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The beautiful game quantified? – A sociological study of performance analysis in professional football

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PhD Thesis

The University of Edinburgh

2015

Contents

Abstract

The aim of this thesis is to illustrate the practice of performance analysis in football and to explicitly illustrate the way match statistics are socially constructed, how this represents an interpreted form of knowledge, and how performance analysts communicate their insights towards other actors inside the club in which they are working. The aim is to investigate performance analysis as a newly emerged form of professional knowledge, which has an impact on the organisation of sports and the evaluation of players. This research is qualitative by nature and was conducted via the study of the educational literature on performance analysis, participant observations of performance analysts, industry conferences and qualitative interviews. The research conducted in this thesis shows that the match statistics of players are created socially via a process of quantification that adheres to tangible skills; in turn, these are infused into the organizational sphere of a football club by means of the mediation of performance analysts. This is an attempt to illustrate that the creation and interpretation of match statistics is not self evident, but undergoes various stages of production, interpretation and mediation through interaction. This study is mainly concerned as a contribution to the sociology of knowledge, and likewise to the sociology of professions because it explores the underlying system of expert abstract knowledge in use that performance analysts claim to possess. The main findings of this study can be summarized by stating that performance analysts conduct their job with socio-materially produced match statistics, which they partly create themselves and claim to be 'objective scientific facts' (Dok4.7). Their interpretative capabilities rest upon distinct sequences of socialization in which they

accumulate a certain form of expertise, which allows them to talk meaningfully about football and the required skills. Performance analysts' work with players is largely aimed at heightening reflexive awareness about the player's performance in training and during matches.

Introduction

[…] The Black Cats can count themselves unfortunate to finish empty-handed but ultimately paid the price for some dodgy defending either side of half-time. Spurs on the other hand made the most of the few opportunities that came their way, climbing above Chelsea into fourth place at least until Monday night, when the Blues travel to Craven Cottage. So how high are Spurs capable of finishing, especially once the likes of Gareth Bale and Rafael van der Vaart return to fitness? "It's wide open", insists Spurs manager, Harry Redknapp, who considers resurgent Liverpool to be a threat when it comes to the dishing out of the Champions League places for next season. "We got fourth place last year and we're right in there. There

are six teams that I think are in the race. Liverpool are on a good run and we are certainly right in there as well with every chance. [...]"[1]

If you take a look inside a newspaper, you may encounter a match report like this excerpt. The match is being reviewed using judgements about players' performances and speculations about the fitness of players. The blurbs from the head coach contribute to the story about the match between Tottenham Hotspur FC and FC Sunderland on the day before this newspaper was published. Concluding the report, the reviewer is taking a hypothetical look into the future about the team's performance, if they continue to play like they did during that match according to his evaluation. If you had watched this match on television, at half-time you might have witnessed a similar discussion between the commentators about the game and players' individual performances. By comparison, fans that watched the game inside the stadium may have had a different impression. They experienced the performance of both teams directly, cheering their favourites in a live atmosphere while hearing the chants inside the stadium emitted from the stands. Their half-time may have consisted of talking to their neighbour about the teams' performances and an occasional look at their phone to check the other half-time results. From just looking at the result of the match in this specific case one team got away with a win and the other team lost points. Depending on how this affected their moods, the fans may be divided into those who celebrated the victory and those feeling disappointed by the result.

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[1] http://www.theguardian.com/football/2011/feb/12/sunderland-tottenham-hotspur-premier-league
[2] Other types of sports such as rugby and cricket also use this methodology but this thesis is

However, there is another fraction of people watching the match, who have a very different agenda. Performance analysts who may have seen this game as well use a combination of match statistics, video sequences, and graphic representations to analyse football matches. They even quantify matches on-the-fly while the game is going on by using a computer-software-camera setup. At half-time they brief the coaches with their interpretations of the quantified match events and give them accompanying video sequences to show to the players in order to improve the second half of the match.

Companies like Opta Sports and Prozone deliver the backend of match data to the clubs along with software-based analysis tools. Hence, performance analysts may be looking at the match footage and statistics after games to review their team's performance. Once they are finished with this task, they go on to review the next opponents' match statistics and footage to prepare the coaching team and players for the next match. This cycle is usually repeated until the end of the season.

Taking a look at the quantitative data-driven world of performance analysts is an interesting phenomenon. This newly emerging profession has jurisdiction over the evaluation of 'performance' inside the clubs, which has direct implications for the evaluation and desirability of footballers. However, having jurisdiction over such an area of evaluation may not necessarily be accepted by certain actors inside the club, which raises the question of how performance analysts relate socially to coaches, players, or board members.

This thesis presents a sociological examination of performance analysis in soccer. Performance analysis is a methodology employed by performance analysts

within football clubs[2] to track and communicate the footballers' performances according to quantified match statistics. Not only do they interpret match statistics, but they also assemble the necessary statistical dataset and communicate findings towards other actors inside the club such as players, coaches or the contract management department. In this thesis I am going to clearly explain to the reader what performance analysis is about, and what performance analysts are actually doing. This thesis is organized to answer three questions: 1. How and by whom are match statistics produced? 2. How do performance analysts interpret their quantified data inside a club setting? 3. How are performance analysts communicating their interpretations towards other actors inside the club?

As an overarching puzzle, this thesis examines by which social transformations a new form of knowledge intervenes into the organisation of matches, clubs and the review of player performances, and how this changes the notion of performance. On a sociological level I aim to look at how statistics can be viewed as a form of explicit knowledge. This type of knowledge is used as a basis for interpretation and making decisions, but it also needs to be linked with the tacit knowledge performance analysts use to engage in interpretation. Hence, I am positioning my study as an overlap of distinct sites occupied by the sociology of knowledge and the sociology of professions as presented in the literature review. In terms of sources of qualitative data, I used participant observations, interviews, and the study of technical literature on the topic.

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[2] Other types of sports such as rugby and cricket also use this methodology but this thesis is concerned with specific investigation of the club context.

However, at this point I should point out that finding the topic of performance analysis as an object of study did not occur right at the beginning of my Ph.D studies. Essentially, my first-year board review panel session was a crossroads. I intended to try and sociologize 'Principal-Agent Theory' (Jensen/Meckling 1976), a concept that has wide applicability in economics and the insurance literature (Stiglitz 1976; Rees 1985; Akerlof 1970). In short, this theory revolves around a two-actor constellation. One actor is the principal who hires another actor, the agent, to carry out a certain task or a job. Both actors are bound by a contract, which lays out the goals and contractual stipulations, like incentives. Based on the rational actor model, economists were concerned with how there is an informational asymmetry between the one who hires and the one who carries out the job. Hence, the case was about moral hazard,[3] since *a priori*, both actors may act according to self-interest.

> Moral hazard has a well defined (but narrow) meaning in the insurance literature which where the term originates. It is appropriately distinguished in this connection from the term adverse selection. The latter refers to *ex-ante* screening difficulty, whereas moral hazard has reference to ex-post contract execution problems" (Stiglitz & Mathewson 1986:168).

My intended goal was to sidestep economic theory and draw out social relations in which such an arrangement exists to be studied. My suggested examples,

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[3] The concept of shirking falls into the same category. From an employee's perspective, it basically means being lazy.

which I used in my board review paper, were performance analysts and football coaches to further elaborate on the topic for which I was aiming. This highly conceptual and largely theoretic thesis might have culminated in a monograph tentatively titled 'Acting on behalf of others'. This undertaking would have been very theoretical and I was encouraged by my supervisor to shift my attention to a more empirically observable topic, which would still allow me to use my training in social theory. At the end of my board panel session, it was brought to my attention that it might be a good idea to focus on doing a qualitative study either on professional football coaches or on performance analysis. Owing to limited access and the ups and downs I experienced in establishing fieldwork sites and interview opportunities, I chose to examine performance analysts and their craft as an object of study.

The next chapter serves to set the stage for the overall thesis. I will review the sociological literature that may be relevant to the topic of performance analysis and contextualise the development of performance analysis.

1. Setting the stage

1.1. Literature review

1.1.1. Sociology of professions

One indicator of a profession in the sociological sense is a degree achieved at a university that allows people to undertake a certain profession. As of 2014, performance analysis is now an established university degree, which one can study as part of a sports science degree or as a separate Bsc or Msc. Furthermore, performance analysts have their own conferences in which they give talks about the latest developments in their field and publish academic manuals that describe and explain their work to university students. One of the main claims that came out of my interviews is that the performance analysts possess a form of expert knowledge, which they base on 'objective facts' relative to other actors in the club (see the fourth chapter). One could make the argument that this occupational field can be considered a profession in the sociological sense. Hence, this section will explore the sociology of professions.

In the middle of the twentieth century traditional occupations such as law, accounting, engineering, and medicine enjoyed a 'Golden Age' of expansion (Gorman & Sandefur 2011:276). The flourishing of such professions was mainly attributed to issues of legitimacy arising from the prerequisite university degree required to carry out these jobs (ibid:277). Prolific sociological scholars such as Merton (1958; 1968) and Parsons (1939; 1951) published works on this topic under the banner of functionalist theory. The studies published along these lines (Goode 1969; Denzin & Mettlin 1968; Becker 1962) explicated specific characteristics

ascribed to professionalism. Hence, topics like technical autonomy, status, income, and expert knowledge emerged as dominant themes (Goode 1961) in sociological research. Specifically, expert knowledge (Abbott 1988), which is composed of abstract principles, was identified as a defining feature of professional work. As Gorman and Sandefur (2011:276) argue, traditional research in the sociology of professions has shifted towards the study of occupations. However:

> (p)rofessional and expert work involves the creation, communication, and application of expert knowledge. […] Most knowledge workers—other than those engaged solely in research and teaching—make use of expert knowledge to solve concrete problems […]. (ibid:282)

Another factor that remained an object of study was technical autonomy, as in having control over knowledge (Freidson 1984; Gorman & Sandefur 2011:278), meaning that components of such knowledge remain hidden in their totality from the public and are only available to the professional group who use it for their own purposes. A sociological study of professional and expert work could entail uncovering such distinct expert knowledge.

Andrew Abbott (1988a; 1988b; 1999) is one of the main contributors to the literature in the sociology of professions, and his studies still remain relevant to studies of occupations today (Gorman & Sandefur 2011; Saks 2012; Adams 2014). The subtitle of his book '*The System of Professions'* (Abbott 1988a), is entitled 'An Essay on the Division of Expert Labor'. This subtitle marks one of the cornerstone

arguments found later on in the book. In his opinion, skilled work is what constitutes a profession.

> [O]nly a knowledge system governed by abstractions can redefine its problems and tasks, defend them from interlopers, and seize new problems – as medicine has recently seized alcoholism, mental illness, hyperactivity in children, obesity, and numerous other things. Abstraction enables survival in the competitive system of professions. (ibid:8–9)

Likewise abstract knowledge can be observed in the practitioners' expertise. Abbott states that formal training and the finalising licence process can indicate such knowledge-based expertise.

In order to conduct an analysis via the sociology of professions, one needs to look at how systems of abstract knowledge are created (ibid:53). Performance analysis as an object of inquiry serves as such a category of analysis since performance analysts undertake their craft wherever they operate, whether within a club setting or a national team. They have undergone formal education and practical placements as well. They even use the title 'performance analyst' on their business cards and talk about the practice of performance analysis at conferences.

One of the other major arguments Abbott makes is that organizations that incorporate certain professions are arranged in specific ways to incorporate practitioners who embody specialized forms of expertise (ibid:183). This topic will be further explained later in this chapter. A focus on abstract systems of knowledge,

the process of professionalization, and the types of specialized expertise will be another feature of this thesis. To dive deeper into this specific subfield of sociology I will describe how professions in the sociological sense are defined. Hence, I am intending to draw out minute analytical observations (Abbott 1988a; 1988b; 2011) concerning the emergence of a profession. As will be shown in this thesis, performance analysts make claims that their judgements, based on quantitative data sets are more 'objective' and 'scientific' than the more emotional decision-making of coaches.

One's control over knowledge, skills, and work tasks can be highlighted as an important part of someone acting as a professional. The need to consult these types of experts is situated in historical and cultural processes. According to my interviewees, performance analysts were not necessarily needed in a football club in the way a sick patient may need a doctor to undertake a diagnosis and prescribe a drug for treatment. Moreover, there was a growth in acceptance over time of performance analysis as a league-wide accepted entity within the clubs' sphere. As I will detail more fully in this thesis, performance analysts and their craft were identified as a defining factor in a team perceived as mediocre performing above the bar. What characterizes this profession? Abbott (1988a:xii) defines professional practice as consisting of (a) diagnostics, (b) inference and (c) treatment. A profession is further characterized from afar by its manifestation of a fitting level of abstraction concerning its field of inquiry. It either defines a problem in new ways or defines new problems in old ways. In the case of performance analysts in this thesis, practice deals with the subject of game and training analysis aided by tools involving statistical computation, the digital capture of actions, and visual representations of

match events. While this task has been conducted by coaching teams as well, performance analysts have entered the space of match analysis with their own set of tools and interpretations.

For Abbott the 'division of expert labour' can be defined by abstract knowledge, which is a prime criterion of specific field-skilled labour (Abbott 1988a:8–9). Hence, expertise is an expression of this abstract knowledge. Analysts may practice their analysis separately from the coaching team, but they produce their assessments for the coaching team and the players. Furthermore, they engage in an act of communication. Interactions between actors can be successful if there is a commonly shared knowledge about the underlying meaning of the concepts inherent to the interaction. In this case the understanding and communication about football games while using the right terminology provides a form of 'interactional expertise' (Collins 2010:137), which has to be learned and thus enables interactions in a certain manner. In this specific case interactional expertise relies on a commonly shared understanding of football, meaning an understanding of tactics, which include distinguishing players (like strikers and midfielders) in terms of their position, and distinguishing technical abilities (like pass accuracy or the ability to dribble around other players). Hence, football terminology also needs to be contextualized in interaction by the '[…] understanding of game mechanics' (Dok 2.9). A prerequisite for interactions between actors to be successful in the sense that communication involves an act of mutual understanding, is that both parties have to 'master the language of the domain' (Collins & Evans 2007:86), in this case football terminology and concepts. Personal rapport may be necessary as a prerequisite to enable this specific type of communication as well, but it is much harder to grasp

empirically. Therefore, the explicit knowledge component of match statistics and video footage rests on a tacit understanding of the mechanics of the game.

As I will further explain in a later subsection, having knowledge-based expertise is partly a result of prior education (Abbott 1988:154; 245), which can be expressed through obtaining a licence. In this specific case, formal training for analysts consists of not only taking up a sports science or a distinct performance analysis degree, but also completing practical placements on a club level. Abstract forms of knowledge can be found in the educational system such as textbooks, which codify knowledge about what is involved (Abbott 1988:27; 107). Experts, in the form of practitioners, can be embedded in organizational contexts including, in this instance – the clubs – which I aim to explore later on in this chapter. Hence, one could question how these organizations are arranged to incorporate these specialized knowledge workers (ibid:107). Football clubs are 'social things', but also abstract entities at the same time (ibid:169).

While match analysis has been a task mainly carried out by the coaching team, the emerging performance analysts have entered a part of their domain over which they formerly had complete jurisdiction (ibid:98;139). Abbott (ibid:236) mentions the work of librarians whose filing systems have changed from a manually organized card base to a computer-assisted form of organization for managing the printed material on behalf of the library in which they work.

