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CONSTRUCTS INFLUENCING ADOPTION OF DATA APPLICATIONS IN ELITE FOOTBALL COACHING

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ABSTRACT

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This thesis explores how technology acceptance is formed in elite football coaching, and which factors influence in the adoption of data application in this context. In addition to traditional technology acceptance models such as TAM and UTAUT, User Experience (UX) concept and models are considered. To answer the research questions, a systematic literature review on the topics of technology acceptance and user experience are done, resulting a Combined TAM and UX model, which combines TAM and CUE-model. A case study, where the case is a coaching team of a professional football club using data application named XPS Network is conducted to find out how elite football coaches perceive usage and adoption of data application, and the findings form the empirical study are compared to the Combined TAM and UX model.

The results of the study suggest that factors influencing in adoption of data application in elite football are interaction characteristics, instrumental qualities such as perceived usefulness, non-instrumental characteristics such as risk, and usage outcomes such as confidence. In addition, the results propose that the adoption could be improved by focusing on supporting coaches in changing their behaviors and motivating the players to use the solution and reducing the risk of data becoming too dominant in the coaches decision making.

Keywords: Technology Acceptance, User Experience, Elite Football, Data Application

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Tässä opinnäytetyössä selvitetään, miten teknologian hyväksyntä muodostuu huipputason jalkapallovalmennuksessa ja mitkä tekijät vaikuttavat datasovellusten käyttöönottoon kyseisessä kontekstissa. Perinteisten teknologian hyväksymismallien, kuten TAM:in ja UTAUT:in lisäksi otetaan huomioon käyttäjäkokemuksen konsepti ja teoreettiset mallit. Tutkimuskysymyksiin vastaamiseksi tehdään systemaattinen kirjallisuuskatsaus teknologian hyväksymisestä ja käyttäjäkokemuksesta. Tuloksena on yhdistetty TAM- ja UX-malli, jossa yhdistyvät TAM ja CUE-malli. Lisäksi suoritetaan tapaustutkimus, jossa syvennytään ammattilaisjalkapalloseuran valmentajaryhmään, joka käyttää XPS Network -nimistä datasovellusta. Tapaustutkimuksella selvitetään, kuinka huipputason jalkapallovalmentajat kokevat XPS Networkin käytön ja käyttöönoton, ja lopulta empiirisen tutkimuksen tuloksia verrataan yhdistettyyn TAM- ja UX-malliin.

Tutkimuksen tulokset viittaavat siihen, että data sovelluksen käyttöönottoon huippujalkapallossa vaikuttavat tekijät ovat vuorovaikutusominaisuudet, instrumentaaliset ominaisuudet kuten koettu hyödyllisyys, ei-instrumentaaliset ominaisuudet kuten riski, ja käytön seuraukset, kuten luottamus. Lisäksi tulokset ehdottavat, että käytön omaksumista voitaisiin parantaa keskittymällä valmentajien tukemiseen heidän käyttäytymisensä muuttamisessa ja pelaajien motivoinnissa, sekä vähentämällä riskiä siitä, että data alkaa hallita valmentajien päätöksentekoa.

Asiasanat: Teknologian hyväksyminen, käyttäjäkokemus, huippujalkapallo, datasovellus

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1 INTRODUCTION

Data is said to be the new oil, but as is the case with oil, data is nothing if you don't know how to read it. This creates challenges in the world where everything is easily measurable and even complex data can be achieved cheaply: we don't know how to sort and read our mountain of data. This challenge is difficult one especially in sports, where athletes and their performance need to be measured continuously, but resources and knowledge on the topic are limited. Companies have seen the potential of this challenge and developed data applications that collect the sports data, process it, and presents it to the users in a form that is easily understandable. Yet the challenge remains; in many fields adoption of these applications has been slow and use rates low. Sports clubs buy these applications but use only a small piece of their functionalities. This thesis investigates how elite football coaches adopt data applications and which factors influence on the adoption.

Research on data collection and usage in sports has been increasing in past 20 years. McGuigan, Hassmén, Rosic, & Stevens (2020) found that most sports data studies are researching ways to collect and analyze data and using this data to make decisions. The most common reasons to collect data are evaluating an athlete's fitness and fatigue, preventing injuries, or measuring performance (McGuigan et al., 2020). The data are usually collected by measuring physical attributes like heart rate or speed, or by using psychological self-measurement tools such as questioners (McGuigan et al., 2020). Research on how coaches and athletes perceive data collection and monitoring is limited.

Technology acceptance on the other hand, is well studied field. The Technology Acceptance Model (TAM) is a widely applied theory that has during the years being tested in many contexts and applied to multiple situations. TAM2, UTAUT and UTAUT2 are also well-known theories that are based on TAM. TAM, which only includes two constructs, perceived usefulness (PU) and perceived ease of use (PEU), has been criticized being too simplistic (see e.g. Bagozzi, 2007), and these later models were developed to broaden the understanding of technology acceptance by including factors like social norm and enjoyment.

Lately, the perceived enjoyment has been suggested to be even more important factor to technology acceptance than PU and PEU (see e.g. Akroush, Mahadin, ElSamen, & Shoter, 2020; Bassiouni, Hackley & Meshreki, 2019). This notion opens up very interesting doors – if perceived enjoyment affects technology acceptance, how about other emotions?

UX theories, on the other hand, are not as mature. UX field has being rapidly growing in the consulting world, yet commonly agreed theories do not exist in the same extend than in the field of technology acceptance. However, the various UX theories have a lot in common; many of them focus on how users perceive the usage of a system and what emotional outcomes the usage causes (Hassenzahl, Diefenbach, & Göritz, 2010). This knowledge of usage outcomes can, when combined with the technology acceptance theories, provide a boarder and more holistic view on why and how technology acceptation is built.

1.1 Research Problem and Brief Methodology

This thesis aims to understand better how technology acceptance is formed in high performing environment, in this case, elite football. The thesis does this by combining UX and technology acceptance models and trying to explain the adoption of a data application with a help of these models. The epistemological position of this thesis is phenomenological, and the thesis tries to understand how differently people experience the same situation of phenomenon. A single case study, which is a research strategy used in this research, provides multiple different viewpoints and perceptions of the same situation. The research questions are:

> Q1: What factors influence to adoption on a data application in elite football coaching?
> Q2: What does previous research say about adoption and user experience of technology?
> Q3: How are technology adoption and user experience formed and related in elite football coaching context?

A systematic literature review was done to understand the current state of the topic. Twenty papers from selected journals were chosen according a list of keywords that is presented in chapter 3. To get most up to date knowledge, the publishing year was limited to 2015 or newer, but the results included two reviews which gave an overview for the research done before 2015. These papers were analyzed by searching for constructs that have an impact on user's intention to use the solution. The constructs were then categorized to interaction constructs, instrumental qualities, non-instrumental qualities, and usage outcomes.

In order to understand coaches' experiences on using the solutions, five theme interviews were conducted. The participants were part of a coaching

team of a club playing in national top football league, all having a different role in the coaching team. They were recruited with the help of a data application provider, Sideline Sports. The thesis is not done in collaboration with the Sideline Sports, but they did help with identifying research problem and providing contacts. Theme interviews were conducted in 3 months period in winter 2020-2021.

The scope of the thesis is limited as follows. The focus is on football coaches' perceptions on a data application, and the thesis doesn't consider design or performance of the application. The data collection subjects, in this case the athletes, are also excluded. This study is conducted in only in one country, only within football coaches and only within the users of one data application, XPS Network.

In this study the term data application and the name XPS Network mean a software that football coaches are using to measure or monitor their athletes and to analyze results. A data application is a solution that offers a way to gather data, has an ability to process the collected data and present it visually to the coaches via application interface. Data application provider here means a company that is building and providing such solution to football coaches, in this case Sideline Sports.

1.2 Current State and Contribution

As stated before, technology acceptance is well studied field, and UX a rapidly growing one. The previous studies aiming to combine these two are few but existing. Perhaps the most complete work was done by Hornbæk & Hertzum (2017), who reviewed papers written before 2015 that were combining TAM constructs and UX constructs and found 37 papers including constructs from both. This study will build on top of their work, seeing how the development has been between years 2015-2020, and will also try to understand how these constructs are perceived by conducting theme interviews instead of surveys, which most of the previous studies have done. Previous studies on technology acceptance in elite football is limited, and none were found studying elite football coaching.

Theoretically this thesis tries to narrow the gap and build a bridge between technology acceptance theories and UX theories – which both have the same underlying goal. By combining these theories, we might get a more holistic view on why technology is accepted or not accepted. The paper also provides an interesting peek to the world of elite sports and gives a view on how technology acceptance in high performance environment such as elite football coaching is developed.

In practice the results of this study might help data application providers to design the applications and services to better support the coaches. The thesis provides them a better understanding on how the coaches perceive their application, and why, and providing useful tips on which functionalities to focus. It

could be assumed that the results might be translatable to other high-performing environments such as corporate management.

1.3 Structure

The structure of this thesis is as follows. First, a brief introduction to a stage of data usage in elite football today is provided and the main theories of technology acceptance and user experience are presented. Secondly, the methodology and the results of the systematic literature review are presented. In chapter 4 the methodology of data collection is introduced, followed by the results in chapter 5 and discussion and conclusions in chapter 6, including main findings, discuss the limitations, and suggests future topics to study. Finally, the chapter 7 summarizes the thesis.

2 BACKGROUND

2.1 Data Usage in Sports

Elite athletes train hard and push their bodies continuously to achieve better and better results. But to keep performing and developing, their training load, training quality, rest time, nutrition and many other factors need to be carefully balanced. Too much training can be as harmful as too little training, as is the case with sleep, hydration, food, and all the other aspects of life. To control all these is impossible without a systematic way to measure and monitor the athletes – almost around the clock.

Team sports was late to find and utilize the benefits of data usage, probably because of the higher starting cost when compared to individual athletes. Buying for instance heart rate monitors for a team of 25 football players is more expensive than buying one for a marathonist. On the other hand, many team sports are also more complicated to measure - for a marathonist being able to track a heart rate is a useful tool when aiming to keep pace steady, whereas football players movements are more complex, and include sprints, jumps, shooting and walking. Lately, however, team sports clubs have also taken the steps to utilize data, and today every elite team start to have a person who is responsible on monitoring players training load and fatigue. Yet the mostly used methods are inexpensive or free and require minimum amount of gear, such as monitoring via questionnaires (McGuigan et al., 2020).

The training load monitoring in research is relatively young field, and most of the research done is done during 2010's and later (McGuigan et al., 2020). The research done on the data usage in sports can be divided into three categories: monitoring fatigue and fitness, injury prevention and performance analysis (McGuigan et al., 2020). All of these can be done by using multiple data collection methods.

The most common ways to collect data and measure and monitor players are physiological measurements, such as using heart rate monitors or performance and workload tests like Yoyo-test or speed test (McGuigan et al., 2020).

Psychological self-reports were second most used way to monitor, and these are most often done in a form of questionnaires (McGuigan et al., 2020). Where physiological tests give coaches good view on how an athlete's body is doing, the psychological measurements give a good understanding on how the athlete is feeling as a person, for example how much stress they experienced during a competition situation. Neither of these is working well separately, and it is recommended to have both sorts of measurements (McGuigan et al., 2020).

Most research done on this topic has been studying ways to collect data, to analyze the data, or how to act according the data. Most studies are studying the numbers, for instance the heart rate variation or the relation between training load and injuries. Athletes or coaches' experiences or perceptions on data collection are rarely studied.

2.2 Technology Acceptance

2.2.1 Technology Acceptance Model, TAM

Technology Acceptance Model (TAM) is a model developed by Davis (1985, 1989) for predicting and explaining acceptance and usage of technology. It is based on Theory of Reasoned Action (TRA), a general model explaining human behavior which is well used in social psychology (Davis, Bagozzi, & Warshaw, 1989), but tailored for IS context, and has been widely applied in later research and tested in many environments (Hornbæk & Hertzum, 2017). TAM is providing general explanation on why technologies are accepted, or not accepted, and which factors play a part in this process. It is a model that is not specified to any type of technology or user group (Davis et al., 1989).

In his model Davis (1985) focused on two theoretical constructs, which were in earlier studies (e.g. Robey, 1979; Bandura, 1982) found to be "fundamental determinants of system use" (p. 320): perceived usefulness and perceived ease of use (see fig. 1). Later he conducted another study that defined the concepts, developed a multi-item measurement scales for each of them, and tested them empirically in two different studies (Davis, 1989).

Perceived usefulness is "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989, p. 320), that is, weather the system helps the user to fulfil their tasks. Davis based the choice of this item to work of Robey (1979), who found the perceived usefulness to play an important part in accepting technology.

Perceived ease of use means "the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989, p. 320). This choice is based on Bandura's (1982) research on self-efficacy, defined as "judgments of how well one can execute courses of action required to deal with prospective situations" (p. 122) (Hornbæk & Hertzum, 2017).

According to TAM perceived usefulness and perceived ease of use together create attitude towards using the system, which in turn creates an intention to use the technology, as is illustrated in figure 1. TAM assumes that intention to use system will lead to actual use of system. The connection from behavioral intention to actual use originates from TAMs theoretical foundation, reasoned action (Ajzen and Fishbein, 1975) and planned behavior (Ajzen, 1991), which "distinguish between beliefs, attitudes, and intentions and maintain that beliefs govern attitudes and attitudes govern intentions" (Hornbæk & Hertzum, 2017, p. 33:4). According to TAM perceived usefulness also has a direct impact on behavioral intention to use, which contradicts with theory of reasoned action, but is empirically proved (Hornbæk & Hertzum, 2017; Davis et al., 1989). Perceived ease of use has also a direct impact on perceived usefulness, since a system that is easy to use is also perceived as useful (Hornbæk & Hertzum, 2017).

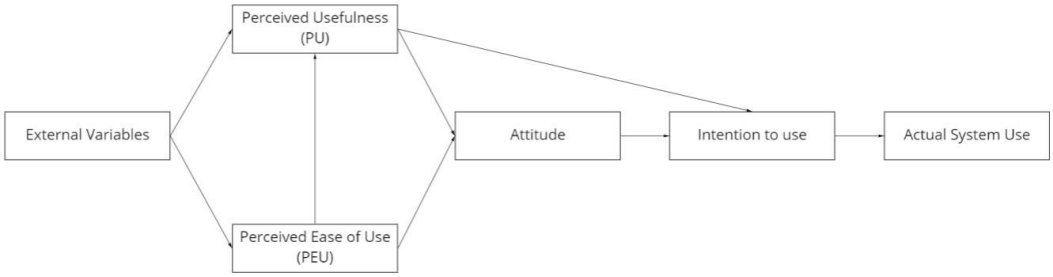

Figure 1 - Technology Acceptance Model

Perceived usefulness was found to be very significant when predicting people's intention to use technology, which has also been proved in later studies (Davis et al., 1989). Perceived ease of use was less significant, but still had impact on the intention. The impact of perceived ease of use was, however, decreasing over the time, when users' abilities to use the solution were increasing. (Davis et al., 1989.)

