

Sports digitalization – realizing the potential value of tracking technologies in professional sports organizations

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Abstract

To improve performance on both individual and team levels, professional sports clubs increasingly follow the push for digitalization and adopt digital technologies. While the use of digital technologies is generally associated with great potential, we still know little about the realized value of these technologies. Against this backdrop, we investigated the implementation of a tracking technology in 13 German Handball-Bundesliga clubs to explore both the potential and realized values of such technology. We organized our study as an explorative, multiple case study and collected data by interviewing both clubs' representatives and the technology vendor. Initial results point to the realized value of tracking technologies deriving from several conversion contingencies. We contribute to the literature on information systems (IS) value creation in the context of professional sports organizations and offer initial empirical insights into the value realization process.

Keywords: tracking technologies, value creation, realized value, sports analytics.

1. Introduction

To improve performance on both individual and team levels, many professional sports organizations follow the movement of digitalization and increasingly rely on data and sports analytics. The underlying motivation for using data and sports analytics, defined as "...the management of structured historical data, the application of predictive analytic models that utilize that data, and the use of information systems to inform decision-makers and enable them to help their organizations in gaining a competitive advantage on the field of play" (Alamar & Mehrotra, 2011), is to provide objective insights – away from a more intuition-based approach – into athletes' performance and results of tactical decisions (Alamar, 2013). Particularly the development of

digital technologies, and the ability to gather data on a larger scale, led to a push in professional sports organizations to use data and sports analytics to increase individual and team-level performance. While data and data analytics have become crucial and pivotal parts of traditional business organizations as sources of competitive advantage (Gartner, 2019b), professional sports organizations aim to gain an advantage over rivals on the playing field. Like traditional business industries, the sports industry travels through waves of digitalization, and recent technological developments offer the opportunity to significantly change (Xiao et al., 2017) or even revolutionize the sports industry (Krzanich, 2016; Jarvenpaa & Standaert, 2018). Furthermore, digitalization and the development of digital technologies change professional sports organizations by utilizing business intelligence and sports analytics, offering new stakeholder touchpoints such as websites and social media, the emergence of fully digital sports (eSport), increased use of Internet of Things (IoT) in sports to collect data, as well as increased integration of performance metrics and tracking data during live broadcasting (Xiao et al., 2017).

Tracking technologies are a prominent example of more recent technological advancement enabling professional sports organizations to gather better data and thus improve performance through improved decision-making processes. Tracking technologies follow the movement of athletes and sports equipment such as balls, converting movements into data (Santiago et al., 2010). Improved tracking accuracy (Leser et al., 2011) increased the attractiveness of tracking technologies to professional sports organizations and fostered sports digitalization.

In increasingly competitive landscapes, data and data analytics have become essential means for improving and reconfiguring organizations to adapt to changing market conditions. As a result, an increasing number of organizations realize the potential value of data analytics driving information technology (IT) investments. Before embarking on investing into tracking technologies, organizations need to anticipate

the potential value of the investment to be able to realize its potential value. The question of how professional sports organizations realize the potential value of tracking technologies arises.

2. Literature Background

From a practical perspective, we see an increasing interest in the use and potential value of sports analytics (Alamar, 2013; O'Donoghue, 2018; Ricky, 2019), however academic research on the topic is scarce. Three recent literature reviews focus on digital technologies enabling data mining in sports and conclude that, despite growing interest, journal publications are limited (Bonidia et al., 2018; Grüttner, 2019; Xiao et al., 2017). Wixom et al. (2014) further support this claim by explicitly calling for further research into the application of data analytics in sports management. Xiao et al. (2017) propose a research agenda on sports digitalization, claiming that the sports industry differs significantly from traditional businesses and should be treated as a separate empirical context due to specific characteristics of professional sports organizations, including the complexity of organizational activities (Riot et al., 2018; Xiao et al., 2017), the heterogeneity of stakeholder groups (Tan et al., 2017), the nature of the products consumed (Grüttner, 2019; Riot et al., 2018), the behavior of consumers (i.e., the fans) (Babiak & Wolfe, 2009), as well as the significant economic, political, and social impact of sports (Grüttner, 2019; Riot et al., 2018). Although professional sports organizations differ from traditional businesses, they have been increasingly professionalized in recent years. Notably, they experience increased pressures toward commercialization, commodification, innovation and technology use, merchandising, and sponsorships. Furthermore, professional sports organizations need to be profitable, ensure organizational effectiveness, and manage scarce resources like any other business (Riot et al., 2018).