While every club in the Premier League and the Premiership now employs performance analysts, it is ultimately the coaches' decision as to how to employ them. In Abbott's words there seems to be a quarrel about the jurisdiction of how to interpret football matches. Settlements of such disputes can be solved through, for

example, the division of labour or subordination (Abbott 1988a:69–79). One category is the information profession into which performance analysts fit. In this category of work qualitative and quantitative work merges, which Abbott again describes by using the work of librarians as an example. Their profession changed into one which involved the organization of qualitative printed material with a quantitative computational database. Likewise, performance analysts organize the unfolding football match into categories of actions with the help of a visually displayed computational database. Match analysis work is done by the coaches as well and can be connected with the computational analysis.

The intertwined concepts of knowledge, expertise and profession will serve as a conceptual frame for my analysis of performance analysts in club environments where they engage in specialised forms of labour. As I will show, one of the main activities performance analysts engage in is creating and mediating types of knowledge through practice. The activities they engage in are enabled by their continual application in a club environment, but are grounded in their formal professional education as well.

From a sociological point of view the approach taken in this study is aimed at the intersection of the sociology of knowledge and the sociology of professions. The connection between these two different strands of sociology has been echoed in the sociological literature to a certain extent as well:

> Abbot's heavy focus on knowledge would suggest a close working
> relationship between the sociology of the professions and the
> sociology of knowledge, there has been almost no dialogue across

these subfields. Lamentably, Abbott's call for a deeper engagement in knowledge […] that an adequate sociology of work and professions "must also be a sociology of knowledge" […] has gone unheeded (Whooley 2013:14; also see Freidson 2001:21).

My empirical work is an attempt to show how those concepts may be interrelated by showing that performance analysts' claims to expert knowledge can be indicative of a profession in the sociological sense.

1.1.2. Sociology of knowledge

One of the core themes in this thesis is related to the sociology of knowledge. Statistical match data represents the core source of knowledge for performance analysts to conduct their craft. Hence, I am going to review some of the literature available on this topic and relate this to the other fields of inquiry relevant to the thesis topic. The sociology of knowledge can be described as a subfield within sociology, which is centred on the idea that knowledge can be treated as '[…] evidence-based representations of the natural, social and behavioural world' (Little 2012). Classic contributors to this field are Karl Mannheim (1993), Alfred Schütz (1982), Peter Berger and Thomas Luckmann (1966), Neil Gross and Charles Camic (2013) and Robert Merton (1968).

Karl Mannheim's aim was to create a sociology of knowledge by delving into social origins, which ought not to be left in obscurity: 'The sociology of knowledge seeks to comprehend thought in the concrete setting of an historical-social situation out of which individually differentiated thought only very gradually emerges' (Mannheim 1936:2). He was of the opinion that the individual does not think as such, but finds himself in a position where thinking is appropriate to what the situation affords. One can consider his sociology of knowledge as more of a general inquiry about people's needs and awareness in different contexts. In a similar fashion Berger and Luckmann (1996) show how people incorporate so-called commonsense knowledge about their 'lifeworld' (Husserl 1889).

> The social distribution of knowledge thus begins with the simple fact that I do not know everything known to my fellowmen, and vice versa, and culminates in exceedingly complex and esoteric systems of expertise. Knowledge of how the socially available stock of knowledge is distributed, at least in outline, is an important element of that same stock of knowledge. (Berger & Luckmann 1966:46)

Their claim is that reality as we experience it is socially constructed. As humans we are embedded in social processes and social relations, which are themselves based on previously enacted actions of individuals and broader social processes. Knowledge is: '[...] the certainty that phenomena are real and that they possess specific characteristics' (ibid:46). In this thesis I will deal with not only the way statistics of football matches are created, but also how these statistics are

interpreted by performance analysts. In turn, they convey their interpretations to other actors. Knowledge is one of the key themes in this thesis, but I am not talking about the commonsense knowledge, to which Berger and Luckmann (1966) refer.

Dealing with performance analysts in the realm of professional football clubs presents itself as a form of specialist knowledge, which borders on scientific knowledge (Latour &Woolgar 1979). I will explore this special type of knowledge throughout my thesis. One of the themes drawn out from my interview data shows that performance analysts legitimize their craft by arguing that their practice is based on 'objective scientific facts' (Dok4.7). Related to this statement Charles Camic, Neil Gross, and Michèle Lamont (2011) present work on how systems of knowledge are produced in their different fields of application. Previously, Neil Gross has contributed an intellectual history of Richard Rorty (2009) while Michèle Lamont conducted a study on '*How professors think*' (2010), in which she dissects the academic peer review system and the types of knowledge that constitute it, from the inside out. Both contributions can be characterized as attempts to reconstruct knowledge activities in the social sciences and humanities.

'*Social knowledge in the making*' (Camic, Gross & Lamont 2011) is an attempt to refocus the sociology of knowledge onto the field of observable knowledge practices, which has been the prevalent approach in the field of science, technology, and society studies (STS). Their idea is to extend this approach into wider areas of society, while using the same toolbox for analysis (ibid:106). As I will show in this thesis, this seems to be an appropriate method for analyzing performance analysis, which is taught at universities as branch of sports science. However, performance analysts work largely within the realm of professional sports

rather than academic environments. Hence, their scope is more centred on an applied field than academic research.[4] Camic, Gross and Lamont distinguish this approach from what they call 'reductionist' sociology of knowledge that entails connecting societal conditions with specific sets of ideas and a 'traditional approach to social knowledge' (TASK), which they classify as a reconstruction of intellectual histories (ibid:5). The contributions in '*Social knowledge in the making*' (Camic, Gross & Lamont 2011) focus on practices central to knowledge-making and the uses of knowledge. They argue that the STS approach has largely been connected with the study of natural sciences such as biology (Latour & Woolgar 1992), and that this approach should be extended to other fields of inquiry as well.

> By "social knowledge" we mean, in the first instance, descriptive information and analytical statements about the actions, behaviours, subjective states, and capacities of human beings and/or about the properties and processes of the aggregate or collective units – the groups, networks, markets, organizations, and so on – where these human agents are situated. (Camic, Gross & Lamont 2011:78)

They conclude that knowledge incorporates:

> [...] the technologies and tools of knowledge-making – that is, the epistemic principles, cognitive schemata, theoretical models,

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[4] It should be mentioned that they there are intersections such as academic conferences where sports scientists and performance analysts collaborate with universities as part of their practice.

conceptual artefacts, technical instruments, methodological procedures, tacit understandings, and material devices by which descriptive and normative statements about the social world are produced, assessed, represented, communicated, and preserved. (ibid.)

Following this description they argue for a detailed study of social practices that are associated with knowledge production. According to their definition practices are:

[...] the ensembles of patterned activities – the "modes of working and doing", in Amsterdamska's words – by which human beings confront and structure the situated tasks with which they are engaged. These activities may be intentional or unintentional, interpersonally cooperative or antagonistic, but they are inherently multifaceted, woven of cognitive, emotional, semiotic, appreciative, normative, and material components, which carry different valences in different contexts. (Gross, Camic & Lamont 2011:122)

Moreover, they want to establish a sociology of knowledge centred on knowledge-making practices. Gross, Camic, and Lamont (ibid:152) hope sociologists can do the same in other areas of society in which one ought not to look at the end result of knowledge-making practices, but illuminate the social processes involved when knowledge is still 'in the making'. In a practical sense meaning can be reconstructed and understood if investigated in a specific context of inquiry (Skinner 1969). Settings on a micro level can serve as field sites of observation in

which to develop research ideas (Camic 2001:8146; Geertz 1983; Whitley 1984). As I have mentioned before, the basis for performance analysis is quantified match statistics, which they produce themselves, but also get obtain from different third-party companies. Hence, they engage with produced and pre-produced knowledge artefacts in their reasoning and decision-making on the job. The tools of the sociology of knowledge can help to uncover the processes of knowledge production and interpretation.

1.1.3. Sociology of sport

Sport has been the object of canonical sociologists such as Weber (1904), Mead (1934), Simmel (1917) and Bourdieu (1988). These authors investigated sports as part of a broader analysis of society (Malcolm 2012:17). Darts (2012) content review of the International Sociology of Sport Journal (SSJ), the Review of the Sociology of Sport (IRSS) and the Journal of Sports and Social Issues (JSSI) states that: 'The sociology of sport is based on the relationship between sport, culture, and society and has always been an open, interdisciplinary field that has sought to incorporate elements from education, philosophy, social psychology, history, and economics' (ibid:646). The common consensus about the definition of sport as the basis of analysis can be formulated as goal-oriented, structured, competitive forms of play (McPherson et al. 1989).

One of the main categories of sociological analysis within the sociology of sport has been the examination of the body as it is related to sports and society

(Andrews 1993; Theberge 1991; Atkinson 2011). Turner (2009) pointed out that embodiment as an important factor of societal analysis came out of British sociology in the 1980s. '(I)n studying sport, where the body is essential to the experience, we have largely missed its meaning and importance' (Theberge 1991:124). The body was further manifested as a cornerstone of analysis in the diverse field of the sociology of sport. Following the classification by Atkinson and Wilson (2002) literature on the body was split among certain subfields. Along the lines of Foucauldian (1975) concepts and terminology, the body was analysed as being disciplined (Dunning 1993). In Foucauldian terms, discipline is a form of power intended to normalize behaviour by continuous surveillance of the body with the goal of conditioning the subject of surveillance to constantly observe his or her own behaviour. Another sociological angle was to talk about the biomedical body (Cole 2000). Several sociologists have argued that elite sport has been infused by biomedical science (Johns & Johns 2000; Maguire 1993; Safai, 2007). According to their arguments, techniques and procedures from science were introduced to sports to enhance sporting performance.

Sports coaching has also been the subject of sociological inquiry under the veil of the sociology of sport (Gilbert and Trudel, 2004, More, 2008, Potrac et al., 2002, Van der Mars, 1989, Potrac et al. 2000). In a recent publication Jones, Potrac, Cushion, and Ronglan (2011) offer perspectives on the role of coaching within the sociology of sport. Along those lines one of the arguments that is made concludes that coaching is entirely social (Jones, Armour & Potrac 2002). In one of their recent articles, Potrac and Jones (2009b) argue that the way coaching has been explained in the existing literature is oversimplified by virtue of not including an accurate

description of the knowledge transfer process, and the potential power struggles that are encountered between other actors in the organization they are working in. In this sense Potrac et al. (2000) recommend the development of observational studies of coaching practice to establish qualitative studies that foster a more in-depth understanding about the choices coaches make, and to look at the contextual factors that enable and hinder the transfer of knowledge.

In addition to the coaching process the topic of performance analysis in professional soccer was studied by Groom, Cushion, and Nelson (2011). Their qualitative study was focused on coach–athlete interactions at a youth level. For gathering data, the researchers recorded video-based feedback sessions conducted by 14 coaches within a ten-month time period. Their study was an attempt to show how performance analysis actually looks on an applied level rather than as a technical layout of how performance analysis should look (ibid.:17); to do so they conducted an evidence-based empirical study of such a context. This paper is largely focused on video feedback analysis and uncovered a cyclical nature of feedback sessions with different trajectories, including opposition analysis, motivational videos, and performance review sessions. Furthermore, this study gave a glimpse into the intricate perspective of coaches at a youth level. However, the authors point out that: 'While considerable academic writing considers the what of performance analysis, regarding system design and reliability [...], the how or use of this information in practice remains under-developed' (Groom, Cushion & Nelson 2011:17). Hence, there is a thematic gap in the literature about this topic which requires further exploration.

This literature review has summarized the different sociological subfields that are relevant to the sociological study of performance analysis in professional football. The objective of reviewing literature on the sociology of professions, the sociology of knowledge, and the sociology of sports was to give an overview of different sociological perspectives related to performance analysis as a field of sociological investigation. While I am mainly going to refer to these different perspectives in the later chapters, I will briefly introduce other theoretical notions at the beginning of the next chapters as well.

1.2. Methodology

In this section I explain the grounded theory (GT) method to the reader. I will go into the intellectual origins of the theory, the different variations, and how it actually affected my data collection process. However, I should point out that I am taking a modified approach (Charmaz 2007) and breaking away from how GT was originally established by Barney Glaser and Anselm Strauss (1967). The GT method is a specific approach to conducting fieldwork, collecting qualitative data, and the process of analysis which I shall explain further.

For my purposes, GT served as a tool-kit (Charmaz 2000:522) for my research endeavours. Part of using GT in a practical manner came from my restricted field access, and therefore the need to stay on top of themes that emerged from my

data collection process. I will give a more in-depth explanation as to why I chose this method and how I came to choose an abbreviated version of the method further on in this chapter (Charmaz 2000; 2007).

Broadly speaking, this approach relates to the Chicago School of Sociology and the tradition of Symbolic Interactionism. In this sense my approach was to study the sociality of a specific area within society by grasping and analysing the day-to-day settings and relating them to the characteristics of the '*lifeworld*' (Schütz & Luckmann 1973). This approach was developed in the 1960s by Anselm Strauss and Barney Glaser. The two were working together in studying the sociology of illness at the University of California (San Francisco). Their intention was to create theory not by deducing it from other theory, but by using observations of reality in order to compile theories and meanings. The central emphasis of their research approach was to look at the context in which day-to-day interactions between people occur. The researcher then takes part in the activities of the actors and inquires about the activities during the subsequent interview phase. Strauss and Glaser were of the opinion that those interacting actors constructed their world through their actions, which grounded them in reality. In this sense one reconstructed their world: '[…] through the researchers' frame of reference' (Grbich 2013:80). The two researchers parted ways over a dispute rooted in the coding process (Walker & Myrick 2006:550). Glaser was more of an advocate of splitting coding into two procedures, substantive and theoretical, thereby '[...] conceptualizing data by constant comparison of incident with incident, and incident with concept' (Glaser 1992:38). Strauss proposed to split the coding process into three parts to consider: '[...] the making of comparisons [and] the asking of questions" (Strauss & Corbin 1990:62). I

have chosen to follow the conception of Strauss and Corbin (1990) in terms coding because it did not seem to me as schematic and rigid. Their focus lies on how the coding of the material from the beginning of the fieldwork process allows the emergence of themes and blocks of clustered topics grounded in the empirical material (Charmaz 2007).

As I have mentioned briefly, GT is an approach that looks systematically at qualitative data. GT can be described as a qualitative method with certain methodological rules. Important concepts in GT are categories, codes and coding. The research process consists of data sampling, data analysis, and development of theory. However, the different steps are not seen as isolated tasks, but as different steps which should be repeated in circular fashion. Shortly before Strauss' death (1994), he did an interview and proclaimed three basic tenets that should constitute a GT approach. These three elements are:

> 1. *Theoretically sensitive coding*: This means generating strong theoretical concepts from the data to explain the phenomenon researched.

> 2. *Theoretical sampling*: A decision is made about whom to interview or what to observe next. This implies starting the data analysis from the first interview and writing memos from the very beginning of the research process.[6]

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[6] Admittedly, theoretical sampling in this study was done in a very limited manner. My field access to performance analysts was severely constrained by their availability and the limitations I faced during

3. The need to compare between phenomena and contexts to strengthen the theory. (Legewie & Schervier-Legewie 2004)

The core categories for working and distilling from qualitative data can be summarized as follows. First, there are (a) codes which can be described as anchors that allow key markings of the data to be gathered. As I will explain later on in this chapter, I used the software Evernote[7] to code my data. The second stage concerns the development of (b) concepts that are fundamentally based on the dataset. These concepts allow codes of similar content to be grouped together. In this sense the researcher can develop virtual 'piles' of data codes that can be related in terms of their content. The (c) categories emerge on a higher level, and contain similar concepts grouped together. Lastly, the researcher has to go on to construct a (d) theory which is a collection of explanations that explain the topic.