Many extended TAM models have been presented during the years, and perhaps the most known of the is the TAM2 model, which, in addition to PU and PEU includes subjective norm as a technology acceptance construct (Venkatesh & Davis, 2000). This was due the findings that suggested that social influence has significant impact on behavioral intention to use the solution. TAM2 suggests that subjective norm is an important antecedent to intention to use when usage of the solution is mandatory (Venkatesh & Davis, 2000). Subjective norm significantly influenced to perceived usefulness, via internalization, in which "people incorporate social influences into their own usefulness perceptions" (p. 198), and identification, in which "people use a system to gain status and influence within the work group and thereby improve their job performance" (p. 198). Over time the earlier vanished, but the later stayed. (Venkatesh & Davis, 2000.)

2.2.2 The Unified Theory of Acceptance and Use of Technology (UTAUT) & The Unified Theory of Acceptance and Use of Technology 2 (UTAUT2)

Even though TAM is widely accepted and used model, it has also received a lot critique, mainly about it being too simplified (Bagozzi, 2007). To address this issue, Venkatesh, Morris, Davis, & Davis (2003) analyzed the existing models and based on the findings, developed a new model, the Unified Theory of Acceptance and Use of Technology (UTAUT), and later UTAUT2 with additional constructs (see fig. 2).

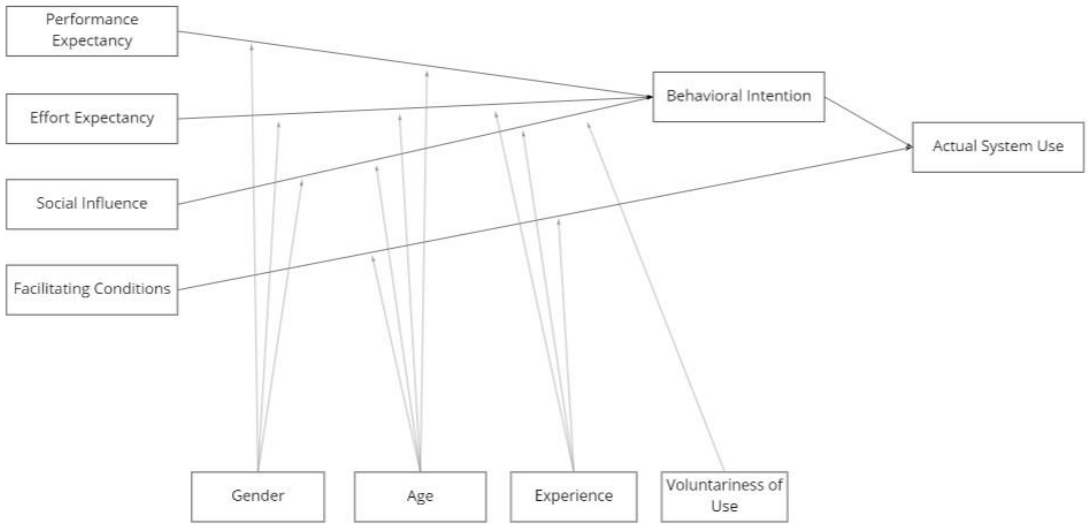

Figure 2 - UTAUT-model

UTAUT (see figure 2) suggests that direct determinants of behavioral intention (of user acceptance) are performance expectancy, effort expectancy and social influence. In addition, facilitating conditions have direct impact on actual usage of the system. (Venkatesh et al., 2003.) Performance expectancy means the degree that the user believes that the system will help them to execute a job better, whereas effort expectancy stands for how easy to use the system is expected to be. (Venkatesh et al., 2003.) Social influence is defined as "the degree to which an individual perceives that important others believe he or she should use the new system" (p. 451) and finally facilitating conditions reflects the degree to which the user thinks that both system and organization will support them when using the system (Venkatesh et al., 2003). UTAUT includes also four moderating factors: users' gender, age, experience and voluntariness. The previously mentioned constructs are all influenced by these moderators, for example increased age or experience may change the degree in which the effort expectancy is perceived. (Venkatesh et al., 2003.)

UTAUT2 model was extended from the UTAUT model to better reflect a context of consumer products, and three constructs were added: hedonic motivation, price value and habit (Venkatesh, Thong, & Xu, 2012). Hedonic motiva-

tion is defined as fun and pleasure the user feels when using the system, price value as a difference between the value the user feels they gets when using the system and the monetary cost they pays for using it, and habit as a degree of automation when performing tasks (Venkatesh et al., 2012).

2.2.3 Other Research Trends

Hornbæk and Hertzum (2017) analyzed the studies developing the original TAM further and divide these later directions into four main categories.

First, they found a category of studies investigating whether external factors influence behavior only via perceived usefulness or perceived ease of use or could there be more factors playing a part. Especially social influence, or subjective norm, has suggested to influence the intention to use since it's also included in TAM's theoretical base, the theory of reasoned action (Hornbæk & Hertzum, 2017). As a result of these studies new extended models, such as UTAUT and UTAUT2 which include subjective norm and were presented earlier, were developed to better define the adoption process.

Secondly, some researchers have been interested in investigating the relative strength of the TAM construct and their relation to each other. These, relations and strength of relations, have found to vary depending on the contexts. Findings from these studies suggest for example that cultural factors seem to play a big role in defining which constructs are significant, and that the relation between intended behavior and actual behavior might not be as straightforward as the many TAM studies assumes (Schepers and Wetzels, 2007; Hornbæk & Hertzum, 2017).

Thirdly, various studies have been interested in finding out what creates perceived usefulness or perceived ease of use, something that original TAM doesn't consider. Yousafzai et al. (2007a) reviewed these studies and listed 79 external variables that previous research has suggested as an ancestor of perceived usefulness or perceived ease of use. These factors are for example accessibility, awareness, computer anxiety, computer attitude, compatibility, end-user support, intrinsic motivation, management support, objective usability, perceived enjoyment, self-efficacy, social pressure, system quality, task characteristics, training, and voluntariness (Hornbæk & Hertzum, 2017). The results from studies are, however, mixed, and sometimes controversial.

Finally, some studies have tried to go beyond utilitarian settings the original TAM was designed to, by incorporating constructs of intrinsic motivation, such as pleasure and satisfaction. Most of the studies testing TAM are executed in work environment or among students, and the tasks done are job related, and therefore the findings might not be valid in the context of leisure use. Hornbæk & Hertzum (2017) suggest that by incorporating the constructs of intrinsic motivation, the models of technology acceptance and user experience could be linked.

2.3 User Experience

2.3.1 Concept of User Experience

User Experience (UX) is widely accepted and used concept in practice and becoming fast an integrated part of any technical system development. In theory, however, the progress hasn't been as fast. Since the beginning of millennium, the concept of UX and how pleasurable experiences are formed with technology has been of interest of researchers (e.g. Hassenzahl et al., 2010), and many models have been developed. Still, unified, commonly accepted models are missing (Hornbæk & Hertzum, 2017).

The idea of UX is not a new one, for example product design has been working with the concept a long time. In the field of Human-Computer Interaction (HCI) the concept of usability (Nielsen, 1994) was the first UX related concept, and for a long time the majority of progress both in practice and theory focused on it. The other factors of UX, for instance aesthetics of a solution, have been neglected for a long time. In the case of aesthetics, it has even sometimes been seen as a bad thing; beautiful things were seen as a way to hide bad functionality (Hassenzahl, 2004; Tractinsky et al. 2000). Today, when users are becoming more and more used to interacting with good looking systems, focusing purely on usability is not anymore enough to keep customers satisfied (Van Schaik & Ling, 2011).

The early work of UX was summarized by Hassenzahl and Tractinsky (2006) in their review, where they highlighted some fundamental research questions for UX work. Most UX models focus on experiences user has when using the product, consequences of such experiences, and connections between these (Hornbæk & Hertzum, 2017). Consequences are most often measured as usage outcomes, such as emotions, which in turn lead to product perception (Hassenzahl et al., 2010).

Even though there is not one commonly accepted model for UX, there are similarities. Many agree, for example, that user experience is "a dynamic, highly context dependent, and subjective account of human–technology interaction" (Law et al. 2009, p. 719). Some common themes can also be found from the models, which are presented next.

2.3.2 Common Themes in User Experience Models

Most UX models separate hedonic attributes and pragmatic attributes from each other (see e.g. Hornbæk & Hertzum, 2017; Hassenzahl, 2004; Van Schaik & Ling, 2008). Hedonic attributes mainly consider the users, how they relate or feel identification towards the system, or get stimulation from the system (Hassenzahl, 2004). Pragmatic attributes are related to users achieving their goals, and seeing solution as simple, practical, and predictable (Hassenzahl, 2004). Perception of the pragmatic attributes were found to change over time,

whereas perception of hedonic attributes seemed to be stable (Hassenzahl, 2004; Van Schaik & Ling, 2008; Tractinsky, Katz, & Ikar, 2000). Moreover, pragmatic attributes were found to have stronger impact on usage outcomes than hedonic ones (Hassenzahl, 2004).

The aesthetics of the user interface is another factor that UX research has been interested, and already in the beginning of millennium Tractinsky et al. (2000) showed that by manipulating aesthetics of a solution, the usability can be increased. Tractinsky et al. (2000), went as far as suggesting that "What is beautiful is usable" (p. 127), which later studies have questioned, showing that the relation between beauty and usability is more complex (Hassenzahl and Monk 2010; Hartmann, Sutcliffe, & Angeli, 2008). However, later studies have shown that aesthetics can override the bad usability, creating a halo effect (Hartmann et al., 2008). Nevertheless, aesthetics and perception of beauty play a big role in UX models (Hornbæk & Hertzum, 2017), and seems to be a significant predictor or user experience especially when usage of a system is voluntary (Hartmann et al., 2008).

Finally, emotions are an important part of UX models. Thüring & Mahlke (2007) stated that emotions, such as subjective feelings, motor expressions, and psychological reactions are important outcomes of interacting with a solution, and influence on the overall perception of the system. Moreover, Hassenzahl et al. (2010) showed that fulfilling a need with interactive product will lead to a positive effect.

2.3.3 Examples of User Experience Models

A UX model developed by Hassenzahl (2018) divides UX into two perspectives, designer's perspective and user's perspective (see figure 3). Designers perspective includes product features such as content, presentation, functionality, interaction, and intended product character, that is, how the designer wants the customer to perceive the solution. From the customers side the model includes apparent product character, which tells how the user perceives designers work, and consequences of using the solution, for example emotions and feelings. (Hassenzahl, 2018.)

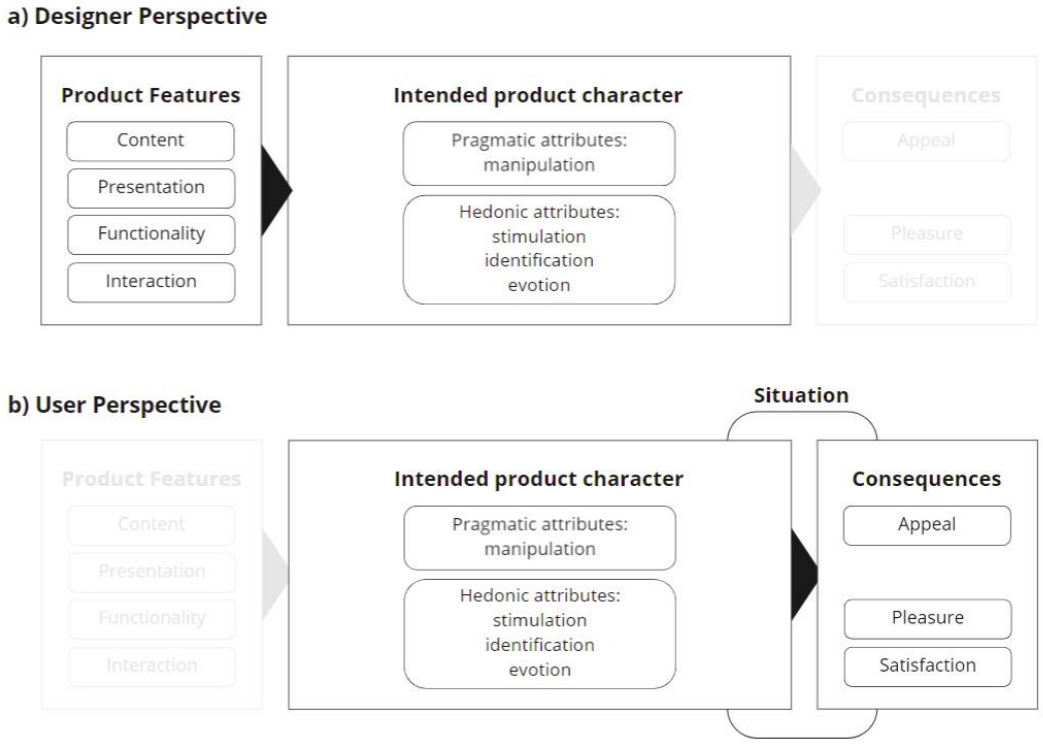

Figure 3 - UX-model by Hassenzahl

Another example of a UX model is the Components of User Experience (CUE) model by Thüring & Mahlke (2007) (see figure 4). The CUE-model divides UX components into three categories: (1) perception of instrumental qualities, (2) emotional reactions, and (3) perception of non-instrumental qualities (Thüring & Mahlke, 2007). Perception of instrumental qualities includes things like how controllable, effective, or easy to use the solution is, whereas non-instrumental qualities are for instance visual aesthetics and identification. These three together create the appraisal of the system, and for instance intention to use. (Thüring & Mahlke, 2007.)

