaped football athletes and training staff members' identities, making them more data driven and more accurate. EPTS build trust among professional football athletes and training staff offering them the evidence they need in order to justify decisions, instructions, and actions taken respectively. Visualization tools for presenting insights need to be further improved with the addition of in-field monitors and 3D presentations. Furthermore, it is important for training staff members to have ethical and consistent strategy on how data derived from EPTS and on how data are used and communicated. Through daily evaluation of their work, football players and training staff members are constantly improving their work identifying exemplary patterns of training and avoiding mistakes to be repeated, and in this way improve individual and team performance.

The football athletes and the training staff members through communication among them, facilitated by visualization tools, are concerned with making situations, which have been collected in the form of data by the EPTS, meaningful to them. Making sense is a collaborative cognitive and ongoing process where individual football players and training staff members try to give meaning to collective experiences retrospectively. The data that are extracted from the EPTS helps them in this process as they have the chance to examine them together, reflect on them, discuss them, make sense of them, share these meanings and finally decide how to act based on them. To do this they raise past, tacit and private knowledge to make it explicit, public, ordered and simpler. In this way, the football athletes and the training staff members turn circumstances into well understood situations, which empowers them to use their understanding to build more impactful experiences to improve their future performance.

An interesting future research will be to repeat the same research in different research settings such as elite football clubs in other countries, elite clubs of other team sports (basketball, volleyball etc.) in Greece and/or other countries and in youth football teams. In addition, the findings could be examined for validity in the international level collecting data from elite football teams of different countries. Another suggestion for future research is to turn the findings into a set of hypotheses and to assess their validity in a quantitative approach involving a larger number of participants. Finally, an interesting future research will be to include female football athletes to examine whether gender affects the outcome of the research.

This research paper generates contributions for the informatics field, and specifically the human-computer interaction (HCI) body of research, and the sports science research field by providing insights into the use of EPTS by elite teams in sports context. Examining how EPTS is used in the football context, this research expands the stage-based model of PI use by Li, Dey and Forlizzi [10] by finding and adding another stage. The research outcome also contributes by applying and expanding the theory of sensemaking into the team sport context and adjusting the seven principles of sensemaking to the properties that take place in a football team. Finally, the research outcome contributes practically to football players, training staff, sports teams and other interested stakeholders by improving the understanding of how they make sense of EPTS and how EPTS can be used in a better way by teams. The research offers football training staff members a model for efficient use of EPTS technology into the everyday football practices and a model of sustainable use aiming to the overall improvement of team performance. The suggestions may be applicable in other sports that exhibit similarities with football. Furthermore, the research identifies that there is a need for improved and advanced visualization tools that will facilitate collaboration and communication of data and analysis. This can be potentially useful for EPTS technology manufacturers.

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