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my stints doing participant observations. Hence I have only been able to interview performance analysts but no other potentially relevant people such as players or coaches.

[7] The software was downloaded for free from www.evernote.com
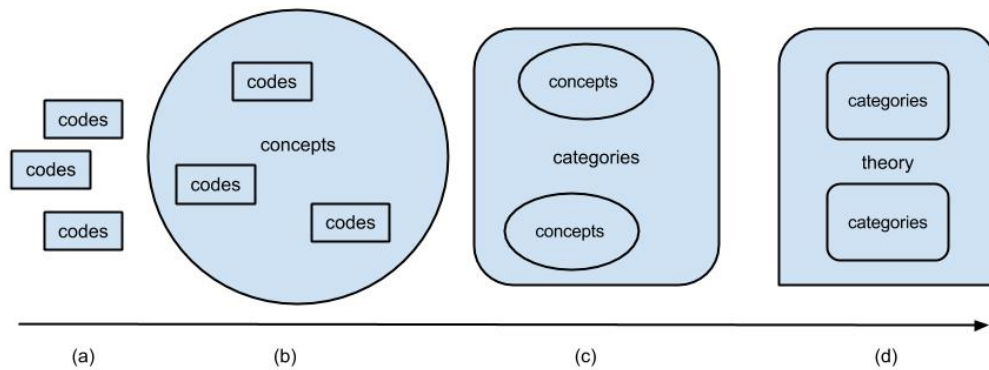
Figure 1. The different phases of conducting grounded theory.

In terms of software, I used Evernote to initially code my data. The use of Evernote brought advantages, but also disadvantages to the research process. On the one hand, it allowed me to quickly transcribe my field notes and interviews into a computable database to establish different emergent codes as I was conducting interviews, participant observation and conference visits. I was similarly able to record audio notes, write text, and collect snapshots into one database. I started using Evernote out of necessity since I had no qualitative database programme for my Macintosh and had used Evernote extensively in the past to research essays and write literature summaries. I was able to install Evernote on my smartphone as well which allowed me to inscribe observations, on the training ground or at a presentation of

performance analysis software as the events unfolded, and record audio notes along with written annotations. Evernote allowed me to directly work with the database on my computer during fieldwork trips and gave me an overview of the themes that emerged throughout the research process. The overall advantage was practicability and speed of using and expanding the text/code based database and the interface, which certainly replaced my initial paper-based notes. Furthermore, I was able to always carry the searchable database with me to refresh my mind on interview data while waiting for another interviewee.[8] Other advantages were the absence of stacks of paper notes to review, and being able to record ideas whenever they came to me. The Evernote software package, which I had installed on my computer and my phone, allowed me to have a readily accessible database wherever I went. This made my data entry and coding much more effective and accessible because of the availability of the database on my phone and any computer with an Internet connection.

The practicability of the initial data entry and search functionality came at the price of having to export entries for analysis purposes, therefore adding an extra step to the workflow process, which I did not intend or envision initially. Other software packages that are dedicated to qualitative research do not require this step. Despite the aspects of practicability and access, Evernote did not affect my findings analytically. A different software package would have brought me to the same conclusions.

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[8] I should mention at this point that MaxQDA has released a smartphone version of their software as well that allows for a similar functionality, which I described in this chapter while using Evernote.

I specifically chose to code my material in this way because the continuous coding of the data helped to organize the piles of themes, while the emerging relatedness between the categories helped me to grasp the topic of research in its details. This way of organizing my empirical material gave rise to the structure of my thesis and the writing process, which started to take shape while doing fieldwork and coding. Themes like the construction of match statistics or the use of such statistics inside the organization of the football club became apparent as potential chapters while I was grouping the concepts into emergent categories.

As I have mentioned in this subsection, I used GT in a practical way as a toolset rather than as a prescriptive methodology (Timmermans &Tavory 2007; 2009; 2012; Charmaz 2006; 2007). This can also be considered a more constructivist approach (Martin & Gynnild 2011:75). 'In classic grounded theory works, Glaser and Strauss talk about discovering theory as emerging from data separate from the scientific observer' (ibid.:10). However, I have to acknowledge that this strategy was chosen due to the constraints and limitations of my field access. Hence, I employed a continual practical process of coding the themes of the interviews and my observations. GT acted as a guiding principle during the process of conducting interviews and participant observation, and implementing this procedure allowed me to keep an eye on the qualitative dataset emerging out of the process of coding. Therefore, I was able to observe topics emerging from the dataset in terms that my interviewees thought were relevant for them in their practice. As a consequence, I mapped out the practices they were adopting. As a result, an understanding of the field I was researching emerged out of the process of doing fieldwork. What became

very apparent very early on was the role statistics played in doing performance analysis.

1.3. Data collection

> I have no data yet. It is a capital mistake to theorize before one has data. Insensibly one begins to twist the facts to suit theories, instead of theories to suit facts. (Holt & Doyle 1999:4)

Prior to my actual board review, I was determined to establish the necessary field access to conduct my study. My initial approach consisted of contacting the clubs formally and providing a legal waiver by the University of Edinburgh to ensure the confidentiality of my interviewees and the anonymization of the adjacent data that would be created. After many emails and phone calls, I was granted access to two different clubs as a quasi intern for up to two weeks each. However, neither of these opportunities to conduct fieldwork materialized for different reasons. One club changed their coaching team and politely wrote me an email stating that no one from outside the club would be allowed on the training ground. The second club initially allowed me to come and visit the training ground. After further emails to set up a date for me to do my fieldwork, they withdrew their invitation. Since the strategy of taking the official route to conduct my research did not work out, I had to think of other ways to gain field access.

After looking for more literature on performance analysis, I discovered the 'Science and Football' series (Reilly, Cabri & Araújo 2009; Reilly & Korkusuz 2009; Nunome, Drust & Dawson 2012). These are edited volumes which are put together from papers presented at the annual 'World Congress of Science and Football', a conference series that happens annually. In these volumes, different areas of scientific research on football are presented such as psychology, biomechanics, and performance analysis (Nunome, Drust & Dawson 2012:137ff). This discovery not only led me to a rich resource on material from practitioners, but also gave me the idea to visit these conferences and more specific ones on the topic of performance analysis.[9]

Part of my fieldwork experience consisted of going to conferences, listening to presentations, and informing myself about the topic. This allowed me to familiarize myself with the topic from a practitioner's point of view and see how they presented their work to their colleagues. These presentations were my first source of qualitative data (Gross & Fleming 2011:152ff; Knorr Cetina 2011:436). Since several performance analysis companies had their technology on display, I was able to see the computer-software setup in action and was able to immerse myself in the user interface on a trial basis. Furthermore, I was able to ask questions to the presenters on what types of opportunities they had for conducting analysis and to give brief examples on how they would conduct analysis with their software. Getting to know the camera-computer-software setup was very helpful in later stages of my fieldwork in order to understand how the practices of clubs may differ, and how

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[9] An example for this is the current 'Sports Analytics Conference' series (http://sportsanalytics.tv/ last accessed on 15.07.2013).

these differences are manifested in the technological setup of quantifying match statistics. Moreover, this played a role in whether analysts would use dedicated performance analysis programmes or take more of a 'bare bones' (Dok5.8) approach by using the raw data file in Microsoft Excel or other spread sheet software, which would display certain quantifiable elements, for example, to the coaching team by using the pie chart visualization feature.

> It depends what the clubs want, when I was at Org(5) we used the standard Prozone package but now we use a more customized frontend. We buy data from Opta as well and plug it into our database. (Dok5.3)

More importantly, I was also able to introduce myself and network with analysts. After my first conference, I made official 'business cards'. This allowed me to exchange communicative details rather quickly after only talking with analysts for very brief periods. Since most analysts were either present to meet their colleagues or to look at job opportunities, their face time was very limited. After introducing myself formally and briefly explaining my research, a quick exchange of cards allowed me to collect a lot of contact information in a very short period of time. This opportunity was greatly amplified by an interview which I conducted in January 2012. The interviewee was generous enough to introduce me to a couple of performance analysts at the second conference I went to which had a kind of ripple effect' (Long 2001) on my fieldwork access and was a breakthrough to securing a number of interviews. I was able to build personal ties with analysts and was able to

write emails with questions about their practice, therefore lengthening the interview process if needed. Being able to contact them in one form or another proved to be a valuable asset since analysts had formal profiles on the respective homepages of the clubs, but neither their email address nor their telephone numbers were on display. From that point onwards, I was able to ask for referrals to other colleagues who might be interested in being interviewed by me. Hence, part of gaining access to interviewees came from introducing myself to analysts at conferences, while the other part was from referrals and introductions by my interviewees. Interestingly, most of the analysts I interviewed were very happy to talk about their work and were curious that an outsider would have an interest in what they are doing. Furthermore, this allowed me to contact other analysts with whom I used my initial contacts as a reference. In total, I interviewed 24 analysts either in person, by phone, or via the use of Skype.

Age	Gender	Experience
26	Male	2 years
25	Male	1 year
38	Male	7 years
29	Female	3 years
35	Male	8 years
45	Male	9 years
27	Female	1 year
28	Male	3 years
41	Male	8 years
40	Male	2 years
36	Male	5 years
28	Male	4 years
32	Male	4 years
25	Male	2 years
39	Male	8 years
35	Female	3 years

32	Male	4 years
37	Male	9 years
24	Male	1 year
29	Male	3 years
33	Male	6 years
40	Male	8 years
28	Male	4 years
25	Male	1 year

Table 1. Interview participants in total. The interviews have taken place between October 2011 and December 2012. The index system, which I used in this thesis to anonymize the mentioned name consisted of 'X(bx)' with continuous numerical indexation in place of 'x' in my interview transcriptions, which are indicated by using 'Dokx.x.' with numerical indexes as designated signifiers. Further anonymizations were undertaken when organisations ('Org(x)') were mentioned.

Besides being able to see match statistics being created within the offices of performance analysis companies, I was also able to accompany two analysts in their everyday work environment over the course of one to three day periods. This fieldwork included being in their workplace, witnessing their communications, and their ways of conducting the interpretation process. The workdays I was able to observe usually consisted of reviewing the tasks that needed to be done that day, which were written on a whiteboard. This served to coordinate their computer work and the meetings they had to attend with other actors within the club such as coaches, players, or the scouting department. Most of their work was done in front of the computer, such as going back and forth between video sequences, match data, and

graphic representations of match data onscreen by using a keyboard/mouse interface. Depending on whether they were reviewing the just prior match or preparing for the next match, their analytic focus was either on their team's performance or on the next opponent the team had to face. In working towards the first team's requests, they had to compile reports on prospective transfer targets and dossiers about youth players who might be of interest for the first team. This was carried out by writing dossiers about a player's strengths and weaknesses according to the match data, which they accompanied with video sequences underpinning their interpretation of the player's performance. These dossiers included snippets of statistics such as pass completion rates or aggregated statistical items such as successful dribblings. The analysis was mainly conducted in front of a computer, but sometimes the video feed was transferred to a large touchscreen. The analysts would stand in front of the screen and physically draw onto the video image with different colours by hand, using a virtual pen within a programme. In certain instances they would just use a whiteboard to draw up certain patterns of play or distinct player characteristics, such as preferred movement patterns deduced from the dataset. The whiteboard was mainly used to conceptualize how to present their findings to other actors within the club, as well as to discuss their interpretation of the dataset they were analyzing. In those scenarios the analysts engaged in a discussion about which scenes they would show players in the briefing sessions, or what footage would be good to show to the team, for example, to illustrate the next opponent's perceived weakness during counter-attacks. This would be done by drawing arrows in different colours to signify the movement, passes, and shots on goal. At certain times, they would preview a longer reel of match sequences that they would then use in their

presentations. These presentations were co-ordinated and rehearsed. This means that, for example, one analyst would talk about the attacking strengths of the opposing team and highlight their strategies during set pieces while the other analyst would talk about their identified weaknesses when defending. Depending on whether or not they were set up for live coding or assisting the coaching team for the next match, they had to prepare their mobile computer-software setup for travel and check their travel schedule. Once, I was also allowed to spend time inside a stadium during a live match and experience the process of live-match coding (see the second chapter). Being a more or less silent observer in their workplace, I was mostly able to take written notes and not interfere with the work of the analysts by asking questions. The agreement I reached was to ask interview questions during the afternoon and at certain other times when they had some time to spare and did not have a huge workload.

As I have mentioned before, the other participant observation episodes were in the context of sports science conferences. This allowed me to see the work of performance analysts being presented to an audience and how they exchanged information with each other about potential new developments in their line of work. The conferences were generally setup with talks given by performance analysts or more general sports scientist. The topics covered were concerned with such issues as their methodology, recent insights they had using the software or implementation at the club level. Certain talks were geared towards students who were in attendance for recruiting purposes and to show them what the job of performance analyst looked like and how their career path night evolve if they chose to go down that route. The common theme was that multiple practical placements after finishing a university

degree should be expected. The conference venues had a separate section decorated with booths which were occupied by various different companies who are related to the field and who provided demos of their new technology. Examples of such demonstrations were indoor measuring setups, wearable-tracking devices to measure heart rates, or new incarnations of performance analysis software. Besides visiting the conferences, I visited the field sites of the two club offices in which the respective performance analysts were situated, one office of a performance analysis company in which statistics were created, and one friendly pre-season match in which I was able to witness how live coding was actually done by a company during a match. However, my access to interviewees who were not analysts was severely limited. I was not allowed to speak with any players nor the coaches of the respective teams. Prior to my arrival, I always received emails along the lines of:

> […] (t)he Manager does in any case prefer for our training sessions, treatment of players etc. to be kept as private as possible. (Dok2.3)

The training grounds I was able to visit were high security compounds with fences and a reception from where I was taken straight to the offices in which the analysts conducted their work. In the beginning stages of my fieldwork, I conducted informal interviews and participant observation during pre-season training camps in Germany as well. Since then, I have come to realize that the process of match coding employed by performance analysis companies is very similar.

Since the technical literature on performance analysis gave me a more general idea of how this craft would work in a club setting, the overall process of

fieldwork gave me a much deeper understanding about what analysts are doing, how the environment in which they work influences their practices, and what type of knowledge is actually necessary to become a performance analyst. In short, my tactics for gathering qualitative data were greatly shaped by the hits and misses of gaining fieldwork access; this experience ultimately led me to completely alter my approach and my topic. My original plan to become an intern at a football club for a prolonged period of time failed, and I had to resort to a method of doing in-person networking at conferences and using referrals from previous interviewees. Furthermore, I learned a great deal on how to network with interviewees more effectively and take advantage of the fact that I already had talked to certain analysts, who served as references in further emails to recruit more interviewees.