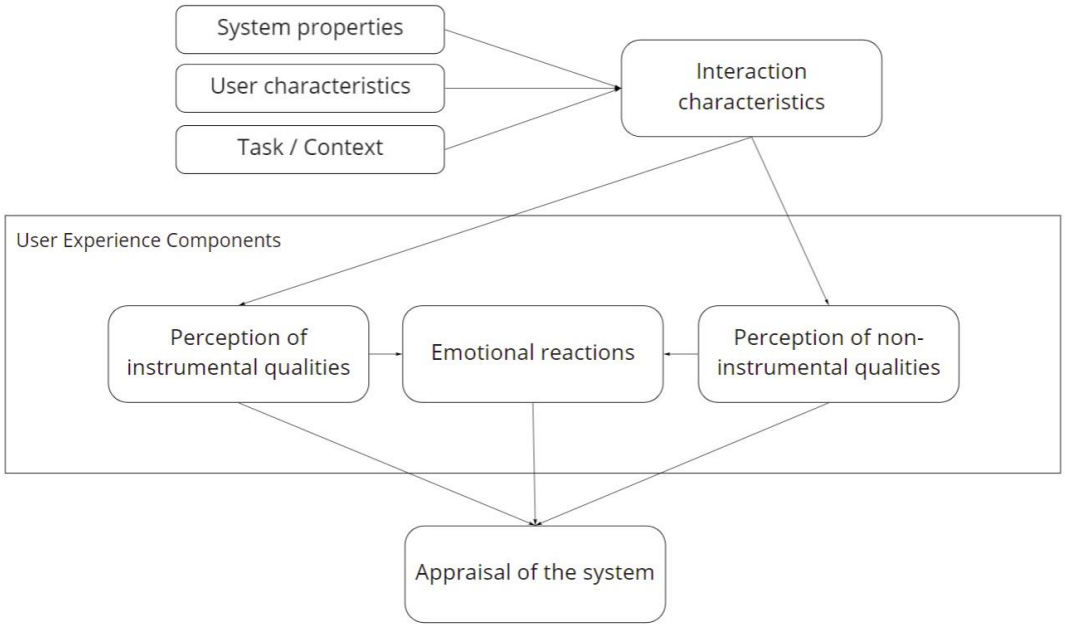

Figure 4 - CUE-model

3 OVERLAP BETWEEN TECHNOLOGY ACCEPTANCE AND UX MODELS

To get an up to date view for the overlapping constructs of technology acceptance and user experience, and the relationships between these, a systematic literature review was conducted. After selection process, which will be explained later, 20 papers were analyzed and used as a base for developing the theoretical framework, to which the findings from the empirical research later in this study are compared to.

3.1 Selection Process

The papers that were chosen for this study needed to fulfil a certain criterion. Firstly, the article needed to study relationship between one or more technology acceptance construct and one or more UX constructs. Articles that were only focusing on TAM constructs were excluded, as well as those only focusing on UX constructs. Secondly, following the example of Hornbæk & Hertzum (2017), the chosen studies needed to construct a model or to test a model because "a broader view on technology acceptance and UX would lead to very general comparisons between, for instance, the theory of planned behavior (Ajzen 1991) and need satisfaction theory (e.g., self-determination theory; Ryan and Deci 2000; Kasser 2001)" (p. 337). Thirdly, the studies needed to either test the model empirically, or review previous empirical studies.

The literature review was conducted by searching relevant papers with predefined search terms. The venues where the searches were conducted were the three big databases that a widely used in ISS: Scopus, IEEE Xplore Digital Library and ACM Digital Library. The articled needed to include at least one technology acceptance key terms; technology acceptance, unified theory of acceptance and use of technology, perceived usefulness, or perceived ease of use, and at least one of the user experience key terms, user experience, aesthetics, affect, appeal, emotion, engagement, enjoyment, flow, fun,

or hedonic. These words needed to be in title, abstract, or in a list of key words. In addition, the search was limited to years between 2015 and 2020 to get an updated view for the topic, and to papers that include words model and empirical in their abstract, title, or keywords.

In all three databases there we 209 hits, which were browsed through to sort out the promising ones. After browsing, 30 papers were selected for closer investigation. When reading trough, the papers, 10 more were excluded, because they didn't fulfil the criteria. The 20 papers chosen for the study are presented in table 1.

3.2 Results

From the 20 analyzed studies, 18 papers used Technology Acceptance model (TAM) as a base theory, which of 5 used it together with UTAUT, borrowing constructs from both, and one (Kim, 2016) extending TAM further. One paper (Tamilmani, Rana, Prakasam, & Dwivedi, 2019) focused solely on UTAUT, and one (Khakurel, Immonen, Porras, & Knutas, 2019) used WAM, an extension of UTAUT. This suggests that technology acceptance is a mature field with few strong theories and constructs, that are widely used. Two of the chosen papers were reviews of previous empirical studies, and 18 tested their model empirically themselves.

The UX theories and constructs, however, were not as unified. Most of the papers didn't mention any theory to back up their decision to include some UX related constructs. In some cases, for example with enjoyment (see for example Kumar Kakar, 2017; Bassiouni et al., Hackley, & Meshreki, 2019), this is understandable since enjoyment has been closely linked to TAM in recent studies. In other cases, however, the choices seem sometimes random. Csikszentmihalyi's Flow Experience theory was the most used UX related theory, being present in three papers (Esteban-Millat et al., 2018; Krishnan, Dhillon, & Lutteroth, 2015; Calvo-Porral, Faíña-Medín, & Nieto-Mengotti, 2017). Other theories, each mentioned once, were the Kaplan's Theory of Environmental Preferences and the Cognitive Absorption Nomological Net (Visinescu et al., 2015), the Hedonic Treadmill Theory and the Theory of Regulatory Focus (Kumar Kakar, 2017), the Social Cognitive theory (Al Kurdi, Alshurideh, Salloum, Obeidat & Al-dweeri (2020), the Stimulus-Organism Response Theory (Wakefield, 2015), and the Immersive Experience Theory (Su, 2019).

As Hornbæk & Hertzum (2017) also noted in their review, most of the studies focused on utilitarian settings, where the participants are asked to execute some practical tasks such as test an e-learning platform (Kanwal & Rehman, 2017; Al Kurdi et al., 2020), health related wearables (Khakurel et al., 2019; Kim, 2016), task related mobile applications (Kumar Kakar, 2017; Li & Luo, 2020; Krishnan et al., 2015), or an e-democracy platform (Hujran, Abu-Shanab, & Aljaafreh, 2020). Only four of the papers studied hedonic use of technology, for

Table 1 - Studies Included in the Systematic Literature Review

Technology Acceptance Constructs
User Experience Constructs

Author	Year	Constructs
Krishnan, Dhillon, & Lutteroth	2015	PEU, performance expectancy
		Hedonic motivation, perceived risk, anxiety, security
Visinescu, Sidorova, Jones & Prybutok	2015	PU, PEU, Intention
		Cognitive absorption (enjoyment, curiosity, temporal dissociation, immersion)
Wakefield	2015	PU, PEU, intention
		Positive and negative affect
Kim	2016	PEU, PU, intention, attitude
		Attractiveness, affective quality, appeal
Calvo-Porral, Faíña-Medín & Nieto-Mengotti	2017	PEU
		Satisfaction, engagement
Hornbæk & Hertzum	2017	PU, PEU, intention, attitude, usage
		For instance, PE, cognitive absorption, beauty, satisfaction flow
Kanwal & Rehman	2017	PU, PEU, attitude, intention
		Enjoyment, anxiety, subjective norm
Kumar Kakar	2017	PU
		PE, novelty, appeal, esthetics
Nawangsari, Wibowo, & Budiarto	2018	Intention
		Hedonic motivation, anxiety, value pricing, customization
Bassiouni, Hackley, & Meshreki	2019	PU, PEU, intention, attitude, usage
		Subjective norm, social interaction, enjoyment
Esteban-Millat Martínez-López, Pujol-Jover, Gázquez-Abad, & Alegret	2019	PU, PEU, intention, attitude, usage
		Flow
Khakurel, Immonen, Porras & Knutas	2019	Attitude, intention
		Aesthetics, experience
Lee, Kim, & Choi	2019	PU, PEU, attitude, intention

		Enjoyment, social interaction, strength of ties
Su	2019	PU, PEU, attitude, intention
		Fun, social presence, immersion
Tamilmani, Rana, Prakasam, & Dwivedi	2019	Intention
		Hedonic motivation, enjoyment, playfulness
Akroush, Mahadin, ElSamen & Shoter	2020	PU, PEU, attitude, intention
		Enjoyment, trust
Al Kurdi, Alshurideh, Salloum, Obeidat, & Al-dweeri	2020	PU, PEU, intention, attitude, usage
		Self-efficacy, social influence, enjoyment, interactivity, anxiety
Hujran, Abu-Shanab, & Aljaafreh	2020	PEU, intention, subjective norm
		Enjoyment, behavioral control
Li & Luo	2020	PU, PEU, playfulness, interactivity, subjective norm
		Satisfaction
Turja, Aaltonen, Taipale, & Oksanen	2020	PEU, PU, intention, attitude, actual use
		Trust, enjoyment, social influence (Adaptivity, anxiety, social presence, perceived sociality)

instance in context of video games (Bassiouni et al., 2019), livestream shopping (Su, 2019), and VR devices (Lee, Kim, & Choi, 2019). This might be due to history and the rapid development of technology use in hedonic settings; even though in practice technology is part of the everyday life of users, science hasn't kept up with development.

Out of the 20 papers, e-learning (e.g. Al Kurdi et al., 2020), shopping (Vicunescu, 2015), and personal tasks (Kumar Kakar, 2017) were the most used contexts, each used in three studies. Wearables (Khakurel et al., 2019) gaming (Lee et al. 2019) and healthcare (Krishnan et al., 2015) were all present in two papers, and governmental tech (Hujran et al., 2020) had one hit. One paper didn't state what kind of technology they used in their test, only that the tested solution was "digital technology". It is, however, important to note in most of the cases the chosen field of technology was not the main point of the study but chosen as a representant of technology. For example, Kumar Kakar (2017) studied how enjoyment and usefulness impact on acceptance over time, and the measurement subject that was representing any technology was a personal task tool. On the contrary, some studies had a special focus on the study subject; Turja, Aaltonen, Taipale, & Oksanen (2020) studied the acceptance of robots in health care, and Hujran et al. (2020) acceptance of e-democracy. The previous ones were studying technology acceptance in boarder view whereas the later

were focusing on acceptance of a specific technology. In addition, two studies focused on user interface characterizes and their relation to acceptance (Visinescu et al., 2015; Kim, 2016).

Geographically most of the studies were conducted in Asia (7), followed by Europe (5), and Middle East and North America (3 each). Approximately half of the studies was using university students as study subjects (9), and the other half boarder public (8). One study (Khakurel et al., 2019) included both, students and university employees.

3.3 Constructs

The constructs found from the 20 studies were divided into three categories: product characteristics, interaction characteristics, and usage outcomes. Moreover, product characteristics were divided into two subcategories, instrumental qualities, and non-instrumental qualities. Constructs related to system characteristics or user characteristics were out of the scope of this thesis and are therefore not presented.

3.3.1 Instrumental Qualities

Instrumental quality constructs found in the systematic literature review are presented in table 2. The basic constructs of TAM were present in almost all the analyzed papers, which supports the findings from Hornbæk & Hertzum (2017) that technology acceptance constructs are well adapted in research. Either Perceived Ease of Use (PEU) (e.g. Calvo-Porral et al., 2017; Akroush et al., 2020) or Effort Expectancy (Khakurel et al., 2019; Tamilmani et al., 2019) were present in all 20 studies, and Perceived usefulness (PU) (e.g. Calvo-Porral et al., 2017; Akroush et al., 2020) or performance expectancy (Khakurel et al., 2019; Tamilmani et al., 2019; Krishnan et al., 2015) were mentioned in 17 studies. In addition, Hujran et al. (2020) had developed the concept of PU further to fit e-governance and called it Perceived Public Value. Only Nawangsari, Wibowo, & Budiarto (2017) and Bassiouni et al. (2019) didn't mention a variation of PU. Attitude was part of 13 studies, in which some presented attitude as an integral part of TAM (e.g. Esteban-Millat et al., 2018; Kanwal & Rehman, 2017) and other mention it being a construct of technology acceptance but had decided to leave it out of their model (e.g. Wakefield, 2015; Li & Luo, 2020). The rest didn't discuss the role of attitude at all, which Hornbæk & Hertzum (2017) also had noticed and criticized**.** Intention to use was included in 18 studies, only Li & Luo (2020) and Calvo-Porral et al., (2017) left it out, whereas whether intention and other factors led to an actual usage was only included in 7 studies. This is in line with previous literature review of the topic, where PU, PEU and intention are the most used constructs, followed by attitude, and actual usage often neglected (Hornbæk & Hertzum, 2017).

Table 2 - Instrumental Qualities

Construct	N
Perceived ease of use	18
Perceived usefulness	14
Effort expectancy	2
Behavioral control	2
Performance expectancy	2
Perceived public value	1
Convenience	1

In addition to traditional technology acceptance constructs, some other instrumental qualities were included in the studies. Perceived convenience, defined as availability, accessibility, and agility of a product, were suggested to operate as a mediator between PEU and perceived enjoyment (Bassiouni et al., 2019). A key part of theory of planned behavior, behavioral control, which "characterizes the difficulty faced in performing a certain behavior depending on the situation and past experiences" (Hujran et al., 2020, p. 530) was found to have a direct effect on intention to use (Hujran et al., 2020; Hornbæk & Hertzum, 2017).

3.3.2 Non-instrumental Qualities

Constructs categorized as non-instrumental qualities, mostly consisting of hedonic attributes, were far less unified as the instrumental qualities, and also present in only few studies. The constructs found are presented in table 3. In the CUE model the constructs of hedonic attributes were the two dimensions of hedonic quality; identification, defined as user's social image, and stimulation, defined as arousal and novelty of the solution (Hassenzahl, 2018; Hornbæk & Hertzum, 2017). Out of the studies included in his thesis, only Hornbæk & Hertzum (2017) mentioned these two. However, the concept of image as a source of identification was discussed by Bassiouni et al. (2019), image being way users want others to see them, and therefore make actions or decisions based on subjective norm to achieve this image. Mentions of similar constructs, such as ideal self or social image we found in other studies as well (e.g. Kim, 2016). Kumar Kakar (2017) on the other hand discussed a concept of hedonic value, similar to hedonic quality, which in turn has novelty and unexpectedness as ancestors.