A central element in the digitalization of sports is the use of data for sports and business analytics. In their investigation of FC Bayern, Tan et al. (2017) found that the club used data and analytics for monitoring player and team performance as well as event management and customer analysis. However, their study did not reveal details regarding how these goals were accomplished. Ofoghi et al. (2013) outline different techniques for data mining and how they can be used for performance pattern discovery, performance prediction, real-time decision-making, and demand analysis in professional sports. Big data can be used to prevent sports injuries by means of

predictive models assessing whether an athlete is at risk of injury (Wilkerson & Gupta, 2016).

Extant literature has primarily focused on technical methods and application of tracking technologies and data rather than the value of these (Bonidia et al., 2018; Grüttner, 2019). However, a few studies show that tracking data can add value to sports clubs by supporting decision-making, which may eventually transform training sessions and matches in sports such as soccer (Memmert & Rein, 2018).

3. Analytical Framing

The value of IT investments remains a topic of IS research interest (Schryen, 2013). Extant literature shows that implemented systems do not deliver the expected value (Barua et al., 2010). Consequently, several conceptual models describing the IS value creation process have been developed that are useful for analytical purposes (Davern & Kauffman, 2000; Dedrick et al., 2003; Dehning & Richardson, 2002). The majority of these models consider IT expenditure as the starting point for value creation, subsequently demonstrating how IT expenditure impacts business processes and organizational performance (Dedrick et al., 2003; Dehning & Richardson, 2002). Moreover, such models include the impact of contextual factors on the value realization (Dedrick et al., 2003; Dehning & Richardson, 2002). Davern and Kauffmann (2000) broaden the perspective on IS value creation to also consider the potential value of an IS investment rather than only technology costs. This is supported by Kohli and Grover (2008) who assert that IS value also needs to consider the intangible value of investments. This allows for a broader analysis of value as it focuses on the maximum value of an IS investment (Davern & Kauffman, 2000) rather than merely the IT expenditure. The authors present three elements of the value creation process: potential value, realized value, and conversion contingencies (Figure 1).

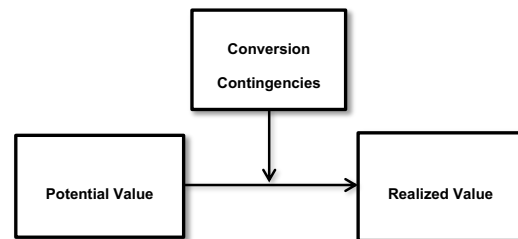


Figure 1. Adapted value creation framework.

The framework compares the realized and potential values of an IS and outlines the critical role of conversion contingencies and their effects on the

realized value of an IS investment (Davern & Kauffman, 2000). The assessment of potential value is usually based on “*heterogeneous user perceptions of payoff relevancy and adequacy*” (Davern & Kauffman, 2000, p. 126), e.g., an increase in productivity or collaboration among employees. The potential value of an IS investment can be used after the implementation to assess whether an organization realizes the full potential value of the investment (Davern & Kauffman, 2000).