In this instance, I should mention that the questions I asked in those interviews changed significantly over my time conducting fieldwork. My first objective was to gain proficiency in the concepts and technical vocabulary performance analysts were using when talking about their work.[10] I had to learn how they were actually embedded inside the organization of a football club and how they interacted with other members. I had to find out their relationship and the type of interactions they had with coaches and players alike. In this instance, I found out that they also supply data and interpretations for other branches of the club such as the

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[10] Garfinkel refers to this as 'mastery of natural language' (Garfinkel/Sacks 1970:344). Together with his colleague Wieder, Garfinkel went on to describe this as: 'the unique adequacy requirement of methods is identical with the requirement that for the analyst to recognize, or identify, or follow the development of, or describe phenomena of order in local production of coherent detail the analyst must be vulgarly competent in the local production and reflexively natural accountability of the phenomenon of order he is "studying" (Garfinkel & Wieder, 1992:182).

scouting department and the board of directors. Finding out about how they communicate inside the clubs, how they are situated in the organizational structure, and how they relate to other actors was a slow process. In this sense, the first four interviews I conducted were preliminary by nature. I inquired about what my interviewees were doing on the job, how they were doing it, and who they interacted with. The questions were very open-ended..

These first interviews gave me some ideas as to how to structure future interviews and the types of topics I needed to research. I was able to link back to what I had read in the performance analysis manuals (McGarry, O'Donoghue & Sampaio 2013; Hughes & Franks 2007), but gained a more applied perspective on the methods described in textbooks, such as measuring plays and the way statistics are presented to players and coaches. When starting the first semi-structured interviews, I became aware that the sociological concept of knowledge would become more of an incremental part of my research as it emerged as a topic throughout dialogue with the analysts. I noticed that 'ensembles of patterned activities' (Gross, Camic & Lamont 2011:122) became apparent features in the work of performance analysts. In the beginning of my fieldwork, I asked very general questions like 'What do you do on a day-to-day basis?' The further I progressed in my interviews the more I developed a refined and specific interest about their biographies, how their weekly schedule looked, how they were analysing the whole corpus of match data, and how they mediated and conveyed their conclusions to other actors. The interview data showed me that performance analysts had a weekly schedule of activities in which they performed certain tasks centred on statistical database analysis, video footage reviews, and feedback sessions with other club

members. This allowed me to find out that they supplied snippets of match statistics and dossiers to other members of the club, such as the board or the contract management department. Over time, I was getting a much better overview of the practice of performance analysts as sets of patterned activities in which they are engaged, the conduct of their work, and how they related to other actors within the organizations. I identified the practice of conducting performance analysis as a sort of knowledge creation, knowledge interpretation, and knowledge mediation procedure based on quantified match statistics; all of these different facets of their work had practical relevance for other actors inside the club.

Moreover their tasks were highly centred on a socio-technical interface to analyse statistics of matches, as well as to communicate their findings with coaches and players alike. Hence, my main focus in the following semi-structured interviews was to find out how these practices are enacted in settings like the stadium, as well as how this specific type of knowledge is communicated to e.g. the players and the coaches. The more analysts I interviewed the more I came to realize that performance analysts in professional football could be categorized as a profession in the sociological sense (Abbott 1988). This further focus became more of an emerging thought and analytical interest after presenting my prior fieldwork findings to my supervisors. Performance analysts not only shared certain biographical features such as a degree in sport science, but also practical placements at clubs from which they worked their way up to being hired as performance analysts with permanent contracts. They also claimed that their point of view on football is an 'objective' one compared to the more emotional way players and coached might view the game.

The second source of qualitative data was the aforementioned participant observations, which I drew from my stints at three different clubs over the course of my fieldwork, being a participant in the conferences on sports sciences, and staying at one performance analysis company to witness the third-party coding process of matches in person. The third source was transcripts from talks given at the conferences I attended[11] and the technical literature on performance analysis, which according to my interviewees, were used by universities within their sports science courses to teach the topic to students who may consider becoming an analyst in the future. The data collection process was, admittedly, a rocky road in which I had to gain access to a field that was foreign to me and led me to do a lot of in-person networking. Overall, the whole process of learning about performance analysis changed the way I watch football games. While I was a fan of the game of football before starting my fieldwork, I did not have intricate knowledge about the different dynamics at play during football games. I just enjoyed watching games together with a couple of friends at a pub. Nowadays, my perception has changed quite a bit. Beforehand, I mostly enjoyed games purely for their entertainment value, but after conducting my fieldwork I watch games from a different perspective; one could say my perspective is much more technical now. I pay more attention to the space between the players and constantly find myself focusing on passing opportunities whenever I watch a match. Whereas previously, I was fixated on where the ball is moving I now pay attention to player movement as well. Having seen performance

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[11] In one instance I make reference to the 'The World Football Congress 2011' in Nagoya, Japan as the video footage is in the public domain. I did not attend this conference but I was able to watch the different presentations in an online stream via the Internet and replay the presentations on YouTube.

analysts do their work and overlay video images with graphical representations of quantified variables (such as movement patterns) has led me to gain a different perspective on the game and see more of its resemblance to an applied form of geometry.

1.4. Ethics

During my first-year board review paper, it was brought to my attention that ethical issues should be regarded in relation to securing the anonymity of my interviewees. Since this issue was raised, I prepared myself in case an issue to do with it would arise during the research process. I told my interviewees and the gatekeepers of my fieldwork locations that I would guarantee their anonymity by completely anonymizing their interviews and my field-site observations by not using their names. I provided all my interviewees with my phone number and email address in case they had any other questions or would like to receive a copy of my thesis or abstracts from it. In case there would be strong objections in terms of protecting their privacy, I intended to offer potential interviewees a legal waiver by the University of Edinburgh, a strategy that was recommended to me by one of my supervisors in a subsequent meeting. However, the necessity to provide such a document in order to insure the anonymity of my interviewees was not necessary. None of my interviewees requested such a document. Contrary to my expectations before starting

fieldwork, the most challenging task was not to ensure confidentiality, but to secure interviewees.

1.5. Performance Analysis in context

1.5.1. From factory owned entities to a professionalized league

Although this thesis is mainly concerned with the topic of performance analysis, I start this section by giving a very brief overview of the historical background of professional football in England. In the second half of the nineteenth century the English Football Association (FA) was formed in 1863 and provided a codified rulebook for the sport of soccer (Charlton & Bragg 2006). This development took place in order to standardize the rules for play. Henceforth, a regulatory framing was established, which was applicable to all teams who were members and played in the respective leagues. This competition was initially contested mostly by amateur teams, but by the end of the nineteenth century it was dominated by professional teams that were mostly members of the Football League that had been founded in 1888 and expanded during the 1890s. The Football League[12] is a competition which contains men's professional association football clubs from Wales and England. It was founded in 1888, it is considered as the oldest organized competition in the world of

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[12] Today the Football League is also known as the 'Npower football league' for sponsorship reasons.

football. It was the top-tier football league in England from its formation in the nineteenth century until 1992. In that season the top 22 clubs formed the Premier League.[13] Other European countries did likewise and codified the game into formal rules as well. In 1904, the Fédération Internationale de Football Association (FIFA) was founded and is now the highest international body for governing the formal framework of football. Therefore, rules of football are not an arbitrary compound, but based on conventions (Kaminski 2004), which in this case are formulated by a recognized authority.

As the governing body of the national football organizations, the FIFA's most recent case was to assess the possibility of introducing goal line technology,[14] which was advocated by many officials, to the game. Doing so would add an element only available prior to this in other sports, such as ice hockey or American Football. This addition, which effectively began in the World Cup of 2014 in Brazil, may have changed the way football matches are conducted. Since the Premier League season of 2013–2014, this system has been implemented ye it is the referee who is in contact with the technological setup who will indicate whether a goal can be given or not depending on the visual feedback that determines whether the ball crossed the goal line. However, a supervisor outside of a stadium controls the system.

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[13] The total number of teams was reduced to 20 clubs in 1995.

[14] See http://www.guardian.co.uk/football/goalline-technology (accessed 28.06.2013).

Figure 2. Controlling the Hawk-Eye system[15]

In the second case, the FIFA decided to introduce a change in the offside rule.[16] This de facto change in the regulatory framework was instigated as of the 1st of July 2013, which had a direct influence on the education of referees and their training seminars. While a representative body such as the FA governs football and codifies rules, the match officials, such as the referees, had to enforce this modified rule in the 2013–2014 season. These two examples lead to another framing or structuring mechanism

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[15] Photograph taken from http://www.theguardian.com/football/2013/aug/08/football-goal-decision-system (last accessed 30.11.2013).

[16] See http://www.sportpulse.net/content/fifa-bringing-change-offside-law-9003 (last accessed 28.6.2013).

which becomes apparent during a football match. For example, such regulations concern the team members in the technical area next to the pitch, which is occupied by substitute players, assistant coaches, and the medical team. The regulations indicate who is allowed to move within these parameters and in what way, and who is allowed to give directions to players on the pitch.

> 8.22.2 Only one person at a time has the authority to convey tactical instructions to the Players during the match from within the technical area. [...]

> 8.22.4 The occupants of the technical area must behave in a responsible manner at all times. Misconduct by occupants of this area will be reported by the Referee to The FA, who shall have the power to impose sanctions as deemed fit.

> 8.22.5 With the exception of the team manager, the team coach and any substitutes who are warming up or warming down, all other personnel are to remain seated on the trainer's bench. The team manager or team coach is allowed to move to the edge of the technical area to issue instructions to his team, but must then return to the trainer's bench (The FA Rule Book 2012/13:512).[17]

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[17] The rulebook for the 2012-2013 season can be accessed in PDF form at
http://www.thefa.com/~/media/Files/TheFAPortal/governance-docs/rules-of-the-association/fa-handbook-2012-13.ashx

Rules and regulations influence how match data is collected and how, for example, performance indicators are adjusted to the regulatory framework. In the UK, companies have to purchase a licence from an official body to measure the league. This body is called the Football DataCo,[18] which is setup to regulate the publishing of British football league data in the public domain. Not only do they regulate the types of data that they allow for collection, but they also prohibit the measuring of a player's heart rate, respiration, and GPS co-ordinates with external devices attached to the player. This would be conducted via a technologically enhanced vest or heart-rate measuring band. Such technical devices are allowed during training or friendly matches, but not during an official league game. If the clubs use a fixed camera system operated by a third party, the respective coder who is responsible for the process of creating game statistics has to start up the computer and the software before the match. Furthermore, the cameras in the stadium have to be calibrated to the pitch size in which the capture of movement via the tracking programme takes place. In this sense the regulatory framework is partially responsible for the fluctuations between pitch sizes as they allow clubs a certain amount of 'spiel' in terms of the overall size of the area in which the match is played.

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[18] See http://www.football-dataco.com/ (last accessed 01.12.2013).
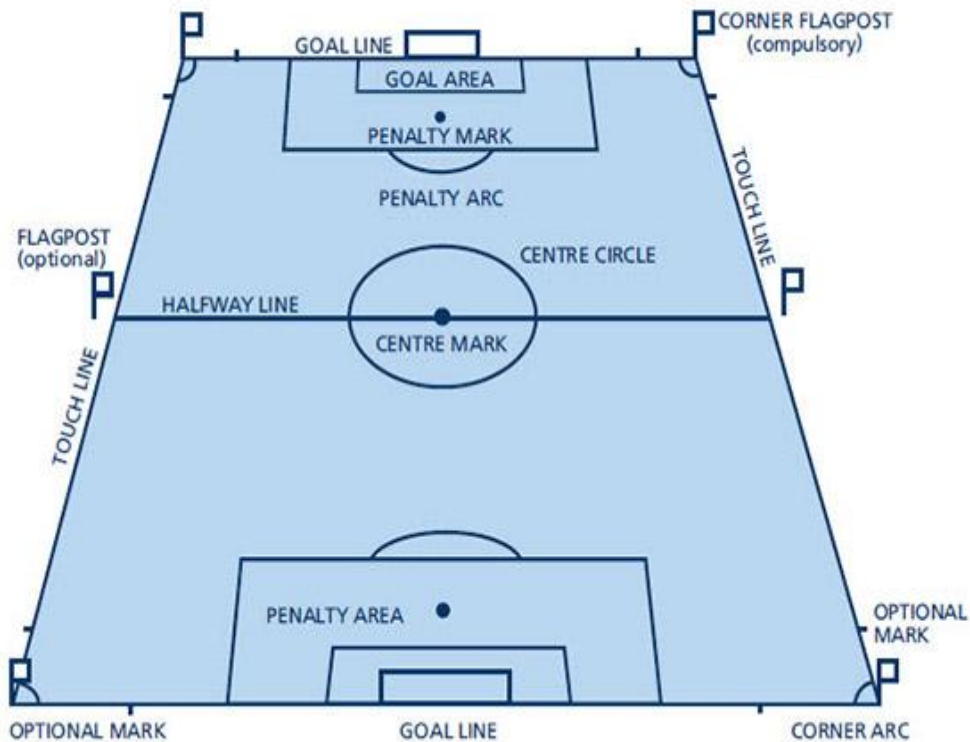
Figure 3. Field of play[19]

Figure 3 represents a formal layout of the pitch while also ascribing meaning to certain areas on the pitch which have implications for the enforcement of other rules. Fouling a player from the opposite team, outside of the penalty area, results in a free kick. By contrast, a foul conducted inside a team's penalty area against one of his opponent's results in a penalty being given to the other team. With respect to the process of calibrating the computer hardware-software setup, such a process is necessary because the size of pitch can vary within a certain regulatory framework.

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[19] http://www.thefa.com/football-rules-governance/laws/football-11-11/law-1---the-field-of-play.aspx (accessed 28.06.2013).

Figure 4. Measurement of the pitch[20]

However, when the clubs use a setup which employs the television feed, this calibration process is not a factor as the information they derive for creating statistics is captured from the television video feed focused on the ball in motion.

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[20] See ibid.

1.5.2. First attempts at Arsenal FC - Historical change of technology and practices

The story of performance analysis in football in the UK is not only about creating, managing, and interpreting the team's statistics, but the practice also revolves around a technological change that can be traced back to certain developments in the way football matches are captured in relation to the technical video recording equipment in use. The whole system of cameras, software, and computers is digital and vastly different from the analogue system that was still used a decade ago. Before there was computer aided statistical creation back in 1996 when OptaSports was founded, games were largely coded manually. The 'old school' way of coding included the use of pen and paper, a classificatory schema, and the game running on television as a recording (Pollard 2002; Anderson & Sally 2013:10).[21] The origin of this method can be traced back to an assistant coach named Charles 'Wing Commander' Reep (Larsen 2001; Pollard 2002) a former Royal Air Force (RAF) officer. The Journal of Sports Sciences even went as far as to describe him as the 'first professional performance analyst of football' (Hughes/Bartlett 2002:735). Reep had an analytical interest in football. This was further sparked when he attended at seminar by Charles Jones, the captain of Arsenal FC at the time. This talk featured a vignette about the systems of play employed by Herbert Chapman, the manager of Arsenal FC. He was drawn in by the analytical detail in which the tactics to create goal-scoring

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[21] See 'Charles Reep (1904–2002): Pioneer of notational and performance analysis in football' by Richard Pollard (2002) for an in-depth historical account on the development of the methodology.

opportunities were described (Lyons 1997; Pollard 2002). His professional background was in accounting, and he had a try out using his analytical capabilities with teams he was a part of in the RAF (Reep 1989). His analytical tools had scarcely been published and consisted of showing how games can be broken down into sequential passing movements to which he ascribed a manually written code for each sequence.