Table 3 - Non-instrumental Qualities

Construct	**N**
Risk	3
Playfulness	2
Aesthetics	2
Value pricing	2
Novelty	1
Unexpectedness	1
Attractiveness	1
Hedonic value	1
Adaptivity	1
Beauty	1
Goodness	1
Hedonic qualification, identification	1

Aesthetics was present in two articles (Kumar Kakar, 2017; Khakurel et al., 2019), beauty in two (Hornbæk & Hertzum, 2017, Kim), and attractiveness in one (Kim, 2016). When considering the claims that UX studies did in field's early days, for example that what is beautiful is useful (Tractinsky et al. 2000) there has been surprisingly few mentions about the construct of beauty. Previously beauty and aesthetics were seen important only in the context of hedonic use, but lately it's been noted that they have an impact also in utilitarian context (Hornbæk & Hertzum, 2017). All three articles support this suggestion, all studying the impact of aesthetics has to the intention to use in the context of utilitarian consumer product. It is also important to note that the context of use in these three studies is different than what Tractinsky et al. (2000) studied when doing their big claim. In their work the beautifulness was a way to make the use enjoyable and easy, whereas in these studies, beauty is a way to show one's style and to build identity (Kim, 2016). Interestingly, Khakurel et al. (2019) found that even if aesthetics played a big role when predicting intention to use smart wearables, the effect vanished when the main function of the product was counted as medical. This finding suggest that the pragmatic values can overrule the hedonic ones if the motivation is high enough.

Surprisingly goodness, which earlier was found to be one of the most used UX related constructs (Hornbæk & Hertzum, 2017), was not mentioned in any other papers. Other non-instrumental qualities mentioned were interestingness (Su, 2019) and playfulness as an antecedent and stickiness as an outcome of satisfaction (Li & Luo, 2020).

Risk was present in studies as a privacy concern (Khakurel et al., 2019), privacy and security risk (Krishnan et al., 2015) and as a perceived risk (Akroush et al., 2020). Risk was defined as potential loss the user might face when using the system (Akroush et al., 2020). It was found to have negative impact on PU (Akroush et al., 2020) and attitude (Akroush et al., 2020; Khakurel et al., 2019), intention (Khakurel et al., 2019). However, Krishnan et al. (2015) found that risk doesn't have a correlation with intention to use.

3.3.3 Interaction Characteristics

From the constructs that were identified, six were related to interaction or sociality of the system. These are presented in table 4. Subjective norm, which is also included in some technology acceptance models, was included in four studies, and often presented as a part of technology acceptance (e.g. Li & Luo, 2020; Hujran et al., 2020). Social influence, which is a construct that is very similar or even used as a synonym to subjective norm, existed in three studies (e.g. Al Kurdi et al., 2020, Turja et al., 2020).

Table 4 - Interaction Characteristics

Construct	N
Interactivity	6
Subjective norm	4
Social influence	3
Social presence	2
Social interaction	1
Strength of ties	1

The importance of social interaction, interactivity and social presence were especially important in hedonic usage, such as gaming (Bassiouni et al., 2019), or in pragmatic use when the system was unconventional, such as robots (Turja et al., 2020). Interaction is according the papers influencing on enjoyment (Lee et al. 2019), satisfaction (Li & Luo, 2020), and fun (Su, 2019).

3.3.4 Usage Outcomes

Constructs classified as usage outcomes are presented in table 5. Out of usage outcomes, two almost identical concepts were repeated in many papers: intrinsic motivation and hedonic motivation. Intrinsic motivation, which is related to "perceptions of pleasure and satisfaction from performing a behavior" (Hornbæk & Hertzum, 2017, p. 335), was mentioned to include constructs such as perceived enjoyment (Kumar Kakar, 2017; Wakefield, 2015), cognitive absorption (Visinescu et al., 2015), flow (Esteban-Millat et al., 2018), anxiety, and emotion (Wakefield, 2015). Intrinsic motivation is often mentioned together with extrinsic motivation, which refers to perceived usefulness (e.g. Kumar Kakar, 2017). Hedonic motivation, which also is included in UTAUT2, in turn is explained as fun or pleasure received when using the technology. Hedonic motivation, like was the case with intrinsic motivation is also often paired with extrinsic motivation. (Tamilmani et al., 2019.)

Enjoyment or perceived enjoyment is a construct that sometimes is counted as part of TAM next to PU and PEU (e.g. Bassiouni et al., 2019, Kumar Kakar, 2017). It was the most often used non-pragmatic construct found, used in 15 papers, defined as "the extent to which the activity of using the computer is

perceived to be enjoyable in its own right, apart from any performance consequences that may be anticipated" (Davis et al. 1992, p. 1113), and is described to bringing hedonic aspects to the TAM (Hornbæk & Hertzum, 2017). The findings of the relations between enjoyment and other constructs are somewhat contradictory; it is for instance find to be an antecedent of PEU (Bassiouni et al., 2019) but also a consequence of it (e.g. Visinescu et al., 2015; Sidorova; Al Kurdi et al., 2020, Kanwal & Rehman, 2017). Enjoyment was also included in many other concepts, such as hedonic motivation (e.g. Kim, 2016; Krishnan et al., 2015), intrinsic motivation (Kumar Kakar, 2017; Wakefield, 2015), and cognitive absorption (Visinescu et al., 2015; Esteban-Millat et al., 2018).

Fun is a similar construct to enjoyment, and often used as an explanation to enjoyment (Kumar Kakar, 2017) together with pleasure (Hujran et al., 2020). It is also linked to the concept if hedonic motivation, and even said to be equal to hedonic motivation (Tamilmani et al., 2019; Krishnan et al., 2015). According the studies constructs creating fun are social presence, PU and PEU, and fun in turn influences on PU and attitude (Su, 2019).

Satisfaction was surprisingly found only in few studies. As an own construct it was identified only by Li & Luo (2020) and Calvo-Porral et al., (2017), who found it to influenced by playfulness, interactivity PU (Li & Luo, 2020) and PEU (Li & Luo, 2020; Calvo-Porral et al., 2017), and to lead to stickiness (Li & Luo, 2020), engagement and loyalty (Calvo-Porral et al., 2017). In addition, satisfaction was mentioned for example as a part of enjoyment (e.g. Hornbæk & Hertzum, 2017).

Table 5 - Usage Outcomes

Constructs	**N**
Enjoyment	15
Intrinsic motivation	7
Anxiety	6
Fun	5
Pleasure	4
Hedonic motivation	4
Satisfaction	3
Loyalty	2
Engagement	2
Immersion	2
Cognitive absorption	2
Curiosity	1
Flow	1
Emotion	1
Involvement	1
Emotional absorption	1
Anger	1
Positive feelings	1
Negative feelings	1

Most of the papers study positive emotions and feelings, such as those mention above. Negative feelings are rarer, which Hornbæk & Hertzum (2017) also noted. Wakefield, 2015 studied both positive and negative feelings and their relations to PU, PEU and Intention and found that positive feeling arouse from PU and negative feelings both from PEU and PU. He also found both to be significant to forming intention to use (Wakefield, 2015). Anxiety was present in six studies, either as a general anxiety (Nawangsari et al., 2017; Wakefield, 2015; Krishnan et al., 2015), computer anxiety (Hornbæk & Hertzum, 2017; Al Kurdi et al., 2020, Kanwal & Rehman, 2017), and having a relation to PU (Al Kurdi et al., 2020) and to attitude (Nawangsari et al., 2017), whereas not being significant in predicting PEU (Kanwal & Rehman, 2017). In addition to these, the only negative feeling found from the included papers was anger (Hornbæk & Hertzum, 2017).

Based on Csikszentmihalyi's (1975) flow theory, Esteban-Millat et al. (2018) integrated flow to their version of TAM, suggesting that it is an antecedent of PU, PEU, and actual use. Flow refers to a situation where the user feels in control of their interaction, loose sense of time and self-awareness. Moreover, flow is identified to be a factor for intrinsic motivation. (Esteban-Millat et al., 2018.) Temporal dissociation, similar term to flow and defined as "the inability to register the passage of time while engaged in interaction" (p. 4) was used by Visinescu et al. (2015). Based on the same Csikszentmihalyi's (1975) work, immersion or immersive experience were presented as part of cognitive absorption and as constructs influencing to PU, PEU (Visinescu et al., 2015), attitude (Visinescu et al., 2015; Su, 2019), and to social presence (Su, 2019). Immersion means a state of total engagement and concentration, where other factors than immersive experience itself, are ignored (Visinescu et al., 2015).

Finally, value pricing, which refers to the difference between the value the users feels they are receiving and the actual monetary cost (Venkatesh et al., 2012), was suggested to influence on intention to use (Nawangsari et al., 2017; Hornbæk & Hertzum, 2017). Value pricing is also a construct that was added when developing UTAUT2 (Venkatesh et al., 2012).

3.4 Results of the Literature Review

The findings from the literature view shows that technology acceptance constructs such as those presented in TAM or UTAUT are widely adopted and used, whereas UX related constructs are not. However, UX constructs such as enjoyment or hedonic qualities were claimed to be the biggest indicators of intention to use (Lee et al. 2019) or even that these UX related constructs may overrule basic TAM constructs (Kim, 2016). UX construct seem to be an important predictor of technology acceptance.

Based on these findings and the UX models presented earlier, the technology acceptance model was modified by adding interaction characteristics, non-instrumental qualities, and usage outcomes into TAM. The division follows the

CUE-model presented earlier, where interaction was seen as ancestor to user experience components, which were instrumental qualities, non-instrumental qualities and emotions. By comparing the CUE-model constructs, TAM constructs and the constructs found during the systematic literature review, the Combined TAM and UX model was developed. The model is presented in figure 5, and motivation to include these themes follows.

Various interaction characteristics, such as subjective norm and interactivity, were present in many studies and seemed to be an important part of both technology acceptance studies as well as UX studies. Therefore, following the CUE-model, interaction characteristics were given a separate block in the model, even if one of the constructs, subjective norm, sometimes is counted to include in TAM. Following the example of UX models, interaction characteristics are suggested to influence the instrumental and non-instrumental qualities. Also, the findings from the literature review support this, since interactivity was found to have in impact on instrumental qualities PU and PEU (Al Kurdi et al., 2020).

Instrumental qualities in CUE-model and the traditional TAM were presenting the same constructs, and therefore the choice to include it in the model was made. Instrumental qualities were found to be ancestors of usage outcomes such as having fun (Su, 2019), and to have direct impact on attitude, following the example of TAM.

The non-instrumental qualities were, likewise, present in CUE-model, and constructs such as price value were also present in UTAUT2 model. In addition, constructs such as beauty and aesthetics have been of interest to many researchers (see e.g. Tractinsky et al. 2000) and thus the non-instrumental qualities were included in the new model. The non-instrumental qualities in turn seem to have an impact on instrumental qualities, based on UTAUT2 model and findings suggesting that for instance risk is influencing PU (Akroush et al., 2020). The non-instrumental qualities seemed to also have direct impact on attitude (Akroush et al., 2020).

Finally, usage outcomes were included in the model, again following the example of CUE-model, where emotions were part of the user experience components. Emotions were expanded to usage outcomes, following the suggestions that intrinsic motivation could work as a link between technology acceptance models and UX models (Hornbæk & Hertzum, 2017). Because intrinsic motivation was during the literature review found to be built via enjoyment, cognitive absorption, flow, anxiety, and emotions, but also to be ancestor of them, the block was chosen to be called usage outcomes and expanded to include other constructs that seemed to be result of interactivity, instrumental qualities or non-instrumental qualities, such as immersion.

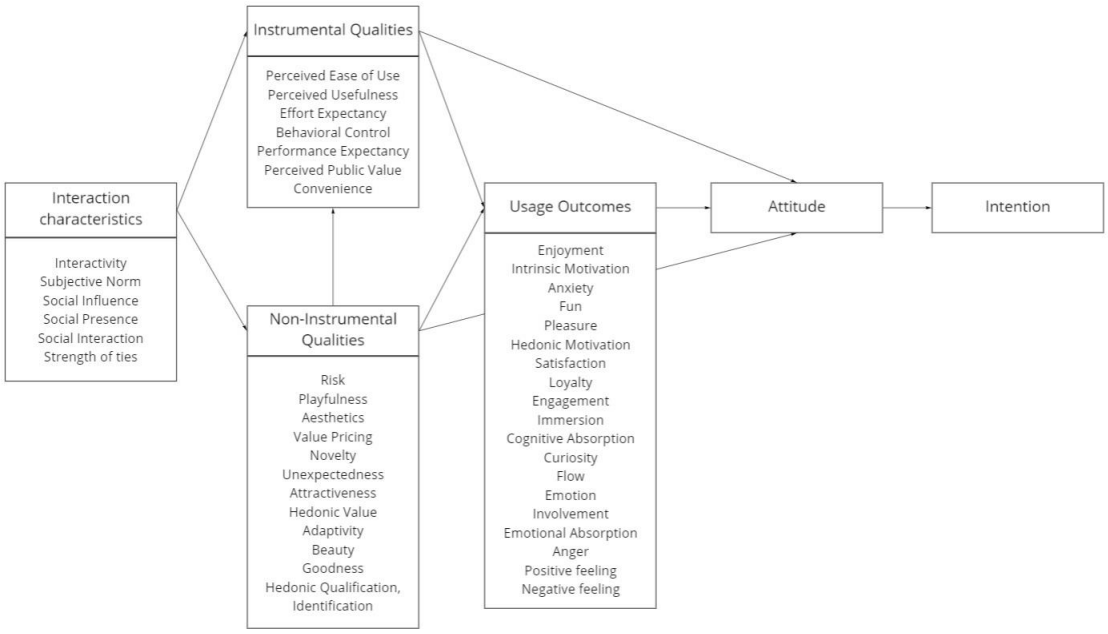

Figure 5 - Combined TAM and UX model with constructs

4 Methodology

This chapter presents the methodology of empirical data collection and data analysis, introduces the case, and discusses methodological limitations. The empirical study was conducted in order to answer the first and third research questions, "What factors influence to adoption on a data application in elite football coaching?" and "How are technology adoption and user experience formed and related in elite football coaching context?". The methodology of systematic literature review was presented earlier in this paper.

4.1 Research Approach and Strategy

This qualitative study explores how adoption of data applications is formed in a specific context. Qualitative research approach was chosen due to the nature of the study problem, the need of understanding the adoption and usage of the data application in elite football coaching. In order to understand different point of views regarding the topic and to find underlying reasons behind actions, qualitative approach was best suited.

Research strategy for this thesis was to conduct a single case study, which enables to explore the topic and dynamics in this specific context (e.g. Baxter & Jack, 2008; Eisenhardt, 1989). The technology that is of interest in this study is used to support decision making and thus usage and context cannot be separated. Therefore, the decision to conduct a case study was made, allowing to "examine a contemporary phenomenon in its real-life context, especially when the boundaries between phenomenon and context are not clearly evident" (Yin, 1981). Also, the nature of football coaching supports the choice of the approach. Coaching is teamwork where the coaching team members divide the tasks and for example fitness coach and head coach use the tool differently. Therefore, including one coaching team from one club instead of one coach from many clubs gives more holistic view on data application usage, and provides a view that is "not explored through one lens, but rather a variety of lenses which al-

lows for multiple facets of the phenomenon to be revealed and understood" (Baxter & Jack, 2008).