Conversion contingencies are structural and organizational factors that increase or decrease the realized value of an IS investment. Weill (1990) initially introduced the term of conversion effectiveness and focused on factors internal to the organization. Davern and Kauffman (2000) expanded this concept to consider both internal and external factors and labeled these *conversion contingencies*. Many researchers have studied conversion effectiveness challenges to identify their impact on the realized value of IS investments (Kohli & Devaraj, 2003; Kohli & Grover, 2008; Schryen, 2013; Weill, 1990). Similarly to potential value, realized value should be assessed on multiple levels such as industry, business, and the individual (Davern & Kauffman, 2000). For an ex-ante assessment, one can estimate the realized value of an IS investment by discounting conversion contingencies’ effects on the potential value of the investment (Davern & Kauffman, 2000). For ex-post assessment, realized value is compared to potential value to measure the effectiveness of the implementation and guide necessary, follow-up investments to extract additional value from the IS investment (Davern & Kauffman, 2000). In this assessment of realized value, the organization should pay attention to time lag effects associated with, e.g., acquiring experience with a technology, which may lead to delays in value realization (Davern & Kauffman, 2000; Schryen, 2013).

4. Research Design

We followed an explorative, multiple case study approach (Yin, 2014) in investigating how professional sports organizations realize the potential value of tracking technologies. As previously outlined, we lack a deeper understanding of the realized value of tracking technologies despite the consensus that these technologies have great potential value. Even though the value of IS investments is not an emerging topic, the lack of in-depth understanding of the realized value in professional sports is rather limited.

We conducted our study at the German Handball Bundesliga (HBL), the German national league for professional handball sports organizations. The HBL

was founded in 1966 and in 2004, to manage cross-league operations such as marketing, branding, and selling TV licenses, the Handball Bundesliga GmbH was established (Liqui Moly HBL, 2020). Today, the 18 best German handball clubs compete over a 34-week period for the championship. The clubs vary in size, available resources, fanbase size, and revenue (Sponsors, 2020). Commenced during the 2018/2019 season, the HBL entered into a 4-year agreement with KINEXON GmbH, a tracking technology vendor, to collect geodata through ultra-wideband (UWB) radio technology, representing the current state of the art for player and ball position detection in team sports (Blauberger et al., 2021). The HBL’s stakeholders such as the individual clubs, TV broadcasters, and the press have access to this user-generated data. The clubs can access their respective data through either an analytics platform or extract it to an electronic spreadsheet as a CSV file. Whereas the HBL covers the licensing fee for using the tracking technology as well as most installation costs, the clubs pay the remainder of the installation costs. The tracking technology is installed at the clubs’ arenas and data is collected mostly during matches, where athletes are equipped with a sensor collecting positional data, including speed, distance covered, acceleration, sprints, jumps, and deceleration. Apart from tracking the athletes, six clubs play with the so-called iBall, which is a SELECT handball with integrated tracking sensor technology. The HBL intends for all clubs to use the iBall, however, due to clubs’ individual contracts with different ball manufacturers, this aim was not attainable during the 2018/2019 season.

4.1. Data collection and analysis

As mentioned previously, we conducted our study of the HBL, where we interviewed 13 handball clubs, the HBL GmbH, and KINEXON GmbH as the tracking technology vendor.

As we were interested in investigating the realized value from the tracking technology and getting a first understanding of the phenomenon, we relied on purposive sampling (Bryman & Bell, 2011) and selected interviewees based on their knowledge about the tracking technology and their respective use of data. Clubs relied on the user-generated data for different purposes, which resulted in the need to identify specific roles within the clubs most knowledgeable about the tracking technology and the associated data use. With the support of the clubs to identify potential interviewees, we had the opportunity to include various roles with a diverse set of responsibilities from both the business and the sports perspective. We conducted semi-structured, in-depth

interviews, where ten of the interviews were conducted over telephone. Three clubs provided extensive answers to our interview questions in writing. All interviews were semi-structured supporting us in a systematic approach to our data collection while at the same time allowing us to be open and explore potentially relevant topics emerging during the interviews. This gave the interviewees the opportunity to provide context-specific information as well as to elaborate on the tracking technology and data use. We developed interview guides which we tailored to the different roles. The interview guides had two common themes to be explored. The first part of the interview contained questions around the background and implementation of the tracking technology, whereas the second part contained questions related to potential value, realized value, and conversion contingencies of the tracking technology. Example question include: “Which value do you see KINEXON’s data add to your organization?”, “How has having KINEXON’s data available changed your way of working?”, or “Which value do you think that your coaches/players could potentially get out of KINEXON’s products?”, “Have you realized this value? Why/why not?”.