> Some eye-opening features were being brought to light entirely unexpectedly. I could see that a whole new dimension of soccer "expertise" was opening up before me, in which I would be the unchallenged pioneer. From then on, I was completely hooked on performance analysis! (ibid:32)

His first attempt to create this system happened when he was a spectator at Swindon Town's game against the Bristol Rovers in 1950 (Olson 2001). He manually and systematically notated with pen and paper what he could observe in the game. The different increments he coded were actions, positions, and passing sequences. His first job in professional football came during the 1950–1951 season when he was introduced to the Brentford football club through a common friend (Sally & Anderson 2013:300–301). At the time, Brentford was within the relegation zone of the table. From then on, he analyzed their games and provided advice. Brentford went on to win the next 13 matches out of 16 that season. Reep was basically analyzing what is commonly referred to as the 'playing style' of football teams. This refers to finding out about the specific formations teams employ on the pitch (e.g. a 4-4-2 or a 5-3-2) and how players may embody specific characteristics

when playing on the pitch such as, for example, a fast winger who prefers to move in front of the box to shoot from distance or a defender who moves up the pitch once in possession of the ball to pass it towards the offensive midfielder. The system Reep developed was designed to uncover the possible intentions of coaches and players during games including their choice of tactics, the use of an offside trap, and which player initiated those types of tactics (Pollard 2002). His coding schema provided shorthand for manually recording, for example, an attacking move and the subsequent result of such an action. In 1955, Reep retired from the RAF, was employed by Sheffield Wednesday, and afterwards went on to work at Watford FC (Larsen 2001). The English FA took notice of Reep's work in 1981 when Charles Hughes contacted Watford to learn more about what Charles Reep was doing. Both parties went on to develop a lively correspondence about Reep's work (Hughes 1990). Reep's effort to establish a coding schema for analysing football matches not only left a mark on English football, but also on Norway's development of professional football when sports scientist Egil Olsen adopted Charles Reep's methodology (Larsen 2001). Only later in the 1990s those codifications were inscribed into a computational database (Hughes & Franks 1995). By pressing the start and the stop button on the video recorder the analyst had to 'small-chunk' the game and manually code what was happening with pen and paper. The schema for classification was distinctively simple. Only shots, passes, and saves were coded. Compared to performance analysis in 2013 when matches are sometimes coded live with constant updates for the coaches via headsets or displayed on a tablet computer, the pen-and-paper approach used in the 1980s and early 1990s took ten hours (Anderson & Sally 2013:10) to code a match. As I have mentioned in previous

sections of this chapter, back in 2002–2003 games were recorded on analogue video systems (O'Donoghue et al. 1995). This made the quantification process and the mass creation of statistics very difficult:

> To be honest, back in the day we did not have touchscreens, and the data wasn't very detailed […]. I worked on a contract and had to update the machine from time to time as well. […] [I]t was quite different back in the day […]. The video files were huge, and we had a tower to run all the codecs […]. You just couldn't plug the database into another application; everything was prehistoric compared to now. (Dok9.1)

Since then, the capacity for computer storage has risen exponentially and created the possibility to store high definition match footage and package it with statistical data. In addition, the portability of mobile devices that are able to run the accompanying technology in the form of software, as well as laptops able to show high definition video and the recent rise of tablet computers have significantly changed the process of analysis. The portability of such a package of footage and statistics allows for different ways of showing and telling information to coaches and players as well. Although the software for coding matches is the same among different types of sports,[22] the template used within these programmes differs greatly. This is due to the fact that different formal rules for games allow the unfolding of playing patterns in ways which are compatible with the official setup of regulations. Regulations are not only a structuring device for how games are played,

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[22] The industry standard is Sportscode.

they also frame the ways of working in which performance analysis is allowed to operate, for example, according to the regulations established by governing bodies such as the FA. As I have shown in this chapter, performance analysts are mainly prohibited from sitting in the coaching area on the sidelines of the pitch. Furthermore, the players may wear GPS transmitters and heart-rate monitors in training sessions, but are prohibited from doing so in matches under the umbrella of the Football Association. Consequently, I was able to discover that the technical literature on performance analysis was mostly an account of where this technology and mode of analysis came from and how it could be implemented within different sports, such as rugby, cricket and football (McGarry, O'Donoghue & Sampaio 2013; Carling, Williams & Reilly 2005). Studying this literature helped me to understand the technical setup, make sense of what analysts were talking about in interviews, and understand the limitations that this approach may produce.[23] Different sports have different rules; rugby is different from football in the way it is played. In this sense, rugby can be a good example. Not only does this sport differ from football in terms of the number of players involved,[24] but a different type of ball is used. More importantly, the pitch size is different, you may use your hands to carry the ball in rugby, and the playing sequences in terms of ball circulation are very different given the formal rules in terms of passing the ball and the range of physical contact allowed between players. A scrum would simply not be allowed in football. The actual game mechanics and the way playing sequences unfold are very different and require different types of coding templates, which translate into quantitative

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[23] See the fourth chapter for a more in-depth reflection on this topic.

[24] Rugby league football features 13 players per side compared to 11 per side in football.

databases. However, interpretation and the subsequent communication of such coding requires an understanding of the rules and mechanics of football. The whole process of performance analysis, the diffusion of match statistics, and the subsequent analytic process are highly dependent on a technical foundation, which enables the current workflow described in this thesis. Sense- and decision-making have an underlying technical manifestation rooted in the coding utensils and in the computer-software setup that allows interpretation of match events. The origin of the current setup of capturing movement of objects and people on a video screen derives from technology originally developed for military purposes. It is based partly on the principles of optronics, which essentially means the detection, observation, recognition and location of military objectives (Carling et al. 2009:93). The technology was influenced by the development of software belonging to image processing and mathematical algorithms to guide missiles (ibid.:90). As I will show in the subsequent chapters, the role of the computer and the accompanying software is one of the key anchors that guides the practice of performance analysis and the creation of match statistics, and is a factor present when analysing and interpreting match data as well.

1.5.3. Development towards a profession - Grounds of legitimacy

One way of explaining this process of adapting performance analysis can be achieved by using the theory of mimetic isomorphism as a template. The concept of

isomorphism is borrowed from mathematics and can be applied in the sense that: '[...] two objects are isomorphic if they are indistinguishable given only a selection of their features' (Vinberg 2003:3). In sociology, the concept of isomorphism was formulated by Paul DiMaggio and Walter Powell (1983) in their article '*The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields*'. This article is also part of the three canonical articles which manifested '*Neo-Institutionalism*' as a strand in organizational sociology; it has since been expanded by John Meyer in his research on the '*World Society*' theorem (Meyer et al. 1997; Meyer & Jepperson 2000; Meyer, Krücken & Drori 2009). Isomorphism is defined as '[…] a constraining process that forces one unit in a population to resemble other units that face the same set of environmental conditions' (DiMaggio & Powell, 1983:146). Isomorphism emphasizes the role of conformity and convention as a response to environmental pressures exerted on organizations. The literature suggests that there are different types of isomorphism which should be thoroughly investigated. In this sense I have addressed a prevailing critique for this specific type of theory in its application to empirical research, '[...] researchers are positing a particular process that results in a behavioural outcome, but they are measuring only the outcome while assuming the process' (Mizruchi & Fein 1999:664). '[T]his selective appropriation provides a limited picture of the world and at the same time unfairly implicates them [DiMaggio and Powell] as accessories to this limited picture' (ibid.:680).

First of all, coercive isomorphism may be diagnosed when organizations feel pressures in the form of force or persuasion. Coercive isomorphism can result from formal financial relations, for example, a World Bank loan (Stein 2008:130), from

funding received from governments, which is tied to certain actionable requirements or from less formal relations, such as the pressure to participate in competitions such as a European PISA study (Wiseman, Astiz & Baker 2013:31–32). Essentially, this means that organizations experience '[...] pressure to conform to institutionalized organizing templates' (McKinley & Mone 2003:362).

Secondly, normative isomorphism of organizational change stems primarily from professional pressures. In the field of education, accreditation agencies (Scott 2008:212), professional certification boards and training institutions reinforce normative expectations and impose standards, rules and values on universities and schools. Normative isomorphism is encouraged through filtering of personnel. In this case, professional and accreditation agencies serve as gatekeepers determining who should be allowed into certain types of jobs (ibid.). Normative isomorphism can result from the type of 'experts' that educational systems rely on to implement reforms like the recommendations of management consultants.

Lastly, mimetic isomorphism can be diagnosed when organizations imitate others perceived to be successful when they are faced with uncertainty and ambiguity. For example, one university chooses to model itself after another that is perceived to be more prestigious in the public eye. In the field of education, mimetic isomorphism is encouraged by, for example, academic conferences, exchange programmes, international educational experts and information technology (Wiseman, Astiz & Baker 2013). In the specific case of professional football in England, I may speculate according to my interviewees' opinions on the topic:

If you look at the timeline of how performance analysis evolved, it started back in the 90's when I think Opta did provide the coaching staff with massive dossiers, but it didn't fly. People weren't ready for it, and they did not have an operator to interpret the data for them. Back in the days, performance analysts were not present to such large extent. (Dok2.6)

An interesting facet to explore would be to look at the grounds on which this practice is based and how performance analysts become a regular feature at the club level. My interviews uncovered that one of the reasons can be traced back to what I call 'legitimacy', and a perception of the success of certain Premier League football clubs. Another element that has prevented performance analysis from being widely used is the complicated process of creating match statistics. Performance analysis, as it exists at the time of writing this thesis (2014), represents a form of match analysis, which is highly amplified by the use of digital computer technology.

According to my interviewees, performance analysis technology and performance analysts were only scarcely present in the Premier League a decade ago.[25] A third of the clubs were equipped with such technology, but the different databases by the different companies, who were offering such services, were incompatible. The lack of high definition footage also led to a high margin of error for coding the matches. The process of digitizing video footage was complicated as it had to be transferred from analogue magnetic cassettes to a digital magnetic disk

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[25]http://www.prozonesports.com/news-article-a-decade-of-performance-analysis-development.html (last accessed 16.09.2013).

drive. The whole process was slow since the video feed also had to be encoded into a video codec that was compatible with the performance analysis software. At that time the software only worked with Microsoft Windows as an operating system.[26] In short, the process was rather complicated as it not only required specialist knowledge to conduct the conversion process, but also made the live coding of matches only possible with a very fast computer. The further transfer of such footage for a half-time analysis was not common at all. At that time, the performance analysis companies mostly employed analysts who were rented out to the clubs who bought the technology and the accompanying software/database licence.

Performance analysts not only work in clubs, but also in other types of organizations. Performance analysis companies employ them to conduct contractor work with certain clubs at specific perceived critical junctures of the season or to present their software at sports science conferences. According to my interviewees, when a team is dwindling towards the relegation zone there seems to be a common practice to hire external experts to help and assess the situation with the goal of helping prevent the process of relegation into a lower league. I came to realize that this was a practice when I emailed an analyst I had met at a conference, who was employed by a performance analysis company. I had a few more questions concerning the work of analysts generally, but received an automated reply via email telling me that the analyst was doing contract work in a club and was out of office for a certain period of time. Companies, like Prozone, offer a consulting service on

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[26] Current software from companies like OptaSports offer a system, which is freed from the barrier of the operating system and can be accessed via Linux, Microsoft Windows or Macintosh OSX as it operates as a web browser-based application, which requires an active broadband internet connection.

pre-match opposition-, post-match statistical- and individual player scouting-reports. These features are consistent with what analysts are doing on a club level as well. Nevertheless, this contract work is being conducted without being embedded in the clubs organizational hierarchy for a longer period of time, but is seen as a measure to combat being relegated into a lower league. The first generation of performance analysts which worked in the Premier League were under contract by Prozone:

> I was hired by X(b05) after my contract with Prozone ended. Most of the guys you'll meet, the more senior ones, their roots are at Prozone. They started there. In terms of variety you will see people use Opta, some Prozone or Amisco; there is a whole lot of variety out there. Those guys are {pause} Prozone opened the door to get into the clubs. This door didn't exist in the clubs until Prozone provided it. (Dok9.12)

Hence, Prozone played an important role by establishing a relationship between the software and personnel. They rented out analysts who would operate the technical machinery, conduct interpretations, and communicate such interpretations towards other actors.

According to my interviewees, the biggest factor in performance analysis becoming a quasi standard and an established methodology was the reign of coach Sam Allardyce who took over Bolton Wanderers FC in 1999. In two consecutive seasons he managed to qualify for the UEFA Cup in the seasons of 2004–2005 and 2005–2006. Allardyce was very vocal about his methods of coaching and was

visually very much equipped with the technology.[27] During matches he wore a headset, which connected him to his analysis team in the stands with whom he was in constant communication. According to my interviewees, the success of the team and his being an advocate for this method/technology was the '*tipping point*' (Gladwell 2000;7ff) for performance analysis to be adopted across the board in the Premier League. A further indicator of the diffusion of his methods is the placement of his assistants at that time at other Premier League clubs after his reign at Bolton ended. Mike Ford is, at the time of writing, the head of Performance at Chelsea FC and Gavin Fleig now occupies the same position at Manchester City FC.

As of 2013, all of the Premier League clubs, all teams in the Championship, and the majority of First Division teams had dedicated performance analysts as their employees. All major performance analysis companies such as Prozone and Opta code the matches of these leagues into quantitative databases. From what I could digest of my interviewees' information, Allardyce was considered to be the biggest influence on this development to spread out and institutionalize performance analysis in English football.

> One of the interesting things about Sam Allardyce is that he is seen as a traditionalist. That's true in the sense of the kind of football his teams play, but he's not averse to modern methods. He has been an interesting fore-runner of modern management in English football [...] He was one of the first people to embrace Prozone which tracks

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players' movements on the pitch and he is very interested in sports science aspects of the game.[28]

At the time of Allardyce taking over, Bolton was considered to be an average team, but his methods were retrospectively regarded as pivotal in the Wanderers' success. The following league-wide adoption, which has now diffused into other European leagues, such as the German Bundesliga[29] and the Spanish Priméra Division, led to a whole global market for quantitative football databases, which are also used to scout players from other overseas leagues. Prior to this development, match statistics were mostly used in media coverage.

Using statistics to scout players can lead to curious incidents when players are scouted via video footage and statistics alone.[30] A recent case of this was observed in the German Bundesliga.[31] The club Hannover 96 wanted to sign a tall central defensive midfielder who would be more robust in duels on the pitch. The player they went on to sign was the Brazilian Franca who was supposed to be 1.90m tall. When the newly signed player ultimately trained with his new teammates, the head coach Mirko Slomka, who is 1.87m tall, stood next to the player and saw he was significantly shorter than himself. After taking his measurements, the coaches'

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[28] http://www.newstalk.ie/Shouldnt-Sam-Allardyce-be-getting-more-love (last accessed 03.12.2013).

[29] Impire, the company who is responsible for measuring the league in a similar way like Prozone is doing in England, is using a fixed high definition camera system inside the stadiums.

[30] This type of scouting is touted to as 'technical scouting'.

[31] http://bundesligafanatic.com/hannover-come-up-short-with-franca-and-5-other-botched-bundesliga-transfers (last accessed 28.06.2013).

observation was right. His height came in at 1.80m; the player was not as tall as stated in the statistics, which were a basis for the scouting process.