4.2 Description of the Case

4.2.1 Case Application

The data application that the coaching team included in the case is using is called XPS Network from a company named Sideline Sports. XPS Network is a solution that provides coaches support in tracking and analyzing their players, organizing and planning their work and communicating with their players and other coaches. The solution has support for 9 sports including basketball, field hockey, floorball, handball, ice hockey, rugby, football, tennis, and volleyball. The solution is in use in 15 countries and in many levels, from school teams to national teams.

Coaches using the XPS Network can access the solution via mobile application or desktop application. The desktop version offers more functionalities such as video analysis and more detailed view on players status, whereas the mobile application provides fast views on the calendar, messages, material bank, and simplified version of player data. An example of a view that coaches can see in the mobile application is found in figure 6, and an example of desktop view in figure 7. The coaches can send out notifications to the players for example if training time is updated or set reoccurring notifications for them to remind about monitoring. The XPS Network also works as a "bank" for the coaching team, where all the information is collected, stored, and shared within the team. The materials stored in the XPS Network can also be shared to other XPS Network users if the coach wishes so.

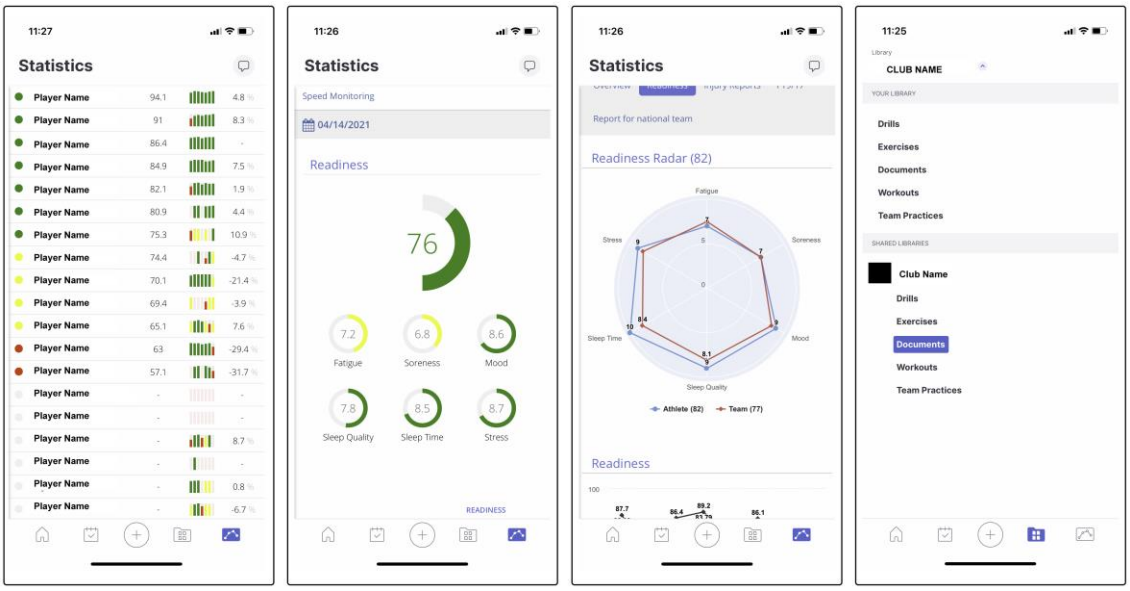

Figure 6 - XPS Network, Coach View, Mobile

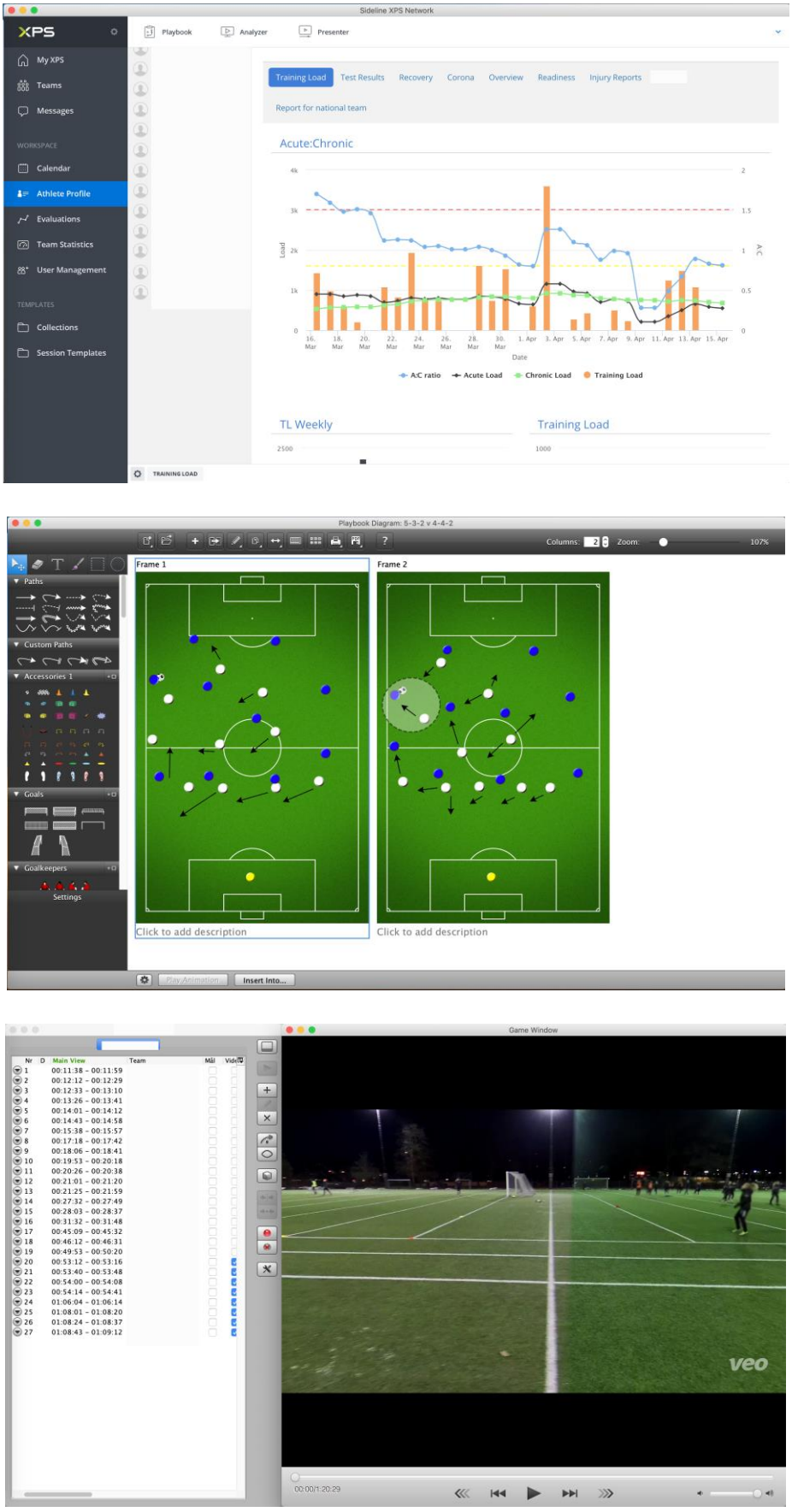

Figure 7 - XPS Network Coach View, Desktop

The players only have a mobile application, where they fill in their monitoring every day, answering questions such as amount and quality of sleep, mental and physical feeling, and status of injuries. The coaches can define what questions the players receive, and can even have multiple questionnaires, for example post-game questionnaires or Covid-19 monitoring. The results of the daily monitoring form a readiness score that the coaches see in their view. In addition, the players have access to calendar, messages, and to materials such as training plans or videos, that the coaches have shared with them. An example of monitoring in the players view can be seen in figure 8.

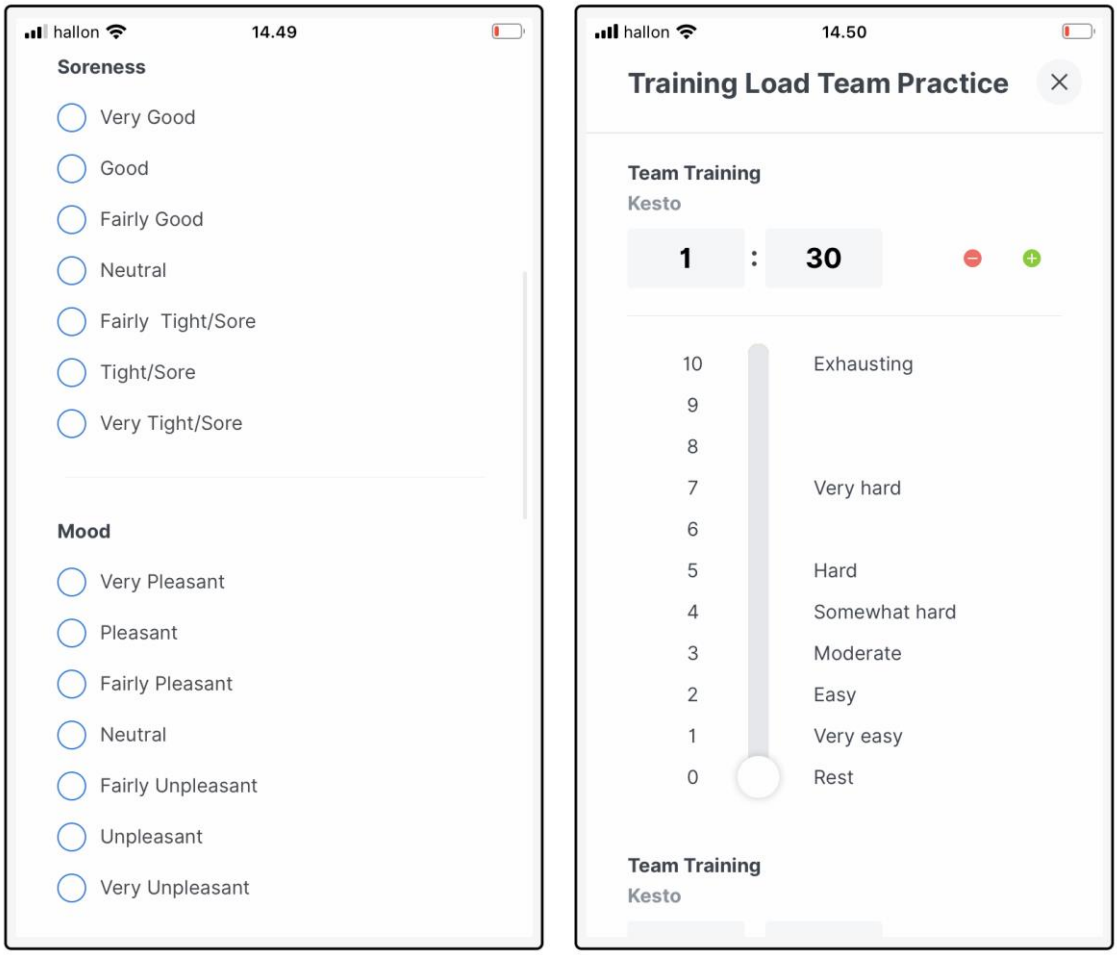

Figure 8 - XPS Network Player View

4.2.2 Case Context

The case context in this study was a professional football club playing in the highest national league and competing in international competitions. This specific club was chosen because it is a professional club with professional coaching team, using XPS Network to help coaching, and was accessible and willing to participate to the study.

From the club, the whole A-team coaching team was interviewed, including the head coach, two assistant coaches and two fitness coaches. All of the participants use the XPS Network regularly, some weekly and some daily. Out of the interviewees five were female and one was male, four of them had master's degree and four had a UEFA A or UEFA Pro coach license. Moreover, the participants were citizens of three different countries. The participants are presented in table 6 and furthered in this paper the interviewees are referred by using their title, such as Head Coach or Assistant Coach 1.

When doing a case study, the aim is to include all viewpoints within the case. In this case, however, the decision to exclude players from the case was done, even though they use the XPS Network as well. This was done due two factors: firstly, this study focuses on factors influencing in technology adoption in football coaching, e.g. how the coaches, not players, adopt the technology. Secondly, the players use the XPS Network mainly to fill in their current status and to communicate with the coaches, whereas coaches use it as a supporting tool for their coaching.

Table 6 - Participants

Title	**Gender**	**Years coaching**	**Years using XPS**	**Education**	**Coaching License**
Head Coach	Female	28	9	-	UEFA PRO
Assistant Coach 1	Female	12	2	Master's degree	UEFA A
Assistant Coach 2	Male	20	9	Master's degree	UEFA A UEFA Youth Elite
Fitness Coach 1	Female	2	2	Master's degree	-
Fitness Coach 2	Female	7	7	Master's degree	UEFA A

4.3 Data Collection and Analysis

Data collection was done by using theme interviews, where five themes were discussed with each interviewee. Theme interviews were chosen because they allow the interviewee to "to develop their special point of view in detail" (Schorn, 2000, p. 2). The focus in theme interviews was in how the individual has experienced the theme, and what they felt was important to discuss (Schorn, 2000). The themes used in this study were background, start of usage of data application, impact of using data application, continued use of data application and finally, other topics that the interviewee wanted to discuss. The structure of interviews is presented in Appendix 1 – Theme Interview Structure.

During the December 2020 to January 2021 five interviews were done. Three out of five interviews were hold online due the Covid-19 situation, and two in face-to-face meetings. In each interview the interviewees were informed that the interview will be recorded but not used to anything else than for this study, and they were also told that their data will used anonymously. When

using theme interviews, open conversation is important (Schorn, 2000). To ensure that the interviewees could focus on the topics and conversation, and not worry about language, they were allowed to choose the language the interview would be conducted. The interviews were hold in Finnish, Swedish, and English.

After interviews each interview record was fully and carefully transcribed. After all the interviews where in written form, they were carefully read through multiple times. The data was then compared to the constructs found when doing the systematic literature review, trying to find if the same constructs were present in empirical data, and to identify additional constructs. The constructs presented in chapter 3 operated therefore as categories for data analysis, which were written into an excel sheet. Quotes from each interview that were discussing the category were pasted below the category headline. This follows a one suggested way of analysing qualitative data (Eisenhardt, 1989). When the division was done, the quotes under each category were carefully read through, and their importance was evaluated, for example by counting that in how many interviews the topic was present and how big role the topic had in the interviews. The final categories chosen to include into this study are presented in chapter 5.