Table 1 gives an overview of the study participants.

Club	Form of participation	Representative
THW Kiel	Interview	Business representative
TSV Hannover-Burgdorf	Interview	Sport representative
Füchse Berlin	E-mail	Business representative
Rhein-Neckar Löwen	Interview/E-mail	Business/Sport representative
MT Melsungen	Interview	Sport representative
HSG Wetzlar	Interview	Business representative
SC DHfK Leipzig	Interview	Sport representative
TVB Stuttgart	Interview	Sport representative
HC Erlangen	Interview	Sport representative
TSV GWD Minden	E-mail	Business representative
Die Eulen Ludwigshafen	Interview	Business representative
HBW Balingen-Weilstetten	Interview	Business representative

HSG Nordhorn-Linger	Interview	Business representative
KINEXON GmbH	Interview	Business representative
HBL GmbH	Interview	Business representative

Table 1. Overview study participants.

In addition to the clubs, we had the opportunity to include KINEXON as the vendor of the tracking technology as well as the HBL GmbH as the head organization of the HBL. These interviews were more explorative in nature and contributed by offering a broader understanding of the tracking technology and its use as well as the underlying technical implications and possibilities respectively. Besides interviews as our main source of data, we supplemented these with secondary data in the form of video material, websites, as well as non-academic articles. We transcribed all interviews and used Nvivo 12 to code our data according to the above-presented theoretical framework to prepare for subsequent analysis (Saunders et al., 2016). Coding consisted of a two-step process. First, we coded according to our analytical framework and divided our data into three categories of potential value, realized value, and conversion contingencies. Aligned with our explorative approach, we then identified sub-codes for each category through abduction. As a result, we identified ten sub-codes for both potential and realized values, as well as 12 sub-codes for conversion contingency. Throughout the process we aligned our coding with existing concepts through which our codes continuously evolved. Finally, we conducted a within- and cross-case analysis. The within-case analysis allowed us to familiarize ourselves with each club and identify how each club used the tracking technology to realize potential value, mediated by different conversion contingencies. To compare value creation and realization processes, we followed up with a cross-case analysis and identified overarching patterns. To compare clubs in terms of their value realization processes and to account for differences, we turned to the following parameters: financial resources, organizational support for data-driven decision-making, and playing with the iBall.

5. Results

Our analyses reveal that potential and realized values from tracking data is present on three levels. Therefore, we structure the results according to the unit of analysis (HBL versus the clubs) and perspective (commercial versus sports): (1) The

organization HBL, (2) the clubs from a commercial perspective, and (3) the clubs from a sports perspective. Each of the following subsections outlines the potential and realized values, followed by a subsection describing conversion contingencies that affect value realization.

5.1 The HBL – potential and realized values

By implementing a tracking technology and thereby following the sports industry's push to digitalize, the HBL can create value through three pathways: new sponsorship agreements, additional product offerings, and an increase in the sport's attractiveness.