Earlier on in this chapter I described the success of Bolton Wanderers as consequential for the establishment of performance analysis in the Premier League. The retrospective fit of this pivotal approach led to the perception that Allardyce's methods were considered to be legitimate modes of coaching that, in turn, could bring about success in a way that was lacking in other clubs. Other clubs adopted the approach, leading to a diffusion of performance analysis not only into the lower leagues, but more prominently into the media and the lives of everyday football fans who 'could play' performance analyst with the FourFourTwo StatsZone application on his or her iPhone. As I explained earlier, mimetic isomorphism can lead to greater similarity in the internal structure of football clubs by establishing distinct performance analysis departments, thereby formally fulfilling the requirement set up by the original mathematical formulation of isomorphism discussed earlier in this chapter.

> [...] I propose that isomorphism is the master bridging process in institutional environments: by incorporating institutional rules within their own structures, organizations become more homogeneous, more similar in structure over time, primarily within a particular institutional environment and context. (Scott 2008:209)

In this sense one may suggest that the perception that performance analysis led to Bolton's success led other clubs to believe that performance analysis led to such success. In this case it was Allardyce's methods, and ultimately the concept of

performance analysis which Allardyce himself was exposed to when playing for the Tampa Bay Rowdies in 1983 (Carson 2013). Back then, the method was known as 'notational analysis' and it was employed at the Tampa Bay Buccaneers football team which he frequently visited during his time in the United States.[32]

Following this argument, the success of Bolton Wanderers was largely attributed to Allardyce's method of coaching, which placed considerable emphasis on using performance analysis.[33] Gavin Fleig, one of Allardyce's assistants at Bolton Wanderers recounts the story of signing:

> [...] the 34-year-old central midfielder Gary Speed in 2004. On paper, Speed looked too old. But Bolton, said Fleig, "was able to look at his physical data, to compare it against young players in his position at the time who were at the top of the game, the Steven Gerrards, the Frank Lampards. For a 34-year-old to be consistently having the same levels of physical output as those players, and showing no decline over the previous two seasons, was a contributing factor to say: 'You know what, this isn't going to be a huge concern'".[34]

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[32] See www.bbc.co.uk/sport2/hi/football/teams/w/west_ham_utd/9622091.stm+&cd=5&hl=en&ct=clnk&gl=de (last accessed 24.10.2013).

[33] In this instance I should also mention that I could classify this development as one involving created and believed myths (Meyer & Rowan 1977), which were incorporated on the grounds of perceived legitimacy.

[34] See http://www.ft.com/cms/s/2/9471db52-97bb-11e0-9c37-00144feab49a.html#axzz1Pd78IO00 (last accessed 16.06.2013).

The success of Bolton Wanderers led to the adoption of performance analysis as an incremental part of the organizational work sphere of professional football clubs. However, according to my interviewees, the internal reality of these clubs sometimes does not quite match their outer '*front-stage*' (Goffman 1961) appearance. A performance analysis branch may exist within a club, but other factions, such as the coaching team, may disregard or dislike the method. During my time conducting my empirical data collection, I frequently witnessed analysts referring to 'dinosaurs in the league' (Dok6.9), who disliked their work because it lacked their own experience. Some of my interviewees voiced their frustrations about doing their analysis work, but were not able to enter reciprocal interactions with the coaching team. In this sense one could also invoke the concept of '*structural decoupling*' (Selznik 1996; Caruthers 1995). This means that the mention of a performance analysis branch on the club's webpage may be an indication of its existence intended for the outsiders of the club, such as the public or the media. On the inside the actual organizational reality may be different in the cases where there is a dissonance between, for example, the performance analysis branch and the coaching team. Hence, the outward appearance of a club may be decoupled from what happens on the inside. This subsection showed how most clubs in the Premier League and the Premiership had a performance analysis department. However, possessing such an organizational element may not be indicative of how performance analysis actually occurs inside the clubs and may, in any case, vary to a large extent.

1.6. Organizational background

> We often forget how much infrastructure lies behind the numbers that are the end product of counting regimes. This is especially true when numbers circulate to places that are removed from the bureaucracies that manufactured them. (Espeland & Stevens 2009:411)

Judging from my fieldwork data, football clubs are now a highly diverse work environments with different branches. Each branch is equipped with different responsibilities in the organizational work sphere. Almost every analyst I interviewed told me that the clubs they are working for possess an internal configuration, which can be considered to be a very specialised form of a division of labour (Abbott 1988; Durkheim 1982).

This assemblage of different departments happens in a hierarchical organizational environment with the owner (or the board of owners) sitting at the top and the coaching team and administrative managers right below. The role of the performance analyst can be subsumed as the person (or persons if it is a team) who provides the rest of the organization with statistics, selected statistics, and summaries of statistics in text form such as dossiers about the team's (and players') performances in training and during matches. They are, in essence, the guardians and creators of quantitative (and after the interpretative process partly qualitative) data. They supply the contract management team with individual player statistics for negotiations about the players wages and the board with statistics in terms of the development of the team and its overall performance in a quantitative sense; but they

work most closely with the coaching team to analyse the teams' past outings, and with the players to review matches and brief them about the team they are facing next. As I have described, the scouting department may also rely heavily on statistics to screen for players who fit the coaches' preferences for characteristics in terms of playing style on the pitch:

> The biggest area we're involved with now is player recruitment. No team will sign a player based on data alone, but it's increasingly a shortcut to a shortlist. (John Coulson, Head of professional football services at OptaPro)[35]

Analysts not only work with the database they receive from performance analysis companies such as Prozone of Opta, but they also create their own statistics during live matches and in training sessions. They supply the medical branch with performance data for them to estimate the players training load and recovery periods. At Arsenal Arsène Wenger believes in the metric of the so-called 'reds zone', which players enter when they run a certain number of kilometres in games and then tend to decline in performance.[36] This metric is a signpost to substitute players or reduce their playing time in the next match. To give the reader a better understanding of

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[35] http://www.theguardian.com/football/blog/2013/jan/20/football-data-scouts-michu-transfer (last accessed 02.11.2013).

[36] http://www.theguardian.com/football/2012/apr/20/arsene-wenger-robin-van-persie-arsenal (last accessed 23.10.2013).

what a club in the Premier League looks like from an organizational point of view, consider the following diagram.
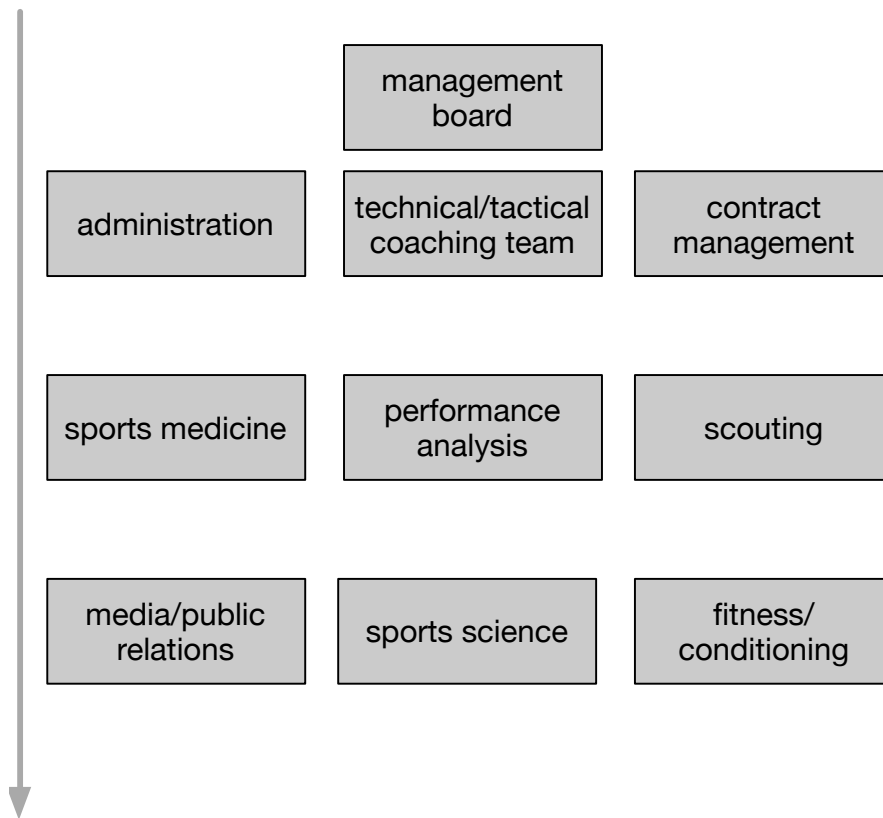
Figure 5. Simplified top down organizational hierarchy of a club.

At the top of the club's hierarchy are the owners, who usually are organized so that they sit on a board as directors of the club. They are usually on top of hierarchy when it comes to making decisions about the direction they want to take the club or which personnel they want to hire as managers and players. Below them is the managing team that consists of coaches and assistant coaches who comprise the

technical and tactical branch of the club. They train the players, coach them in matches, and directly talk to the board and the scouting department about the players they want to sign or let go. The other branches, like sports science (including nutritionists), medicine (the team doctor, physiotherapists, masseurs) and the physical conditioning department provide an infrastructure to the team in terms of training the players to improve or maintain their physiological capabilities, helping them to deal with injuries, or providing recovery after matches. Judging from my interviewees and the conference talks I was able to witness, performance analysts are likely to be at the centre of quantitative information at the club providing data and their interpretations for all the other branches that rely on match and training statistics to shape their reasoning and decision-making.

1.7. The concept of performance in sports psychology

Within sports psychology, performance is investigated differently by employing experimental methods over longer periods of time and laboratory studies. This development began in the 1890s when William James taught psychology to the students of the physical training programme at Harvard. During the same time E.W. Scripture was interested in applying psychology to everyday life (Kornspan 2012:3). These two demarcated a change in which psychologists strayed away from philosophical thought (Kornspan 2007) and began to explore how evidence could be gathered in a laboratory setting. In 1894 Scripture started the first attempt to study

sport in a laboratory to find out whether psychological findings could be applied to sport (Kornspan 2012:4). Furthermore Norman Triplett tested whether the performance of cyclists would change if they rode alone or against a competitor (Kornspan 2012:5). Another important figure was Wilhelm Wundt because 8 of his 16 doctoral students went on to become professors who researched physical training and athletics.

From the 1920s till the 1940s psychologists and educators began to study the psychological aspects of athletics. They had an interest in applying psychology focused on the use of psychological testing and measurement. This was done to identify highly skilled athletes (Kornspan 2012:6) and the testing often took place in laboratories. This involved finding the psychological attributes that helped athletes become successful (Fuchs 1998). In the USA, laboratories were established in Germany where Wundt's former student Werner Schulte (Gradenwitz 1932) tested athletes in order to find out how resilient they are psychologically. In Russia, P.A. Rudik (1962) conducted studies to find out about the reaction times of boxers, wrestlers and runners (Kornspan 2012:7). In the US professional athletes like baseball player Babe Ruth were brought into the psychology laboratory of Columbia University. There they tested him on intelligence, how fast he swung the bat and perception (Fullerton 1921). By the end of the 1930s, psychologists were consulting with coaches. They tried to find out how to incorporate psychological testing for athletes like Coleman Griffith with the Chicago Cubs baseball team (Green 2011). In 1928 the Federation of Sports Medicine was founded to introduce scientific research to sports (ibid.).

In the 1940s and 1950s, psychologists and educators began to explore different ways in which psychology could be applied to help athletes improve their performance. As a result, in the 1940s athlete consultations involving cognitive behavioural models were introduced by Franklin Henry and Anna Espenschade (Kornspan 2012:9). In the 1940s, Dorothy Yates introduced 'progressive relaxation and affirmation' to the regime of boxers (Kornspan 2012:10). In that era psychological research about the performance of athletes was starting to be applied in the field (Kornspan 2012:12).

By the 1960's sport psychology acquired worldwide interest. At the sports medicine conference in Barcelona in 1963 the International Society for Sport Psychology (ISSP) was founded, which then generated multiple national sub-organizations like the British Society of Sports Psychology in 1967 or the French Society of Sport Psychology in 1967. The organization went on to promote the application of psychology in sport (Kornspan 2012:12). In the 1960s and 1970s research on peak experiences by Abraham Maslow (1968) and Mihaly Csikszentmihalyi's (1975) concept of the flow state became prominent in sport and performance psychology. During that time, the methods of mental training developed by sports psychologists were also diffused into other areas of society such as the military and corporations (Kornspan 2012:16).

With the 1990s, issues pertaining to professional practice emerged and accreditation of sports psychology degrees became a topic. Hence standards were established in the US in terms of guidelines that sports psychologists had to meet to call themselves practitioners. This title could be obtained by completing a masters degree in sports psychology. This time period also saw the rise of performance

improvement methods being applied to field business, military, finance and professional sports organizations as well (Kornspan 2012:17).

One can assume that research on performance in sport psychology was mainly geared towards researching how athletes conducted and attained high levels of performance; the practical applications were largely focused on how performance could generally be improved by using psychological techniques.

1.8. Societal embeddedness – Quantification of work performance

As I have mentioned previously this whole theme of performance analysis fits roughly into the paradigm of how people in the workforce get measured by their behaviour on the job and touches upon the sociology of quantification (Espeland & Stevens 1998; Espeland & Stevens 2008).

> (A) sociology of quantification should recognize the effort and coordination that quantification requires; the tendency of quantification to remake what it measures; the capacity of quantification to channel social behavior; the polyvalent authority of claims made with quantitative measures; and the art and artifice of numerical expression. (Espeland & Stevens 2008:431)

In this sense, fund managers receive bonuses for reaching targets to do with making a certain amount of profits for the bank or investment house they are

working for (Jung & Dobbin 2012). Factory workers have to stamp in and out with their productivity being tracked (Landsberger 1958). Recent media coverage showed that people who work in the warehouses of the online retailer Amazon are exposed to continuous tracking of their movements and behaviour during their workday (*Der Spiegel* 04/2013). Performance analysis may be considered as an extreme form of this development. Sociological studies have been conducted about the measurement of work in an organizational environment (Scott et al. 2003; Hoffer 2002; Goodwyn & Gittel 2012). However, these environments in which work is measured are quite different than the inside of a football club. Despite the goal of football clubs to ultimately win matches, performance analysis does not have so much to do with hitting work or productivity goals. While footballers generally have incentives written into their contracts,[37] for example, as to how many goals they have to score to receive certain bonuses, performance analysis is more about looking for trends and patterns in performance, which are then reported back to players and the coaching team. Yet upon questioning my interviewees about concerns they might have about creating a panopticon-style[38] system of monitoring the players generally, they did not voice any kind of concern about these issues. Quantifying human behaviour will be explored in the next chapter. There I aim to deconstruct the ways in which matches are actually transcribed into quantitative databases.

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[37] http://www.theguardian.com/football/2013/mar/08/liverpool-luis-suarez-daniel-sturridge (last accessed 16.09.2013).

[38] In my interviews I did not use the word 'panopticon' but rather explained the concept of the panopticon, gave them examples from Bentham's idea about a prison and the general feature of life in the United Kingdom in terms of being tracked by surveillance cameras.