4.4 Methodological limitations

As it is case with interviews, even in this case it is possible that the interviewee has unintentionally influenced the answers, which is a common thread in interviews (Gubrium & Holstein, 2001). Also, the nature of theme interviews and semi-structured structure allowed the discussion in the interviews flow, which possible let some topics being discussed in more detail than others.

Single case study naturally offers only a limited view on the topic and doesn't consider differences between clubs and coaching teams. The case study also focuses on understanding the phenomenon in a specific time as well as context, and therefore the results might not be applicable in another context or another time.

5 Findings

In this chapter the findings from the five theme interviews are presented. The structure of the chapter is formed according the themes found during the interviews and data analysis, starting from the "start of use" to provide reader background information on the topic, and followed by bigger themes and smaller constructs belonging to the themes.

5.1 Start of Use

The theme "start of use" provides background information on how and why the XPS Network was chosen, how it is used and also covers education of using the application, since it is loosely linked to the start of usage.

5.1.1 Choosing XPS Network

For most participants, the choice of an application to use was not their own. Three participants had been first introduced to the XPS Network via school or a job that had already used the application, and they had had no saying if they want to use it or not. When changing the job, they were expected to learn to use the solution the club was already using.

> I was kind of forced to learn to use it to be able to work in the same environment with the other coaches. (Assistant Coach 1)

The two other coaches had had a change to choose the application they wanted to use, but because a lack or financial resources, their choices were limited. At the end, they made the decision based on price. One coach had even been part of developing the XPS Network, and then implemented it when it was ready. All in all, the choice of a data application didn't seem to be well-thought or given a lot of consideration, but more taken as granted.

5.1.2 Usage of the XPS Network

How and how much the interviewed coaches were using the XPS Network varied in some extent. Half of the coaches told they were using the application weekly, and half daily or even multiple times a day. For some of the interviewees the application was their main channel to do their job, whereas others perceived it as supporting tool.

The most used tools in the XPS Network were monitoring and game analysis. Monitoring consist of questionaries send to players daily (in the morning and after training/game), to which the players answer in the app installed to their phones. The XPS Network then turns these answers into readiness scores, that coaches can see in the application and thus follow the players training load. Game analysis tool is a part of the XPS Network where game or training videos can be analyzed, cut, and shared. With the tool the coaches can for example count the number of successful/unsuccessful passes, shots on target or see the areas where the ball was lost most often. In addition to these, the application was used to gather test data, which was imported manually, to plan and communicate trainings, to communicate with other coaches in and outside of the club, to communicate with players, and to build own personal exercise bank.

The coaches stated that their usage of the application had been changing over the time. Three of the coaches had been using the same application for over six years, and two for 2 years. All of them said that their usage of the XPS Network has increased over the time, when they have learned to use the application better and explored new functionalities.

5.1.3 Education

The amount of education the coaches received when starting to use the XPS Network varied a lot. Some younger coaches had been using the tool already during their university studies or when completing their coach diplomas for European Football Association UEFA. Majority had been receiving a short education when starting to use the XPS Network provided by the Sideline Sports, the service provider, but some of the coaches didn't perceive it being very useful. Half of the coaches had been educated by their colleagues or even previous employees who were more experienced with using the application.

> There was one education but it was more intended to those who had used it [XPS Network] for over 10 years so it was a bit too advanced for me to understand […] They just gave me the credentials and told me to learn by myself. (Assistant Coach 1)

In addition, most of the coaches mentioned that they did their own research and watched tutorials when learning to use new functionalities in the tool. Some praised the videos made by the service provider whereas others felt

that they were the last place to look information, because watching a video took time. The support provided by these videos seemed, however, to be important.

> I might just hear somewhere that this can be done and then for example with YouTube videos I was trying to learn where to click that something happens. (Assistant Coach 1)

> There was no YouTube-tutorials then, like they have now […] It's so easy to learn new skills these days!" (Head Coach 1)

Again, coaches that hadn't been using the solution for longer than three years wished for better education to help them getting started with the tool and felt that they are still struggling with it. The more experiences users were satisfied with the education they've had and expressed no need to improve education.

5.2 Interaction

Interaction enabled by the application was a big part of discussions in every interview, though the nature of the interaction varied. Common themes under the interaction category were interaction between coaches and players, interaction within the coaching team and club and finally, interaction within the community of other football coaches.

In the beginning of the usage the interaction between players and coaches and within the coaching team were the most used functionalities in the XPS Network. Over the time other ways of utilizing the application arouse, but **the importance of interaction via the application remained and even increased**. When coaches implemented new functionalities such as game analysis, it most often included some new way of interaction, for instance sharing game analysis.

5.2.1 Interaction Towards Players

The interaction between coaches and players enabled and supported by the XPS Network was expressed to be a very good thing. This interaction was happening both directly via the XPS Network in form of messages, questionnaires and sharing files, and via other channels, triggered by data gathered via the tool. This could be for example a phone call or face to face discussion before trainings because the readiness score of the player was low.

Two of the coaches lifted that communication trough the XPS Network complimented their work on the field well. They expressed that giving time to every player in the field every day was impossible, and therefore using the application allowed them to have discussions with all players, even those who might get less attention during the trainings.

> As a head coach I pay more attention to the whole team in the trainings and don't have time to talk to every player, but then I can kind of spend time with those players in the XPS […] I hope that the player then feels that they have been seen. (Head Coach 1)

> […] the communication is better, we can see and know more because when you have almost 40 players, it's impossible to manage their load in 1on1 conversations throughout the week. (Assistance Coach 2)

All of the coaches put a lot of weight on the face to face discussions that the XPS Network enabled. When spotting in the application that something seemed not to be right, all the coaches told that they wanted to have a chat with the player to understand the reasons behind the numbers. Sometimes the numbers could even be misleading and without a discussion, wrong decisions can be made. Especially when measuring the players mood, the coaches felt that discussion based on data is essential.

> I call them or text them to get verbal confirmation about how they feel, cause sometimes numbers don't say too much. Let's say that they are very good according to all measurements except the stress, the stress is like one, then their score could be too low, because it's calculated by computer. They could look very bad on paper, but actually they are fit to train, they are just stressed because they have a test tomorrow. Then they can train. (Fitness Coach 1)

> If it feels like it's something bigger and more sensitive that I need to react to, then I go to talk to the person in the trainings face to face. (Head Coach 1)

5.2.2 Interaction Between Coaches Within the Team

Another beneficial interaction that the XPS Network enabled was between the coaches in the coaching team and in the club. Two interviewees highlighted that having one system used by all the coaches in the club was one of the greatest benefits, which helped the communication inside of the club, but also collaboration and changing roles inside the club.

> Definitely, when the whole club uses it [XPS Network], that makes the communication and working very handy, because no matter in which team you are in or who you talk to, you have the one place to share info and one way to do things. (Assistant Coach 1)

Majority of the coaches also found it good that the coaches were able to see each other's work in the application. Within the coaching team the tasks and roles were clearly divided either by task or changing them after a certain period of time, but everyone had always access to all the information. This had for example allowed the coaches work remotely when needed.

> We upload the training videos right after trainings and then [the name of the Assistant Coach 2] will sit in another country and will go through the training and moni-

> toring and everything, and then we have a meeting in the evening and [the name of the Assistant Coach 2] starts asking questions about the trainings and players. (Head Coach 1)

Sharing information via the XPS Network was suggested to help to the youth coaches to improve their work, since they have access to data, references, and inspiration from older teams. This also eases the coaches transitions between the age groups and building the club culture, when coaches are aware of each other's work. Interestingly, this was seen as a benefit by all the coaches who were in some way involved in the youth coaching, whereas those who only work with the A-team did not mention it.

5.2.3 Community

Third aspect of interaction mentioned by various interviewees was the community that the XPS Network enabled. The coaches saw being able to share their work with other coaches outside of their own club as a valuable functionality. This helped them to build network, help each other, and to get inspiration from others. When discussing about the community it was also clear that having control over sharing was important, the coaches wanted to be able to decide what to share and with whom.

> […] you can share them [your work] with other coaches which is really cool, you can connect to a coach. Then I can see the other coaches' templates and the coach can see my templates. So, it's also like a community. If you are willing to share what you are doing, then you can see what other people are doing. I think that's cool. (Fitness Coach 1)

> You can just "open" your work to others in the system, and they can follow what I… and I can choose what I want them to see. That's a very good functionality. (Head Coach 1)

Sharing data to people outside of the organization was at the same time a functionality that many wished to be improved. Sharing inside of the tool seemed to work okay, even if it required a lot of time, but sharing to persons who were not users of the tool was impossible via the application. In some instances, not all the players had access to the application, and sharing information with them required exporting and emailing, which the coaches were not happy with.

5.3 Ease of Use

All the participants said that starting to use the XPS Network was rather difficult and time consuming. One interviewee explained that all the time went to trying to get the most urgent things like updating the calendar done, and

there was no time left for more complex things. However, even though all participants felt that application was difficult and time consuming to use in the beginning, they all also continued by explaining that learning new things takes always time for them.

> I knew there were other functionalities but back then in the beginning I had no chance to utilize them. (Assistant Coach 1)

> When it [XPS Network] was ready, I didn't want to use it. It was so complex. (Head Coach 1)

The ones that had been using the XPS Network for a longer time seemed to be more positive about how easy the application was to use in the beginning of use. Similarly, the coaches that had used the application less than three years were more critical towards its easiness of use, whereas those who had used it longer perceived it easier.

> Even if I'm not super technical, it [XPS Network] was easy to learn. It's simple and there's tutorials for everything. (Assistant Coach 2)

> In many ways pretty clumsy and slow. From the moment I have the video to the moment when I've sent it to the players is super complicated and requires many steps. (Head coach 1)

The discussions about how the participants felt the usage of the XPS Network today were often controversial. On the other hand, the application was perceived as easier way to do things than previously, but in the next sentence the same interviewee might tell that the application was hard to use, like the citations below form one coach show:

> It's easy for me to program with the computer and just send them the programs in their phone so that's easy instead of doing it through excel or something like this. (Fitness Coach 1)

> It's complicated. It's a lot of things to learn when it comes to the system. (Fitness Coach 1)

The system was told to be clumsy and slow, and some of the coaches felt that they were doing extra job and loading of information took for a long time. Others had payed attention to the slowness as well, and it was mention in all except one interview. Slowness seemed to be a result of both functions being complicated and required many steps to be executed, and the program loading data from the database. Many participants wished that in the future the tool would be simpler and easier to use and to operate faster.

5.3.1 Adaptation

A functionality of the XPS Network that was praised by the participants was the adaptability of it. Though adapting for example, the data collection to the team's needs was said to take time, it was also seen as a good way of making the data more readable by eliminating all extra info. Coaches appreciated being able to bend the application to their needs and ways of working, rather than vice versa.

> Like with XPS there's a way that you can kind of decide that what you want to use. So, you as a coach using a solution can decide what information you want to have and what you want to see. (Fitness Coach 2)

The adaptation was also wished to be improved. Two of the participants lifted up a need to improve running multiple functions at the same time, which would provide them with more information about what impacts to what, rather than only showing numbers.

> For example, that you could see data, like if the player has a GPS during the game, I could see the GPS-data at the same time when I'm seeing the video. These are the things that the system must be able to handle. (Assistant Coach 1)

5.3.2 Visual Support

Two of the coaches interviewed mentioned that the XPS Network gives them a quick and good overlook for how the players are feeling. The application presents the players readiness score in a dashboard and marks players with low score with red and the players with good score with green. This helps the coaches to quickly check if there's issues with players and focus their actions on those players that are low on their score. Some other parts of the tool were criticized being clumsy and ugly, and for example lacking colors.

> It's easy to spot the red player, and then I just click on the red player, and then you can see a diagram on exactly why they are red. Like maybe they slept only five hours and they are stressed because of that. (Fitness Coach 1)

5.4 Usefulness

All the participants expressed that the XPS Network helps them with their work, either by making their work more efficient and freeing time to something else, or by improving the performance of the team by providing data on what works and what not, or preventing injuries. Many of the interviewees stated that they would not want to coach without the application anymore.

> With the system, we are able to prevent injuries, and to interfere before it goes too far with the athletes. We get numbers before something happens, so we are able to pull them out before something happens. I think that's the best thing about the system, because obviously I'm responsible to keeping them healthy. (Fitness Coach 1)

5.4.1 Improving Performance

The most discussed benefit of using the XPS Network was improving the performance of the team. This included for example preventing injuries by monitoring the players readiness score, adjusting the trainings to players readiness, spotting gaps in players qualities, and following the teams' mental stage and spirit.

> It's a really helpful tool, it really helps to show what's good and what's bad physically. (Fitness Coach 1)

> It helps a lot in a way that we can make the exercises more individual and therefore improve the players more optimal way, and at the same time to develop the game in a more optimal way when we know what we do now and why some things are not working. (Head Coach 1)

Improving the performance also included knowing what worked previously. When everything is recorded, coaches were able to go back in time to see that what was done during a good period, and what changed when things were not going as well. **This made their action more repeatable and decreased the amount of guessing and coincidence.**

> Like if we have a good flow in the games and then it starts to go less good, I can go back and see what changed. And do again what work previously. Before I was just guessing. (Assistant Coach 2)

> I feel that when you use a data application, the meaning of coincidence is smaller, which means that when you find good thing or bad things, you can either re-do them or avoid them. (Assistant Coach 1)

5.4.2 Confirmation

Another topic that the interviewees mentioned often was getting confirmation on their actions, which helped them to know what worked and what not, and therefore being able to repeat the good actions. One coach also told that seeing the data helps her to make changes and to communicate to the rest of the coaching team that they are needed, which helped to get the changes done.

> I now know if we are going further or not. Before it was just about gut-feeling. (Assistant Coach 1)

> It really helps to identify weaknesses and strengths of the team. (Assistant Coach 2)

> I can see if they are undertrained or overtrained. (Fitness Coach 1)

The head coach also talked a long about getting confirmation with her assistant coaches and evaluating their actions. She explained that coaches in the team have different ways of doing their job, which sometimes caused conflicts. By having the system and seeing the results from there helped her to see which conflicts needed action because the results were not as hoped.

> If the results are as good or better as last year, I know that the way of working is just different but still working. If the results are worse, then I know that something is wrong and I have a proof, which helps me to have the discussion. (Head Coach 1)

5.4.3 Progress

Having a data system was by few of the interviewees mentioned to be the requirement for moving forward as a coach and as a team. They told that without data and a tool to analyze them, a coach can't develop and can't repeat the actions that worked.