Initial results show that potential value lies within new sponsorship agreements that the HBL can enter: *"...we have an additional platform to increase sponsoring"* (HBL) and *"...it allows bringing an innovation sponsor into the league, which is a new type of sponsorship, specifically for the league itself"* (KINEXON). As a result, new sponsorship agreements can result in financial benefits. Furthermore, additional product offerings relate to TV channels, where live data can be integrated into broadcasting matches, which in turn offers the opportunity for the HBL to sell broadcasting rights at a higher price: *"...within the next 1-2.5 years, we expect to see an increase in our product value [...] and thus, we can increase our media earning"* (HBL). Lastly, through tracking data, the attractiveness of the sport can increase by making it more transparent and understandable to outsiders. Displaying tracking data during matches supports spectators in understanding players' performance and subsequently helps highlight handball's core attributes distinguishing it from other ball sports: *"... [tracking data helps] make the product of handball more modern and more like an event"* (Ludwigshafen). According to the HBL, a more attractive sport could ultimately lead to a larger fan base, which in turn could increase financial benefits among other things.

5.1.1 Conversion contingencies

For the HBL to realize the potential that tracking technology offers, initial results point to two conversion contingencies: broadcaster understanding and resource availability.

Both the HBL and the technology vendor stress that TV broadcasters are hesitant to integrate tracking data into their coverage of handball matches. If the TV broadcasters fail to use the tracking data actively in their broadcasting and therefore do not expose viewers to this data, the HBL cannot improve the viewer

experience and the attractiveness of the sport. Resource availability relates to the emergence of a new digital sponsor who supported the HBL in financing the tracking technology. This additional sponsoring revenue meant the HBL had the resources to invest in the tracking technology as a prerequisite for the value-creation process.

5.2 The clubs – potential and realized commercial values

From the clubs' perspective, initial results show that implementing the tracking technology and thereby being able to use user-generated data can create value through three pathways: better live experience, additional and better marketing content, and an increase in sponsor revenue.

Using tracking data can offer a better live experience for spectators who receive more detailed information about the match and individual players. An example of how user-generated tracking data is incorporated into matches is by displaying performance data such as shot speed or number of ball passes on LED screens making *"...the whole experience more enjoyable"* (Ludwigshafen). At the same time, user-generated tracking data allows the clubs to expand and improve their marketing content. Clubs can engage more with their stakeholders by integrating player's performance data into their social media posts and thereby *"...expand[ing] the variety of content"* (RNL-M) and as a result *"...giv[ing] new, interesting data to publish to our fans"* (RNL-M). Moreover, clubs see potential value in increased sponsor revenue as *"...there is definitely a chance for clubs to monetize the data"* (RNL-M). A sponsor's brand can be included when performance data are displayed during matches or published on social media offering a sponsor exposure to the club's fans.

5.2.1 Conversion contingencies

For the clubs to realize the potential commercial value that the tracking technology offers, two conversion contingencies were present: vendor support and ball tracking.

Clubs reported vendor support as crucial in realizing value from the tracking technology. During implementation, the vendor offered support in the form of seminars focused on how to integrate tracking data into clubs' marketing content. Multiple clubs reported that the seminars helped them understand how tracking data can be used to generate value and that *"...it was easier to implement the tracking data"* (Ludwigshafen).

The second conversion contingency present relates to the use of the iBall. Clubs that did not play with the iBall reported it as an obstacle to value realization in their marketing efforts. Lacking ball-specific data hindered marketing efforts: “[as] *our communication purposes, we are missing the most interesting data*” (Berlin). The three clubs integrating the most tracking data in their marketing content play with the iBall which, in turn, illustrates the opportunity that it offers in terms of generating better marketing content and thus facilitating value realization.

5.3 The clubs – potential and realized sports values

From a sports perspective in which individual and team level performance are crucial elements, clubs can realize the potential value of data through a variety of pathways: balance player intensity, optimize training session planning, tactical decision-making support, and time and resource reduction.