1.9. Summary

The foregoing chapter frames the investigated topic of performance analysis in multiple ways. The intention was to review literature on the sociology of knowledge, the sociology of professions, and the sociology of sports to draw out the relevance of this study to the discipline. I introduced the sociology of knowledge and the sociology of professions as distinct lenses for analysis. As my analysis will show, there are different types of knowledge to distinguish when match statistics are infused into the interpretative practice of performance analysts who underwent formal university degrees and practical placements as prerequisites to their profession. The second part of this chapter is an attempt to descriptively frame performance analysis from different angles to give the reader a better idea where this methodology originated historically, how performance analysts are educated, and how they are embedded into the organizational hierarchy of football clubs. Historically, performance analysis is an interesting case since it underwent very strong socio-technological changes with the acceleration of computer technology development and, as I have established, its adoption across the board in professional football is based on the perception of the method as an indicator of success. Furthermore the concept of performance (and measuring performance) was initially developed by sports psychologists and grew out of experimental methods inside a laboratory. These methods were then applied in sports and other areas of society while the profession of sports psychologists and the study of sports psychology underwent professionalization in the 1990s.

1.10. Going further

While the first chapter served to introduce the reader to the topic of performance analysis and set the stage for later chapters, the second chapter will starts to unwrap what performance analysts are doing. Hence, I will be looking at the creation of match statistics as a necessary precursor to the analytical process performance analysts undergo when they review matches. The quantification of football games happens in different instances given the fact that data is created not only by the performance analysts, who work at football clubs, but also by third-party performance analysis companies. Hence, there are different types of datasets created by other actors (in teams) in detached office buildings and inside the stadium in which games are taking place. In this sense, the second chapter explores the process of data creation, which is a social act in itself and is not purely constructed by a computer-software configuration that tracks and codes games. While the second chapter is an exploration of how match data is created, the third and fourth chapters delve more deeply into the concept of statistics as a form of knowledge; here an attempt is made to uncover the interpretative process performance analysts undergo. This presents an intricate conundrum as performance analysts claim to possess knowledge, which they maintain is 'scientific' and 'objective'. The majority of their work revolves around dissecting statistical datasets and looking for patterns of specifically coded action items like kilometres run, shots at goal, or total amount of sprints in the second half of a game. Hence, their task is to transform what has previously been tacit into something that can be considered explicit in terms of numerical indexation of match events through a computer-software interface with a template for analysing predefined variables. By comparison, the fifth chapter turns

the focus onto the relationship between the performance analyst and other actors within the clubs hemisphere by showing that analysts interactions are essentially aimed at training players to engage in a more reflexive review of their match performances. In reviewing match statistics, analysing video sequences, and interpreting the variables as a means of evaluating players' performances, they engage in interaction to foster a greater degree of reflexivity.

2. The socio-material production of football data

Phaedrus was a master with this knife, and used it with dexterity and a sense of power. With a single stroke of analytic thought he split the whole world into parts of his own choosing, split the parts and split the fragments of the parts, finer and finer and finer until he had reduced it to what he wanted it to be. (Pirsig 1975:79)

We conceptualize quantification as social action that, […] can have multiple purposes and meanings. Only by analyzing particular instances of quantification in context can these purposes and

meanings be revealed. As with language, purposes and meanings of quantification are established through use. (Espeland/Stevens 2008:405)

In this chapter I aim to dissect the socio-material production of football data conducted not only by performance analysts but also by performance analysis companies. Therefore, I aim to show how match statistics are actually created in different social settings. In this sense, match statistics can be seen as a precursor to the interpretative process analysts engage in before mediating their interpretations towards other actors. This chapter largely features ethnographic observations on how match statistics are created in different social settings such as in detached office buildings, inside the stadium, and by different actors. This is done with the intention of giving the reader a detailed view into coding practices. The production of match statistics relies heavily on the socio-material interface coders use that incorporates a combination of computers, specific software packages, and camera setups.

Conceptually, this chapter is an attempt to further the explorations of the framework on '*social knowledge*', which derives from Lamont and Camics' edited volume *Social Knowledge in the Making* (2011). This chapter is an attempt to identify *social knowledge* in the creation of football match statistics as acts of measurement and to briefly introduce how these statistics are used by performance analysts.

Measurement intervenes in the social worlds it depicts. Measures are reactive; they cause people to think and act differently […] turning

qualities into quantities creates new things and new relations among

things. (Espeland & Stevens 2008:413; see Espeland & Sauder 2007)

2.1. Statistics as a form of social knowledge?

(A)n inscription device comprises a particular combination of
machines, pieces of apparatus, and technicians. (Latour & Woolgar
1992:58)

In this chapter I discuss the process quantifying football games into statistical

databases and how this practice is diffused into the organization of clubs. Therefore,

I will show that statistics of game events represent an *epistemic device* (Knorr Cetina

2011:438; Moore & Maton 2001:156). These are *classificatory schema* (Schütz

1982, Schütz & Luckmann 1973), which can be cognitively anchored via social

practice (e.g. live-match coding) and facilitated by socio-technical devices (e.g.

computers and software packages). These schemata consist of people, interactions,

and things in relation to each other (Lamont & Huutoniemi 2011; Douglas [1966]

1988). Match statistics influence not only the ontology of performance analysts but

also serve other branches of the clubs as an incremental aspect to their interactions

and decision-making processes. These elements can be attributed to a wider picture

that I am describing as the practice of performance analysis. What is *social*

knowledge? One may situate it in the inherent practice of actors, which at least

makes it observable to the social scientist. However, a working definition is necessary to draw up boundaries of what can be considered as *social knowledge*. In the edited volume *Social Knowledge in the Making* (2011), Charles Camic, Michele Lamont, and Neil Gross define it as follows:

> […] in the first instance, *descriptive information and analytical statements* about the actions, behaviours, subjective states, capacities of human beings and/or about the properties and processes of the aggregate or collective units - the groups, the networks, markets, organizations, and so on where these human agents are situated. […] we included two further elements as well. These are (1) *normative statements* that draw on descriptive information to recommend and or condemn certain courses of human conduct, programs of collective action, and so on; and (2) the *technologies and tools* of knowledge-making, that is, the epistemic principles, cognitive schemata, theoretical models, conceptual artefacts, technical instruments, methodological procedures, tacit understandings, and material devices by which descriptive and normative statements about the social world are produced, assessed, represented, communicated, and preserved. (ibid. 3)

The consequence of quantification allows performance analysis companies first and, to a lesser extent, the football clubs to produce *descriptive information and analytical (normative) statements* about football matches that can be classified. Initially, this process is set into motion via the practice of coding. Hence, my first

aim is to show the *technologies and tools* for knowledge-making. In turn, these so-called 'match stats' serve other practitioners such as betting companies or journalists as conceptual artefacts, descriptive information and technical instruments for calculating the initial odds, or match-day reports. More importantly, performance analysts employ match data within their cognitive schemata for interpretation and decision-making inside the clubs. These schemata are enmeshed with the hardware/software organization, and make the raw numerical data usable. Quantifying matches, coding variables, and database inscription are part of the production process. This can be circumscribed as a continuing process of actualization which continues during the league season. The first databases concerning the Premier League were established in 1996[39]; in contrast, the clubs have established their own databases on different timelines:

> Our own database dates back to 2007 when we first installed the system; we just had third-party match-day data. […] (T)oday we recorded a training session, and we will record the next friendly [match] as well. (Dok7.2)

Certain players are likely to be taking part in international tournaments such as the World Cup. These games are coded and inscribed into databases by performance analysis companies and by performance analysts working for national teams. Some of my interviewees have also worked on a national team level as

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[39] http://www.optasports.com/about/who-we-are/company-history.aspx (last accessed 20.08.2012).

performance analysts after the end of the league season, and they have provided analysis for the national teams that employed them:

> My contract with Org(8) ended. I was contacted to do analysis for Org(14) […] (O)f course the timeframe is different, but performance analysis is more or less the same during a tournament […]. (Dok1.9)

Therefore, the practice may also transcend the boundaries of league football and have a place in national team cup competitions. The Sports Science department of the University of Cologne ("Team Cologne") has been in charge of supplying the German national team with analysis reports since 2005.[40]

> During the 2006 World Cup in Germany, 16 students were responsible for 31 teams. Now, 45 students are responsible for 15 teams. Ahead of each tournament, the German Football Association's coaching team receives a book's worth of reading material. It includes information about all the other Euro teams. Later, they receive another 40-page document and a DVD illustrating various tactics.[41]

Match statistics not only get infused into the organizational work sphere of clubs but also find a use at the national team level. They become diffused into media

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[40] See http://bundesligafanatic.com/team-cologne-modern-data-analysis-and-scouting-in-the-dfb/ (last accessed 30.11.2013)

[41] http://www.dw.de/scouting-for-the-german-team/a-16040814 (last accessed 30.11.2013).

reports and can be accessed in a reduced version by the end consumer via mobile apps as well (see Chapter 3).

2.2. Coding, representation, and mediation

The next step in this chapter is to show the different ways databases are created via the practice of coding. The following subsections will illuminate the skills required to practice coding and indicate how coding is entangled in the context. Quantification precedes interpretation and mediation. However, if performance analysts are involved in the coding process – which is not necessarily the case – they need to have a firm understanding of how the different actions on the pitch relate to the different variables that are available for coding. With mediation I mean the indirect transfer of a '*knowledge artefact*' (Pinch & Bijker 1984; Latour & Woolgar 1992) through another person or a thing which serves as an informational intermediary. This intermediary is a person (or a group of people), and/or a socio-technical configuration (human-computer arrangement). Mediation leads to a change in representation and understanding of the object (i.e. the database of match statistics) which may be a written text, a Microsoft PowerPoint representation, or a video sequence. Mediation is done by the media as well, who use data snippets of specific players or plays to colour their match commentary in print. One could even make the case that the initial transformation of football matches into databases

represents a form of mediation as unfolding events are transformed into databases by using the computer-software interface. In the case of my field of inquiry, the grounding base layers are different data points in the produced match statistics, which anchor these objects in a computer file. I am aware that this is rather formal, if not mechanical by definition, especially since the process of mediation is a social act.

However, there is a plethora of ways to create these specific match statistics. For instance, clubs produce statistics, but third-party companies produce statistics as well. The production of statistics is also commonly described as '*data mining*' (Dok6.1). It is a common feature in other areas of social life and can be observed in recent media coverage about the American intelligence agencies' web of data collection programmes such as PRISM to collect and track users communicative behaviours on the phone and during use of the Internet.[42] One of the stranger occurrences during my fieldwork inquiry was a talk by a representative of a supermarket retailer at a conference about the retailer's way of collecting data and their subsequent analysis. Data mining appears to be a very common tool among retailers to profile consumers' behaviour, structure the way special offers are made, and reward the consumer with incentives in the form of vouchers connected to, for example, their Tesco Club card or Sainsbury's Nectar card.[43] Performance analysts, in general, are mostly not statisticians in the classical sense of applying mathematical formulas, but generally see statistics mediated through software such as *Prozone3*,

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[42] http://www.theguardian.com/world/2013/jun/07/prism-tech-giants-shock-nsa-data-mining (last accessed 30.11.13).

[43] http://www.theguardian.com/lifeandstyle/2003/jul/19/shopping.features (last accessed 06.04.12).

which transforms the players spatio-temporal position recording into a more visually operated computer program. In contrast, the data provided by *Opta* is not focused on the distance and speed of players, but focuses more on descriptive contextual statistics of the visible image on the televised feed. Therefore, the types of variables are quite different from the *Prozone* package. Instead of coding an action of a player as a generic pass event, which is either successful or unsuccessful, *Opta* offers a difference in descriptiveness, whereby the events are coded in greater detail:

> [T]here are differences in which Opta and Prozone code their data. Opta directly delivers to the media and codes live matches; the depth of the statistics is also very different. […] Prozone logs passes, but Opta goes beyond that. Opta logs whether it was a chipped pass, a through ball, a switch of play, a cut back, a flick [not understandable] you know a lot more context and descriptives to data. A shot on goals isn't logged as a shot on goal but also left footed, right footed or a header; was it swerving was it dipping, Opta data adds a lot more detail to it […] you can see here the conversion rates, left footed, right footed, one-on-one situations with the goalkeeper. So you can see conversion rates in different situations. (Dok 1.1)

They code ball events and employ a more detailed coding sheet to use as a categorization template for what happened on the pitch. Analysts have to reconcile both types of available data since the two databases are incompatible. Either they have a valid subscription to one of the databases or to both at the same time. The

other factor which separates Opta's technology from Prozone's approach is their use of the television feed instead of a fixed camera system. Therefore their data does not cover what happens on the whole pitch, but rather what is visible on the feed made for television from the side of the pitch.

In order to get a better understanding of what these match statistics actually are and where they are coming from, I am going to go into the production process of match statistics. In Chapter 1, I showed the creation of match statistics from a manual notational analysis system transformed via the use of software and computers. For tinkering purposes, the programme 'FourFourTwo StatsZone' can be downloaded onto a mobile platform to get a better idea of how performance analysis software looks from a consumer's perspective. However, compared to the software versions clubs use, their functionality is very limited.

Basic variables like player movement on the pitch or specific passing sequences can be visualized.

Figure 6. This is a snapshot of FourFourTwo StatsZone software interface (the software uses match statistics provided by Opta). The different arrows show the different shots at the Goal of Chelsea FC against Rubin Kasan. The different colours of the arrows indicate whether the shot resulted in a goal, was on target (saved), off target, or blocked.

However the home use of such programmes does not allow full access to actual statistics in terms of exporting or extracting datasets. In this instance, statistics can be seen and used as a means of interpretation only within the boundaries of a screen device such as a smartphone, a tablet computer, or the recent combination of the two

devices, aptly named the '*phablet*'. While many things can be considered to be *knowledge artefacts,* the specificity of the actual object[44] lies in the context of use and the actors who use and interact with it. The objects also provide for certain acts owing to their inherent qualities or their actual content. The base layer of match statistics derived from different providers in its numerical form stays consistent. The abstractions and transformations of numerical representations are diffused into different spheres of application (clubs, media, and betting companies) and are put into immediate use that is dependent on the trajectory of intended actions (e.g. inside club review sessions vs. match reporting vs. calculating odds) and the knowledge about the context that these statistics are intended to describe.

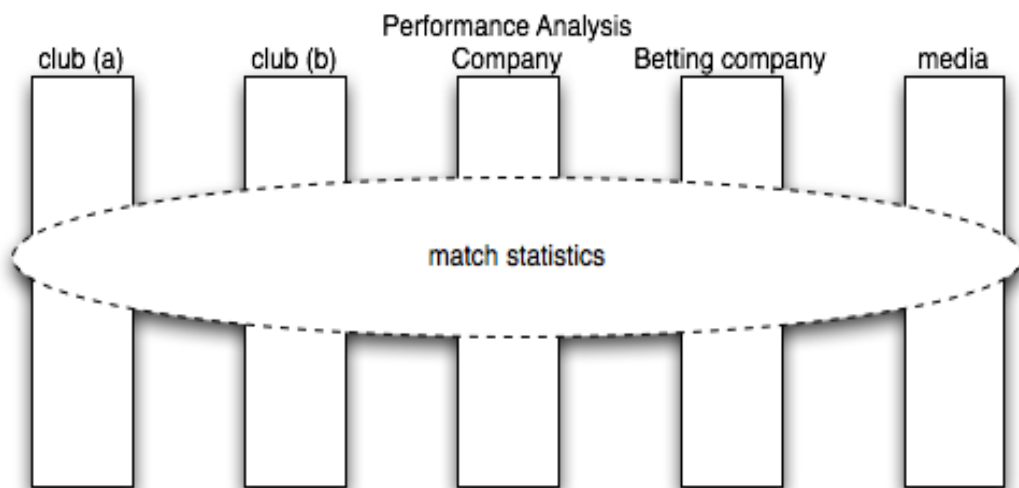*Figure 7. Diffusion of match statistics between different forms of organization.*

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[44] In anthropological jargon these might be considered as 'stuff' (Miller 2009), meaning artefacts that require material knowledge to be produced and interpreted.