> Like I think if you have a good squad and you can be a good coach without the data, but you are not going… I think you are going to stay at that level. If you have the data with you, you can adjust and improve. (Fitness Coach 1)

> It helped me to be better. (Assistant Coach 2)

Also, the progress of the whole field of sport coaching was seen to be very dependent on data and data applications. In general, the interviewees felt that data have become more and more important lately, and that importance of data increase when skills to use data in sports coaching increase.

> I was starting to study five years ago, and then we were like… not popular, like we were just annoying the head coaches. We were like the number people that no-one wanted to listen to. But now like every head coach in the higher leagues need someone that is a number person. That's cool to see. (Fitness Coach 1)

> The meaning of the data will increase. One big reason is that the coaching teams needs to get more people you understand data --- and therefore also we get both gear to collect data and understanding that what to do with that data. (Head Coach 1)

5.4.4 Working More Efficiently

How the XPS Network impacted their everyday life varied a lot from coach to coach. Some said that the application made their work faster and allow them to focus on the things that matter, while some coaches felt that using the application made them work more, because the tool gave them much more opportunities. They told that they were now doing tasks that didn't exist before the XPS Network, and even though the tool helped them to save time

somewhere, the additional tasks made it to take more of their time. One interviewee also told that previously there had been things that she had just left undone because she didn't have the right tools.

> I'm just lucky that my team uses the application, so the computer calculates everything for me. (Fitness Coach 1)

> It was just so hard to do, that I just didn't do it. (Head Coach 2)

5.4.5 Honesty

Often mentioned outcome of using the XPS Network was that the coaches got more honest feedback from the players, both regards the trainings and their well-being. A few interviewees discussed that **it might be because just pressing a button in your phone is so easy and that the players don't think about it that much, and therefore the input is more honest.**

> They are very honest when they are putting in the scale. But they are less honest on the field so if you just ask them verbal, they will always just tell me 'yeah I feel great' or 'I wanna train'. (Fitness Coach 1)

One coach also named that having the readiness score from the players in the tool helped the coaches to make more educated decisions together. He told that coaches can accidently pressure the player to train or vice versa, players push the coaches to let them train but when the data shows that the player is not fit to train, the coaching team can together make a decision based on facts.

> When having one on one discussion, the player is quite easy to accidently talk over their feeling. (Assistant Coach 2)

5.4.6 Integration

Integration with other systems was a functionality that three of the participants told to be missing. They told that having possibilities to integrate both data from different systems and data from other organizations would benefit them in their work. Two of them wished that for instance game statistics could be imported to the system and then compared to for intake to the video analysis. The third highlighted that players that were part of multiple training environments, for instance training in school and club, were filling two separate monitoring that were not linked to each other, even when done in one system.

> One additional challenge is that some of the players are training in school in mornings, and I don't have access to their data from there and I can't for example see how their load is. (Assistant Coach 1)

5.5 Emotions

During the interviews only few emotional topics were mentioned. Most popular was the notion that using the XPS Network made the coaches more confident in their work, followed by frustration and fear. On the other hand, the fitness coaches told that "it's an extension of myself and my job" (Fitness Coach 2) and "I love it" (Fitness Coach 1).

Many of the interviewees told that using the system gave them confirmation that they are doing the right things. By receiving the feedback from the players and data showing how hard the training had been enabled the coaches to reflect if the outcome had been what was intended, and therefore to improve and be more confident as a coach.

> Above all in general, it helps me to reflect if we have succeeded getting the goals that we had, mostly by providing physical measurements and showing if the training was as hard as I intended. (Assistant coach 1)

> I'm maybe more… confident on making a decision on how we are going to train today. Like I look at the players and I think okay they are fresh today… Like if I give them a hard session, I feel okay doing it. Cause I know how they feel. (Fitness Coach 1)

The feeling of frustration was another emotion that was mentioned during the interviews. Frustration seemed mostly to be linked to the XPS Network itself being frustrating to use because it was slow and not logical. Another cause of frustration was slowness of the learning process, where few interviewees described that they were frustrated with themselves, not being able to learn faster.

> It's very frustrating to use it because it's different language and logic and learning to do stuff is so slow. (Head Coach 1)

> Everything was so slow when you don't know what you are doing. (Assistant Coach 2)

5.6 Challenges

The interviewees also pointed out some challenges when using the XPS Network. These were the challenge of motivating the players and changing their own habits.

5.6.1 Motivating Players

To receive full benefits from using the system requires that players are using it as well, because big part of data comes from daily monitoring which they are themselves filling in. **Motivating the players to do this was the most often mentioned challenge that the coaches faced in their everyday work.** Getting the players to do monitoring required that the coaches remind them continuously, check the monitoring every day to follow up any issues and to give feedback, both written in the system and face to face. The coaches told that players easily stop answering if they had a feeling that they answer were not read, which in turn could lead the coach as well losing their motivation.

> Like if players know that I'm not checking it every day, they get unmotivated to answer. And last year it kind of went that way. Like they just stopped answering the questions, I stopped asking them to do it. (Fitness Coach 1)

Another coach expressed her challenge arising from the previous coach's work and the need of being consistent with demanding the players to fill the monitoring. During the earlier years the players had gotten away with not filling in the monitoring, and the coach felt that changing that culture and behavior was hard.

> It's about the culture, if during the previous seasons it hasn't been required to fill it [the monitoring], it is really hard to teach players that it's important and that why it is used. So yeah, it's a struggle. (Assistant Coach 1)

To tackle this challenge the coaches didn't have clear strategies, more than reminding the players constantly and following up any exceptions. They also expressed that **it was important to try to make the players understand why monitoring was done and to what it was used for.**

> Yeah, you need to be ready to argue to the players that why we collect the data so that they would be at all interested in filling it. (Head Coach 1)

5.6.2 Building a Habit

In addition to motivating the players to use the XPS Network, changing their own habits was mentioned to be a big challenge as well. One reason for this was the effort needed learning to use the application, but also modifying the daily schedules and prioritizing tasks that didn't previously exist. Even though the application was perceived to be adaptable, coaches still felt that they needed to adjust their work and routines, which didn't happen easily.

> You need to get into this routine of using it, and then you need to make like a method of how you want to use it. (Fitness Coach 1)

> One big challenge was that when you start using the tool in a different way, how do you build your own routines. (Head Coach 1)

> It's difficult to change your work methods. I refused to use the system for years, even if it was free for me to use. (Head Coach 2)

5.7 Risks

All the participants pointed out that using the XPS Network will also have risks, such as trusting the data blindly, over-monitoring the players and becoming too dependent on the technical tools.

5.7.1 Trusting Data Blindly

A common risk mentioned by the interviewees was only focusing on data and forgetting to talk to the player, which can lead to wrong conclusions and bad decisions. One interview also pointed out that the readiness score that the tool provides them is only an average and doesn't tell what really is wrong. If forgetting to find out reasons behind numbers, the conclusions can be wrong.

> The tool can also interfere, if you are not careful with also taking verbal status, because if you only look numbers, it can be misleading. (Fitness Coach 1)

One coach went as far as expressing that she is afraid that coaches start to focus too much on numbers. She also told that she thinks that **football as a game will lose its creativity and that teams will no longer have the right chemistry, if all the decisions are based on data only.**

> My fear is that data will become too lined, the we become too lazy in our own thinking in how we coach and how we just rely on the data too much. (Assistant Coach 2)

Another point regarding the readiness score was that it only highlights the players that are not fit but pays no intention to those who seem to be never tired. This also led the interviewee to worry that what else she might have missed because of how the tool presents the data.

> […] if someone is always feeling perfect, like is that person pushing itself enough in training sessions? Like is that also normal to always feel good?" […] does that mean that he's never pushing herself or does that just mean that our training session is not developing her, or is she lying? (Fitness Coach 1)

5.7.2 Technical and Privacy Risks

Two interviewees mentioned that being so dependent on the tool was a risk for them. They said that all of the information and data was stored in the XPS

Network, and in addition it was their main channel to communicate with the players. In case of the tool not working or lack of internet connection, all this information would not be accessible, and working would be difficult.

> If it doesn't work, you are screwed. (Assistant Coach 2)

Another risk that was discussed by one interviewee was privacy. The coach was not concerned about the personal health data of their players that was collected in the XSP Network, but rather team tactics that the videos and training plans contain. The coach was especially worried since she had just lately realized that the old players and coaches still had access to the system even if they were no longer part of the club, and could potentially now work for a competing club, seeing all their tactics. She didn't know if the solution had a way to erase old users.

5.7.3 Ethics of Monitoring

The coaches who were also operating with the youth players seemed to be more concerned about how constant monitoring and measuring impacts players. The amount of monitoring is increasing rapidly, and when younger and younger players are included in monitoring, also the question of ethics in these kinds of cases needs to be addressed. On the other hand, another coach was worried about not collecting the data but sharing it with the players, which could potentially lead the players focus shifting from football to the data.

> If we can for example monitor the players around the clock, are they then working all the time and we can follow where they are and what they do, how does that impact in their development and how will they experience it? (Head Coach 1)

> I don't know how good it is for the player to see all their data, it can be stressful to see if you are not for example sleeping enough or if you didn't give good passes in the game. (Assistant Coach 2)

6 DISCUSSION AND CONCLUSIONS

The aim of this study was to provide with better understanding on how technology acceptance is formed in the context of elite football, among the coaches. To do this, a systematic literature review was conducted, and five theme interviews were done. In this chapter the findings of the empirical study are discussed and compared to the results from the literature review, and conclusions and answers to the research questions are presented. Finally, the implications for both science and practice are discussed, followed by limitations of the study, and future research topics suggestions.

6.1 Comparing Data and Literature

The empirical data was compared to the results gained from systematic literature review and to the Combined TAM and UX model presented in chapter 3. The constructs found from the empirical data are presented next, themed following the Combined TAM and UX model.

6.1.1 Interaction Characteristics

According the results of this study, it seems that in a context of football coaching, interaction has a role in coach's intention to use a data application. From the interaction constructs found from literature, subjective norm, social influence and social interaction were found also from the empirical data. Social presence and strength of ties were not present.

Subjective norm and social influence seemed to be strong factors of intended use. Even if the usage of the tool was mandatory and coaches could not decide not to use the tool, they felt that they needed to use it more or in a certain way to keep up with the other coaches. The results suggest that subjective norm would be influencing intention to use directly, by creating pressure for the individual to use the system. This would be in line with the previous re-

search (e.g. Li & Luo, 2020; Hujran et al., 2020), but the scope of this study is not big enough to determine the connection. Unlike in the previous research, connection between subjective norm and instrumental qualities of the system were not found in this study.

Social interaction, likewise, seemed to have a connection to the intention to use via both instrumental qualities and non-instrumental qualities, as the previous research also suggests (e.g. Al Kurdi et al., 2020, Turja et al., 2020). In case of the instrumental qualities, the clearest connection seemed to be between social interaction and perceived usefulness. The application was perceived to add communication between coaches and players and improve this interaction by making it more efficient and honest. Interaction between other coaches within and outside of the organization on the other hand enabled coaches to develop themselves, and when other coaches were using the system, it became more useful for the individual as well because they could follow what others did, and have possibly access to their data and learn.

Social interaction was also mentioned in connection to a non-instrumental quality, risk. The tool enabled more social interaction between the players and coaches, which the coaches saw can lead to forgetting the physical interaction with the player as well as to feeding too much information to the player.

6.1.2 Instrumental Qualities

From the instrumental qualities perceived ease of use and perceived usefulness were strongly present even in this study, which supports the previous studies (e.g. Davis, 1985; Robey, 1979; Bandura, 1982) suggesting that they are strong factors influencing the intention to use.

PEU was mainly presented as a theme and not evaluated further, and the coaches were either very happy with it or very unhappy with it. Happiness came from visual support that the tool provided and simple functionalities, whereas unhappiness was result of the tool being slow and complex functionalities. The PEU seemed also to loose it's significance over time, the coaches who were new to use the application were criticizing it more and found it difficult to use, whereas coaches who had used the application longer remembered that it had been challenging, but now the usage was easy. This supports Davis et al. (1989) findings that PEU's significance decreases over time and could also explain why functionalities of the system were perceived as simple by some and as complex by others.

PU in turn seemed to be the strongest indicator of intention to use in this context, which also supports the previous findings (e.g. Davis et al., 1989). The coaches were seeing the benefits of using the tool to be very important for the results of the team and their own development, and even told that they could not progress without the tool. PU also seemed to have an influence on the coach's confidence, which in literature review were mentioned as an outcome of using the system.

Effort expectancy, behavioral control, performance expectancy, perceived public value and convenience were not present in the study, yet effort expectancy and performance expectancy are similar to PEU and PU.

6.1.3 Non-instrumental Qualities

Out of the 12 non-instrumental qualities found in literature review, only two were found from the empirical data. However, this is not so surprising since these constructs were not present in many previous studies either, risk (n=3) being the most often used. In the interviews the non-instrumental constructs that were presented were risk and adaptivity.

Out of these two, risk was most often mentioned. Participants discussed many different risks when using the system, the most often mentioned being related to their work; forgetting to have physical discussions with the players, trusting the numbers blindly or dismissing the team dynamics. Surprisingly the risks related to the system itself, which have been strongly present in previous studies (e.g. Khakurel et al., 2019, Akroush et al., 2020) were secondary, only system breaking down was discussed by more than one interviewee, and for example privacy risk or leaking information were only mentioned briefly and were only focused on other teams getting competitive advantage, and not at all concerning for example players personal data. This might be because the coaches don't have enough understanding on these risks since none of them had any technical education.

Adaptivity was another non-instrumental quality that was found during this study. The coaches liked how they were able to modify their views and functionalities in the system, which made the tool clearer to use and provided the information that was relevant. Therefore, it could be assumed, that adaptivity is influencing the instrumental qualities, PU and PEU, end therefore also that non-instrumental qualities influence instrumental qualities, as was also suggested in the results of the literature review (Turja et al., 2020).

The rest of the constructs found in literature review, playfulness, aesthetics, value pricing, novelty, unexpectedness, attractiveness, hedonic value, beauty, goodness, and hedonic qualification: identification, were not found in the empirical study. Most of these constructs are related to how the application looks (such as attractiveness, beauty) which have previously found not to be significant to the intention of use when the usage is not voluntary (e.g. Hornbæk & Hertzum, 2017). Since the coaches could not have much saying in what system they'd like to use, the usage of the XPS Network could be counted as mandatory and thus the lack of the aesthetic constructs in the findings seems to be in line with the previous work.