Initial results show that clubs can use tracking data to individualize and therefore more accurately stabilize and optimize player performance. This results in player-centric intensity training sessions, which resonates with the desire to minimize player injuries, as a more stable player performance helps reduce the risk of injuries (Melsungen, Hannover). Several clubs reported using tracking data from matches – such as playing time, number of sprints, jumps, and accelerations – to assess a player’s performance and decided which training intensity to expose the player to during the following training session. For example, one club uses a traffic light system to plan training sessions, where “*...the green players work with the coaches and have some interval runs. The yellow players can do tactical things, such as shooting and the red players are working with the physiotherapists doing recovery exercises in the form of spinning or light running. [It allows the club to] manage the [intensity] more accurately*” (Melsungen). Furthermore, tracking data can be used to optimize training session planning to ensure that it is “*based on data and not driven by gut feelings*” (RNL-S). One sports representative compared the situation to soccer, where coaches have access to individualized performance data, for example, how many sprints, jumps, or turns a player performs during a match. This data helps optimize training sessions. By having the same opportunity in handball, “*...then we can qualify our training*” (Leipzig).

Additionally, tracking data has the potential to improve tactical decision-making before and during matches as “*...we can use the data for assessing the distance between the players. And we know that a*

small distance between players means that it is difficult for the opponent to attack” (Stuttgart). Further, tracking data can be used for strategic purposes such as choosing starting lineups, deciding on attack and defense strategies, and knowing where to aim shots to increase the likelihood of scoring. One club reported using tracking data to analyze correlations between the number of sprints and matches won or lost and leveraging this information for tactical decision-making.

Lastly, clubs highlighted the opportunity to decrease the time and resources spent on manual analysis of matches using tracking data and automated analyses. Both shot statistics and playing time can be measured more accurately freeing up resources that can be used on other value-adding tasks. This was primarily valuable for clubs previously engaged in manual tracking. Other clubs benefitted from getting access to statistics previously unavailable to them.

5.3.1 Conversion contingencies

For the clubs to realize the potential sports value, initial results point to the following conversion contingencies: resource availability, organizational support, coaches’ attitude towards tracking technology, ball tracking, data availability, data quality, data complexity, experience with data, and vendor support.

The most common conversion contingency in the clubs was resource availability in terms of analytical skills and manpower. Availability of resources varied across clubs depending on budget. Whereas a smaller club noted that “*we have many things to improve before we take the step and use KINEXON’s offer*” (Ludwigshafen), larger clubs reported the need to increase investments into additional resources in the form of, for example, a data analyst to be able to work more comprehensively with the data. At that time, however, there was no “*...club that can finance this at the moment*” (Stuttgart). Closely linked to resource availability is organizational support for using data in the clubs, where organizational support relates to prioritizing tracking data and committing resources to them. Only a small number of clubs reported organizational support for using tracking data for sports purposes. These clubs had already been using tracking data for other purposes and are among the clubs with the most financial resources. In clubs with no organizational support, employees experienced difficulties in prioritizing working with tracking data, which led to a lack of value realization.

Clubs reported coaches’ attitudes toward tracking technology as a crucial aspect in realizing potential sports value. Coaches’ attitudes affected the degree of

data usage, where clubs with coaches with a positive attitude toward the tracking technology used the resulting data for various purposes as compared to clubs with coaches displaying a less positive attitude toward the tracking technology. A less positive attitude toward the tracking technology, combined with low organizational support, amplified general resistance to change as “... *it is hard to change the habit of someone who has 20 years of coaching experience*” (Hannover). The technology vendor confirmed resistance to change by stating that “[W]e see much hesitation from the coaches because they have to get into the new area of analysis” (KINEXON). Resistance to change was evident in multiple clubs irrespective of size or organizational support and related to coaches’ attitudes and experiences. Ball tracking presented another conversion contingency. The lack of playing with the iBall constituted an obstacle to realizing value from tracking data for tactical decision-making purposes as “...*the data that is coming out of the system is very limited because we have no iBall in our team*” (Stuttgart). Related to this is data availability. Most clubs conducted training sessions at different locations than where they played matches. Generally, the tracking technology was not installed at training facilities. At the same time, data availability (and access) was limited which clubs regarded as a challenge to their value realization process: “*If you limit the data as the HBL does at the moment, you cannot have the benefits that you get from the whole system like in other sports*” (Ludwigshafen). Furthermore, data quality in terms of reliability and validity influenced value realization. Clubs underscored difficulties in understanding the tracking data due to a lack of metadata, i.e., descriptions and definitions, and some clubs even questioned the accuracy of the data. One club experienced being confronted with inexplicable data: “...*the technology is still young [...] I see some data I cannot explain to myself [...] for example, my goalkeeper has the third longest distance covered during a game, and I wonder if this can be true*” (Stuttgart). Furthermore, clubs reported data complexity as an obstacle to sports value realization. Complexity stemmed from the amount of data generated and the nature of the sport: “...*in the end sports is such a complex topic and you have maybe 100 [data] values. And I do not think that you can say that just one [data] value is really important*” (Stuttgart). Clubs had difficulties determining which variables to consider in their analyses, which indicates a lack of experience with sports analytics and in managing complex data sets.

Data analysis experience presented another conversion contingency for sport value realization.

Clubs with no or little previous experience with data reported difficulties in knowing how to best utilize the data. At the same time, clubs pointed to the need to gain hands-on experience with the data and to experiment with it, as clubs experienced a lack of benchmarks and knowledge of which data are most valuable as a problem: “*It is a challenge for us to know what is important and what is not important, and when we can use the data and when we cannot use the data*” (Balingen). Specifically, the clubs did not have performance standards which could be used for benchmarking purposes: “*During a game, we have no idea what the data are telling us*” (Melsungen).

Additionally, vendor support served as a conversion contingency for realizing sports value. The clubs pointed to vendor support as one of the most beneficial elements in the value realization process where the clubs experienced support in both understanding the purpose of the tracking technology and the resulting data for sports value realization and how to best utilize the tracking technology.

6. Discussion

Our results show that both the HBL as well as the individual clubs can realize the potential sports and commercial values of the tracking technology and thereby follow the sports industry’s push to digitalize and use sports analytics. In realizing the potential value of tracking technologies, professional sports organizations must address the conversion contingencies we outlined, particularly showing organizational support for data usage, allocating financial and other resources, and employing personnel skilled in sports analytics. Our results support and add to extant research that documents value realization challenges faced by professional sports organizations (Memmert & Rein, 2018). We confirm Rein and Memmert’s (2016) findings and show the potential value of tracking data in terms of tactical decision support and training optimization. Whereas previous studies (Buchheit & Simpson, 2017; Schütz et al., 2019) have focused on the potential value of tracking data from a sports perspective, our study provides a more holistic understanding of value realization both from a commercial and a sports perspective. Particularly, the potential value of data for marketing purposes, such as better marketing content and increased sponsor revenues, offers a more convincing argument for investing in tracking technologies. With regard to the sports values of tracking data, our findings are in line with results from previous studies in terms of tactical decision-support, the value of balancing player performance, and optimizing training session planning (Buchheit &

Simpson, 2017; Caya & Bourdon, 2016; Schütz et al., 2019). However, previous studies have focused on the timing aspect of value realization. Our study takes a contingency approach, where the focus is on the process of realizing the potential value and in which situation value can be realized. This offers professional sports organizations a more holistic and dynamic perspective, tailored to their individual organization, rather than focusing on distinct points in time during the value realization process.

Conversion contingencies related to sports value realization, such as organizational support, coaches' attitudes, and resistance to change, are in line with extant literature (Caya & Bourdon, 2016; Ferguson, 2013). Moreover, our study confirms the need to employ data analysts to fully realize the potential value of tracking data (Lacome et al., 2018; Ward et al., 2019). Conversion contingencies such as complexity, organizational support, availability of data, resource availability, resistance to change, proof of value, and data analysis experience are furthermore identified in a non-sports context (Ain et al., 2019). Our study contributes to the extant literature by identifying conversion contingencies that are context-specific, i.e., related to professional sports organizations and the HBL, such as playing with the iBall, access to training data, and access restrictions on data.