6.1.4 Usage Outcomes

The usage outcomes that were found in the literature review and presented in the table 5 were not in big scale present in the empirical data. Outcomes like

enjoyment, anxiety, fun, or pleasure that were often mentioned in previous research (e.g. Bassiouni et al., 2019; Kumar Kakar, 2017; Wakefield, 2015) did not come up in this study. However, outcomes like self-confidence and emotions like love, fear and frustrations were mentioned. Also, the challenge of motivating the players was widely mentioned within the participants.

The tools impact on coach's self-confidence seemed to be high; they were evaluating their work according the data received from the tool and reflected on the results, which lead them getting confirmation for their work and thus increased confidence. Surprisingly confidence was not mentioned in previous studies, which might suggest that it is factor affecting the intention to use data applications, not technology in general.

Positive emotions like love and in more general, positive feelings were mostly connected to the PU of the system, coaches seemed to like they was the application changed the outcome of their work and how it made their work more efficient. Frustration then again was often mentioned together with PEU, when problems and slowness with using the tool were frustrating the coach. These results are in line with what Wakefield (2015) presented.

Finally, intrinsic motivation was a construct that was not directly mentioned, but which from the answers seemed to be lacking. The coaches expressed a challenge of motivation the players to use the tool, which also led the tool not been as useful. Their actions to solve the challenge were to remind the players and to communicate the usefulness of the tool better, i.e. creating extrinsic motivation. It might be interesting to explore if aiming to build intrinsic motivation instead, better results could be achieved, as Hornbæk & Hertzum (2017) suggested.

6.1.5 Other Findings

In addition to the finding that support the Combined TAM and UX Model, there were two other interesting findings from the empirical study. These are the importance of education and difficultness of changing habit.

Challenge of learning to use the application and lack of proper education were present in the empirical data. This seemed to be a hinder when adopting the data application, when coaches felt that learning took time and no support was available. This finding would suggest that facilitating conditions that are included in the UTAUT model (Venkatesh et al., 2003) indeed have an impact on adoption.

Another interesting notion was the multiple mentions of challenges regarding changing habits and building routines when using the data application. This might be seen as a challenge linked to attitude, which was present in the literature review but not in the empirical data, or as a separate construct. In either way, finding more about building a habit when starting to use new technology might be interesting.

6.2 Answering to the Research Questions

Next, the final conclusions are presented and the answers for the three research questions are provided. The research questions of the study were:

> Q1: What factors influence to adoption on a data application in elite football coaching?
> Q2: What does previous research say about adoption and user experience of technology?
> Q3: How are technology adoption and user experience formed and related in elite football coaching context?

In order to answer the first research question, the second and third question are answered first, since they form the answer for the first question. When conducting the systematic literature review, six sets of constructs were identified: interaction characteristics, instrumental qualities, non-instrumental qualities, usage outcomes, and attitude. From these findings the Combined TAM and UX Model was drawn, which is presented in more detail in chapter 3. To summarize and to answer the research question 2, the literature review suggests that in addition to widely studied TAM constructs, there are other factors that influence in intention to use of technology. These additional constructs are interaction constructs such as social interaction and subjective norm, non-instrumental qualities such as risk and adaptivity, and finally outcomes such as emotions. These and their identified connection according the literature are presented in figure 5.

To answer the third research question, the empirical data seems to confirm that interaction characteristics, instrumental qualities, non-instrumental qualities, and usage outcomes indeed influence that adoption, though from the non-instrumental qualities and usage outcomes only a few constructs seem to be relevant in this context. From the previous one only risk and adaptivity were present in the empirical data, and from the later one self-confidence, positive and negative emotions, and intrinsic motivation. In addition, proper education and supporting material seemed to play a part when building intention to use, especially support to motivate players and building coaches own routines. It could be assumed, that the lack of them might hinder adoption.

The findings from the literature review were then compared to the results of the empirical study and to the Combined TAM and UX Model. The data suggests that interaction characteristics indeed are remarkable when building the intention to use, and thus supporting the Combined TAM and UX model. Similarly, the instrumental qualities, especially PEU and PU seemed to be important determinators of intention to use, supporting both the combined model and previous research. Some, but not many of the constructs found and listed under non-instrumental qualities were also found relevant during the empirical research, and therefore it seems that some non-instrumental qualities are indeed influencing the intention to use, but according this study, not all of the listed.

Out of the usage outcomes in the combined model, self-confidence, emotions, both positive and negative, and in some extend also intrinsic motivation were present, confirming the findings from the literature review and the combined model. Attitude, which was included in the combined model was not found from the empirical data and therefore it can't be confirmed. Finally, an answer to the first question is that factors influencing to adoption of data application in elite football seem to be systems interaction constructs and instrumental qualities, and in some extend non-instrumental qualities and usage outcomes. The Combined TAM and UX Model with the confirmed constructs found during the empirical study are presented in figure 10.

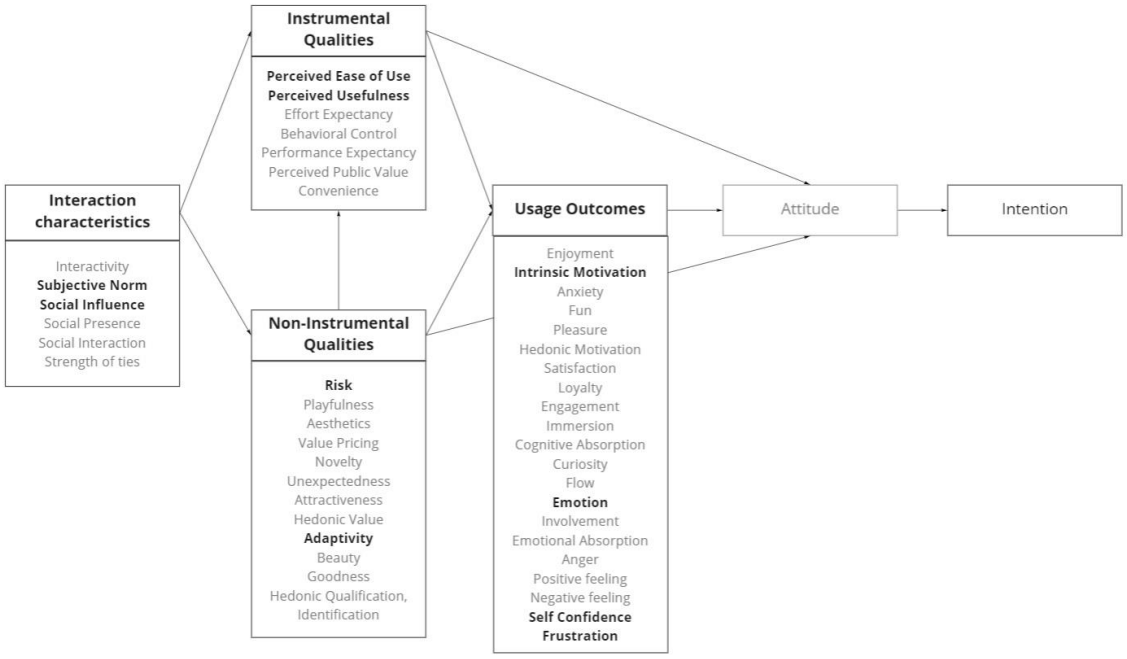

Figure 9 - Combined TAM and UX model with confirmed constructs

6.3 Contribution

This thesis contributes to the science by narrowing the gap between technology acceptance theories and UX theories, identifying constructs that that technology acceptance models lack and thus enabling more holistic view for a topic of technology acceptance. It is possible that by adding UX related constructs to the technology acceptation models, a greater understanding of how the acceptation id formed, is received. This paper also updates the literature review that Hornbæk & Hertzum (2017) previously conducted, covering the later years 2015-2020. Also, thesis provides an interesting viewpoint to the

world of elite football world and the technology acceptance in such high-performance, traditionally not technical industry.

For practice, this study provides the industry of sports data applications with some valuable insights on how and why, coaches use their offering, or why not. The results of the study for example highlight the importance of interaction possibilities in the application, and a need to develop ways to build intrinsic motivation among the users of the application. Interesting finding that this thesis could provide for industry is for instance that the coaches have experienced that the interaction between players and coaches is more honest when it is mediated by a data application. Also, the results of the study indicate that in football coaching context adoption of data application could be improved by helping the coaches to motivate the players to use the solution, either by educating them more or designing motivational functionalities. Similarly, it could be beneficial to investigate how the coaches could be supported in changing their behavior and routines when starting to use the solution. Finally, an interesting notion for the industry could be that the coaches highlighted a fear that the data will "take over" and the game loses its creativity. Supporting them to find the balance and to understand that in which extent the data is useful tool in making decisions, and when to consider other aspects as well. By considering these findings, service providers could improve their application and develop solutions that the coaches would find worth of using, thus improving their business as well.

6.4 Limitations

The results of this study need to be considered taking into account few limitations. Due to the scope of master's thesis, the sample of this study is limited to only one coaching team, and therefore the results are not directly generalizable. Also, the sample included four female and one male participant, which unlike almost all previous studies done about football coaching, made females the majority. This might have impacted the results and might make the results also harder to compare with previous studies. The study was conducted in one country only, and the results might not be translatable to other countries, even if the sample was international.

Interview languages could have also impacted on results. To make the interview as easy as possible for the interviews and allow them to focus on the topic and not the language, the interviewees were allowed to choose the language of the interview, being Finnish, English or Swedish. Even though the themes and supporting questions were translated carefully beforehand, multilanguage data created challenges when finding themes. For some words used in interviews there were no straight translations, and it is possible that some meanings changed when translating.

Finally, the study was conducted in winter 2020-2021 when Covid-19 pandemic was bad, and recommendations and limitations were affecting to the

everyday life. This influenced also the football world, forcing them to find other ways to communicate when social interactions were limited. This might have been impacting how the coaches perceived the importance of the tool, since at that time they were probably using it more than pre-pandemic. Therefore, it can be that the results are not valid in post-pandemic time.

6.5 Future Research

For both, science and practice it would be interesting to explore further if the results of this thesis are applicable to other contexts, and if they still seem to be valid when taking a bigger sample. Therefore, interesting research topics for the future could be testing the Combined TAM and UX Model with bigger sample within data applications in sports coaching, and if results would confirm the model, expand the studies to cover other contexts. Furthermore, it would also be interesting to understand better the connection between various constructs influencing the intention to use, which this thesis only draws very light conclusions. Future research in this topic is needed to identify and validate the connections. Finally, the additional findings from this study open up interesting doors: the challenge of building a habit and routines could be an interesting topic to research more, since it could potentially give a lot of additional information on why technologies are or are not adopted.

7 SUMMARY

This study was interested to understand how technology acceptance is formed in elite football coaching, and what constructs have an impact on adoption. Three research questions guiding the research were "What factors influence to adoption on a data application in elite football coaching?", "What does previous research say about adoption and user experience of technology?", and finally, "How are technology adoption and user experience formed and related in elite football coaching context?". The study consisted of a systematic literature review and a case study.

Technology acceptance models such as TAM and UTAUT have established their place as important theories predicting intention to use a technology. However, they are also criticized being too simplistic, and some later studies have suggested that enjoyment could potentially be even more important construct predicting adoption then traditional TAM constructs (see e.g. Akroush, Mahadin, ElSamen, & Shoter, 2020; Bassiouni, Hackley & Meshreki, 2019). A relatively new research field focusing on user experience could provide interesting support of the technology acceptance models, since the UX studies focus on understanding how the user experiences the usage and how it is formed. Therefore, this study focused on finding links between traditional technology acceptance models and user experience models.

In the systematic literature review focus was on papers that had empirically tested a model that included at least one technology acceptance construct and at least one user experience construct or was a literature review of such papers. 20 papers were identified and analyzed, comparing the constructs and models. Based on findings form the literature review, the Combined TAM and UX model was developed, including the five sets of constructs that were found during the literature review. These were interaction constructs, instrumental qualities, non-instrumental qualities, usage outcomes, and attitude.

In a single case study, a coaching team of an elite football club using a data application XPS Network was studied. Theme interviews with all five members of the coaching team were hold, to understand how the coaches perceive usage and adoption of a data application. The findings of the case study indicate that

subjective norm, social interaction, perceived usefulness, perceived ease of use, risk, adaptivity, intrinsic motivation, various emotions, and self-confidence were factors influencing the usage of the XPS Network. In addition, honesty of interaction was found to be important benefit of usage, whereas difficulty to motivate players to use the solution, challenges to change their own behavior and fear of data playing too big role in decision making could potentially be hinders of usage and adoption.

Finally, the Combined TAM and UX model based on findings from the systematic literature review and the results of the case study were compared. The four sets of constructs, interaction constructs, instrumental qualities, non-instrumental qualities, and usage outcomes were present in both, whereas attitude was not mentioned in the case study findings. Out of the 44 constructs of the Combined TAM and UX Model, 8 were discussed during the theme interviews. Moreover, two new constructs, self-confidence, and frustration, were added.

Thus, the results of this thesis propose that factors having impact on in adoption of data application in elite football are the four sets of constructs: interaction characteristics, instrumental qualities, non-instrumental characteristics such as risk, and usage outcomes such as confidence. Moreover, adoption could be improved by supporting coaches in changing their behaviors and motivating the players to use the solution and reducing the risk of data becoming too dominant in the coach's decision making.

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APPENDIX 1 – THEME INTERVIEW STRUCTURE

1. **Career & philosophy**

- Tell about your coaching career
    - Which levels & teams
    - Which roles
    - Education
- Tell about the meaning of data in you coaching philosophy

2. **Knowledge**

- Tell about how you found out about the data application?
- Tell about the process of starting to use the data application?
    - When you started to use the data application? Why?
    - Have you used other applications? Why did you change?
    - Why did you choose this application?

3. **Impact**

- Tell about your use of the XPS now
    - How do you use the data application?
    - What do you use it for?
    - Why?
    - Are other people in your coaching team using it?
- Tell about how the data application affects your job as a coach
    - What goals are you trying to achieve with the data application?
    - How the data application affects to your job?
    - Are you happy with the way you use the data application now?
    - If not, how would you change it?
    - How do you see that using/not using would change you as a coach?
    - How data will be used in the future?

4. **Continued use**

- Tell about how you've experienced the usage of the data application?
- How has the usage changed over time?
    - How the implementation was?
    - How did you experienced the first weeks of using the data application?
    - How was it to learn to use the data application?
    - How did using the data application make you feel?
    - What is the data application doing well?
    - What it is not doing well?

5. **Other topics**

- Anything else that you would like to discuss?

- about data applications, using data as a part of coaching or the data application?