We speculate that our findings are transferable to other professional sports, as they share many characteristics such as similar value propositions, customer segments, cost structures, revenue streams, and key resources (Grüttner, 2019; Xiao et al., 2017). Even if professional sports organizations differ from other businesses (Grüttner, 2019; Riot et al., 2018; Xiao et al., 2017), they experience an increasing degree of professionalization (Leberman et al., 2005; Riot et al., 2018). Therefore, findings from our study may also provide valuable insights to organizations in other industries that are also adopting tracking technologies, for example, hospitals (Zhu et al., 2020). Although the majority of the identified potential values are specific to professional sports, the conversion contingencies are more generic and relevant to managers in other industries and should be considered when embarking on tracking technology projects. Based on the preceding analysis and discussion, we outline four theoretical propositions. These propositions communicate the interplay between, on the one hand, potential and realized values and, on the other hand, conversion contingencies when implementing a tracking technology in a professional sports organization. These propositions emerged from the analysis, relate to extant literature, and have been tested against the

empirical data to verify their validity in the context of this study. We propose that: (1) The potential value of tracking data includes financial benefits such as increased sponsor revenues and non-financial benefits such as tactical decision support, (2) realizing the potential value of tracking data is contingent upon organizational support of data usage, data analysis experience, and availability of financial and other resource, (3) value realization increases over time as a function of the experience and amount of data that the clubs aggregate, (4) professional sports organizations can expect to benefit from improved marketing content and increased sponsor revenue shortly after implementation and use of tracking technology and the resulting data. Values including increased attractiveness of the sport and obtaining support for tactical decision-making are realized over time if resources in terms of analytical skills and manpower are invested.

Limitations and future research. One prominent limitation relates to our data collection process. At the time of data collection, the tracking technology had just been implemented which made it difficult to find knowledgeable informants at that time. Also, as value realization takes time, it would be both interesting and relevant to revisit the cases at a later point in time to trace the value creation process to understand how exactly and when value is said to be realized. Further, to facilitate a broader perspective, it would be necessary to investigate the potential and realized values of tracking technologies across different sports organizations as well as leagues, and include additional stakeholders such as consumers (i.e., fans), sports betting companies, and sponsors.

7. Conclusion

Our study set out to investigate how professional sports organizations can realize the potential value of tracking technologies and thereby follow the current trend of digitalizing sports and using sports analytics to increase individual as well as team performance. It reiterates the call for future research by Grüttner (2019), Xiao et al. (2017), and Wixom et al. (2014) who also point to knowledge gaps with regard to sports digitalization in general and tracking technologies specifically. We collected data in the German Handball-Bundesliga (HBL) by interviewing the HBL as the head organization as well as 13 handball clubs and the technology vendor. Our results show that the HBL can potentially benefit from increased sponsor revenue, increased value of TV rights, and an increase in the overall attractiveness of the sport. From a commercial perspective, the clubs can potentially benefit from better marketing content, increased

sponsor revenue, and a better live experience. From a sports perspective, the clubs can potentially benefit from balancing player performance to reduce injuries, optimizing training session planning, supporting tactical decision-making, and reducing the time and resources spent on manual tracking. Furthermore, we identified conversion contingencies related to value realization, including resource availability, organizational support, playing with a trackable ball, coaches' attitudes, resistance to change, training data availability, complexity, access restrictions, data quality, data analysis experience, and vendor support. We extend state-of-the-art knowledge of the value of tracking technologies by highlighting how professional sports organizations can realize the commercial value of tracking data as part of their marketing efforts. Finally, our study adds to the extant literature by identifying the potential sports value as well as highlighting how conversion contingencies affect value realization.

8. References

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