Depending on the directed vector of appliance towards a certain goal, intently using these '*knowledge artefacts*' implies a different angle of usage and hermeneutical extrapolation by the respective users of these objects. The interpretations of match statistics as '*types*'[45] consist of specific ways of reasoning which performance analysts employ to foster their interpretations (see Chapters 3 and 4).

Consequently, match statistics get delivered in different forms to different audiences. Performance analysis companies may package statistics differently for clubs, betting companies, and the media. In other words, Opta or Prozone may act as the initial knowledge selectors. They deliver packages of quantified football game events in various different physical and virtual manifestations depending on the customer's wishes, technical possibilities, and contractual obligations:

> It really depends on what the coach wants […] X(b31) wants us to
> focus a lot on sprints with the ball, zonal defence […] the stuff he lets
> the players do in training […] he wants to see how well they do it.
> (Dok4.1)

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[45] In this case I refer to the Weberian (1973:191) interpretation of types as in 'Gedankenbilder' (thoughts as pictures). Typification is a concept in Schützian sociology (Natanson 1970) drawing on phenomenology and Weberian concepts. 'An ideal type is formed by the one-sided accentuation of one or more points of view and by the synthesis of a great many diffuse, discrete, more or less present, and occasionally absent concrete individual phenomena, which are arranged according to those one-sidedly emphasized viewpoints into a unified analytical construct [...]'(Shils & Finch 1997:90).

We did not have this league-wide system back when I was starting out […] the computers were a lot slower as well […] now things are different, all the clubs have access to the stats. (Dok6.7)

[…] (W)e can do a lot more on the visual side, you see we transfer all the video sequences onto an Ipad […] I have a session with X(b19) later on […] I'm going to show him who he's up against, what he can expect based on our analysis. (Dok6.4)

In this sense there are different types of match statistics, which, depending on the content, the context of use, and the trajectory of intended actions yield to different ways in which these *boundary objects* are understood, solidified in interactions, and mediated by other actors:

As with words, the purpose and meaning of numbers often change as they travel across time and social space. Subsequent uses and interpretations may bear little resemblance to what produced numbers in the first place (Espeland &Stevens 2008:406).

These statistics, which are captured in actualized databases, can be regarded as *knowledge artefacts* (Pinch & Bijker 1984; Latour 1992) or *boundary objects* (Bowker & Star 1999; Hogle 2008:848–849; Star & Griesemeyer 1989):

[T]hose objects that both inhabit several communities of practice and satisfy the informational requirements of each of them. Boundary

objects are thus both plastic enough to adapt to local needs and constraints of the several parties employing them, yet robust enough to maintain a common identity across sites. They are weakly structured in common use and become strongly structured in individual-site use. (Bowker & Star 1999: 297)

As we will see in Chapters 3, 4 and 5, different groups of people use these created objects in different manners and contexts. Furthermore, these artefacts mean different things in different contexts, but their structural underpinnings as quantified artefacts remain the same. This understanding is dependent on whether you are a member of the organizational sphere of a football club or literally an outsider to the organization because you are unable to subscribe to the updated databases of Opta or Prozone. The core of the classificatory schema of the object remains and is diffused beyond the performance analysis companies and the clubs as well.

A classification system is a spatial, temporal, or spatio-temporal segmentation of the world. A "classification system" is a set of boxes (metaphorical or literal) into which things can be put in order to the do some kind of work – bureaucratic or knowledge production. (Bowker & Star 1999:10)

In this case this core objects are numerical manifestations of events and movement of football matches in a computational database that diffuses into the media, the clubs, and the everyday football fans via smartphone applications. Collins (2010:16) would call these manifestations '*strings*' which are 'bits of stuff inscribed with patterns' (ibid.).

Therefore, statistics can vary in terms of the content they provide, the way they are presented to other actors (e.g. graphical or numerical), or how they are communicated to the actor to whom they are being shown:

> You can't expect someone {pause} a coach or a manager to sit in there and use the technology, but there would be somebody there who could then interpret it for them and say okay, out of all the data that's in there, and there's masses of it, this is what I've picked out as meaningful in terms of opposition and our own performance. (Dok4.2)

> Of course the players are gonna see something different […] I will have prepared a highlight reel of set pieces for them […]. (N)o, the coach is getting my full report, every time […]. (H)e will tell me in advance what he wants to see. (Dok5.9)

Hence, the manifestations of match statistics can be considered as quite different given the context in which they are used.

2.2.1. Coding 'in the wild' Part I – Inside an office building

To get a better grasp of how performance analysis companies go about creating these statistics with a dedicated team of coders, I am going to describe two instances of

'match data' creation that I was able to observe during my fieldwork. The first instance happened in an office building on the 7th floor. The open-plan office space has a reception desk at the front equipped with the latest brochures containing short summaries about the functionality of the companies' software products. All of the offices have large glass windows facing towards the inside of the office. Generally, the space is divided into regular multi-person offices. A large table is located in the middle of the area. It is scattered with older computer models and multiple DVD spindles inscribed with past seasons' statistics. The largest room in the office is located on the right side with a battery of 20 computers. An hour before the Premier League match day starts, the computer stations are starting to fill up. The people who do the coding are largely university students or part-time employees aged between 19 and 37. They have been schooled in the process of coding in seminars. This type of education can take up to two months. Consequently, this training can be categorized as an acquisition of a '*tool-kit*' (Swidler 1986): learning how to categorize what they see, therefore quickly interpreting onscreen game events while using the predefined classificatory schema of the computer's coding programme to categorize what is happening. To use the language of cultural sociologists, the training equips them with '[…] mental models and ordering schemata […]' (DiMaggio & Markus 2010:349) the use of which is facilitated by the material devices they use to code.

> As each actor has at hand only a bounded set of heterogeneous resources (concepts, actions, stories, and symbols) for solving the diverse problems of everyday life, distinctive toolkits can be associated with particular actors and collectives. (Weber 2005:228)

In general, a pair of coders, one for each team, codes matches. For them, using the hardware/software interface is a common, almost ritualistic, undertaking in which they engage whenever there is a match to code. Depending on the number of matches during a week, a coder may end up coming to the office one to five times a week. The schedule is especially hectic during weeks when international competitions happen, such as the Champions League or the Europa League.

Fifteen minutes before kicking off, the room is completely filled. Matches from all over Europe are coded and the Premier League has the earliest kick-off time on this specific day. The computers are running dedicated software for coding which syncs with the live 'on-the-ball' television feed. The keyboard they are using has colour-coded keys and markers, which relate to certain coding functions in a programme. Pushing one key or a combination of keys is an act of inscription of game events into a database. Players are marked with a mouse and linked up to the relevant (virtual) slot in the database for this specific player. Player movement on the screen is tracked automatically without further input via the programme. Actions (or events) such as passes are added via clicking specific keys on the keyboard. Once the match starts, rapid clicking sounds fill the room. In this specific case, statistics are collected remotely in an office building. The coders' choice of categories for actions (interpreting player's actions as a pass or shot) derives not only from what they observe on the representation of the television feed, namely, a limited snapshot of the overall pitch centred on ball movement but also on the type of options the coding programme is offering. Players onscreen have white bracket-type markers and the ball is the centre of the camera focus. What happens to the ball is categorized, coded, and inscribed into a database. The programme, on the other hand, grasps movement

of the marked players automatically unless there is a glitch in it and the coder asks for technical help. According to the informal interviews after the coding session, the mental focus of coders is narrowed in on the ball, but widens in situations when multiple marked players stand or run in the near vicinity, or outside forces such as weather or pyrotechnics distort the programme's features. The coders to whom I was able to speak said the work process is mentally taxing but:

> […] once you get into the flow of match, time passes by very quickly. (Dok4.4)

However that may not always be the case:

> Sometimes you just sit there and they pass the ball […] the other side picks up the ball and they do the same, bloody boring if you ask me {laughs} but you have to stay concentrated […] it's my job you know. (Dok4.4)

Other interviewees mirrored these sentiments, which beg the question of whether the process of coding might be considered to have immersive properties in the sense that coding requires deep mental involvement and can induce a state of 'flow'.[46] After one of the coding sessions I was able to witness, I asked some of the coders if the situation was different when they were fans of a team:

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[46] 'A sense that one's skills are adequate to cope with the challenges at hand in a goal directed, rule bound action system that provides clear clues as to how one is performing. Concentration is so intense

{Uhm} of course we are fans as well […] you have to be professional
though {laughing} cheering is allowed, but only after the goal is
coded correctly. (Dok4.1)

Although I did not observe it, I was told that another team checks the data of
each match for correctness three days afterwards; this marks the inscription of the
match into the database as final. The key differences between these coders and the
performance analyst inside the stadium can be categorized as follows. The coders are
working in an office setting. They are not required to interact with club staff
members; their sole purpose lies in the act of coding. They are not involved with
team members in matches to any degree; hence, they are detached from the
organizational decision-making processes of clubs during a match. Their work
purely consists of the coding process; it is a matter of observation, recognition, and
computer-interface interaction without the human-to-human interactional
component. In a sense, these specific 'types' of coders could be described as
detached *inscription agents*.

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that there is no attention left over to think about anything irrelevant or to worry about problems. Self-
consciousness disappears, and the sense of time becomes distorted' (Csikszentmihalyi, 1991:71).

2.2.2. Coding 'in the wild' Part II – Inside the stadium

The second case I was able to observe was live-match coding by a third party inside a stadium. Analysts engage in quantitative coding based on an image generated by a fixed camera system installed inside the stadium. The context in which I was able to observe the system and the coding process happened during a pre-season friendly match. A multi-person team is situated high up in the stands above the touchline. In this sense, their position is quite similar to the actual performance analyst conducting live coding during a match while connected to the coaching team via a headset.
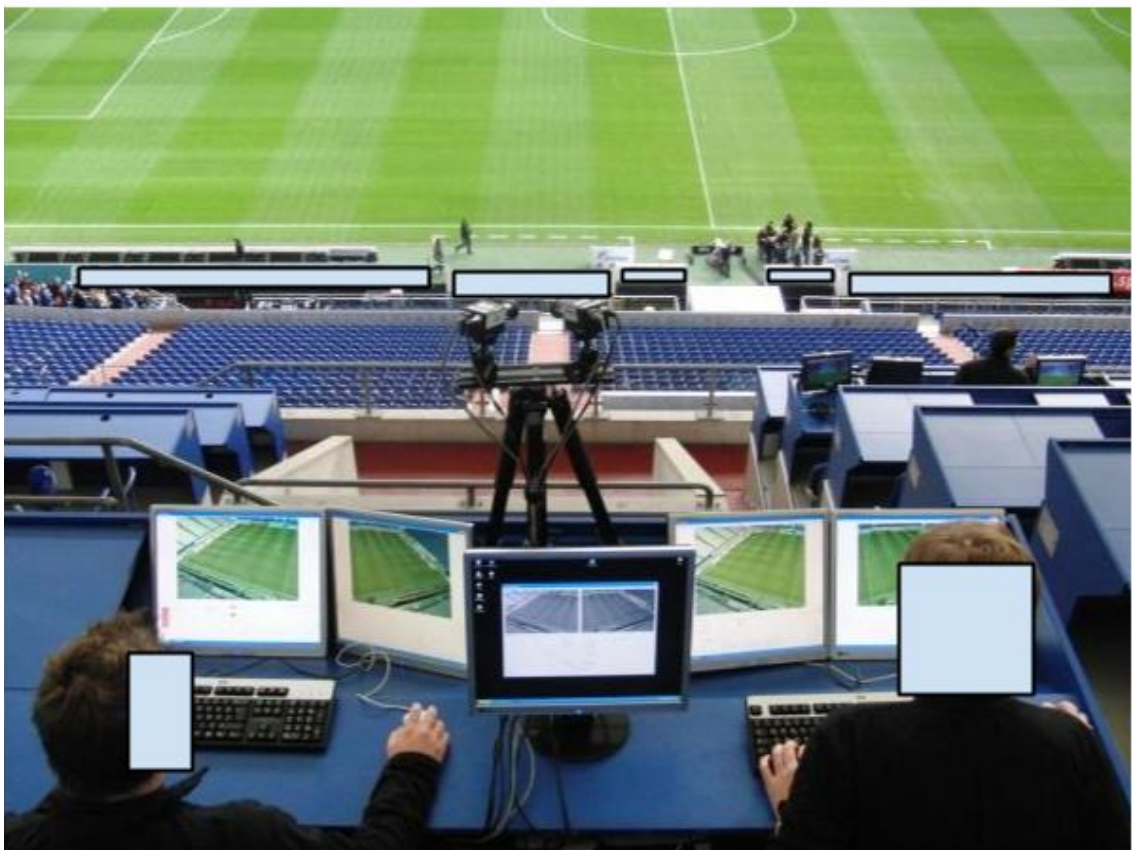

Figure 8. Exemplary setup of a coding configuration to quantify live football matches.

After entering the stadium, I met with one of my interviewees in order to get accreditation. This is a prerequisite for being allowed into the area in the stands where the coding team and some of the media were situated. Two hours before the match, the software–hardware setup was configured and calibrated by the operational expert to make sure everything ran smoothly once the match began. During the match, I was able to observe four people who were involved in the coding process inside the stadium. Although I could not observe this, the coders told me that two people back at the company's headquarters would act as controllers making sure the inscription process into the database worked correctly. Three out of the four coders who operate the computers were university students and were doing this as a part-time job. The fixed cameras inside the stadium can grasp the whole field plus the movement of all players, referees, and the ball at all times. The statistics which are then produced differ quite a bit from the ones recorded via the television feed in a remote office location.

The team of data collectors present at the match is divided into (a) speakers, (b) writers, and (c) the team captain. First, the (a) speaker verbally expresses the events happening on the screen that he or she can observe, such as player X(b21) passing to player X(b22). The (b) writer inscribes these observations with commands on the keyboard or clicks on specific event fields on the screen with the mouse. One has to bear in mind that this capturing process only works with predefined variables and leaves out actions that cannot be coded (so-called 'outlier events'). Text-based impressions are not possible because of the rigid template of quantitative variables. Therefore, the observations, which are verbally uttered, are conducted within the framework of what can be considered as codeable. Again, the software acts as a

cognitive framework that not only enables but also limits the act of classification. The (c) team captain oversees the whole process and can generally be described as a hard-/software expert who assists the coders whenever the computer or the software (or both) cause trouble. Two assistants in an office back at the headquarters look over the collected data in the search for errors or gaps while the match is being coded. The database is instantly transferred via the Internet to the company's intranet and can be remotely accessed afterwards. If the clubs has a valid subscription to the ongoing database they can gain access to these types of match statistics 24 hours after the match has finished.

However, the whole process of data collection might not play out as smoothly as one would expect. Although the cameras inside the stadium deliver a high definition image, my interviewees told me that the software has problems with certain situations that may occur during a match. Pyrotechnics inside the stadium, snowy weather conditions, and/or fog can disturb the player-tracking process to a point where the programme can no longer recognize the players. Under such circumstances, the players have to be manually re-marked by using the mouse and the corresponding software functions. Game situations, such as goal celebrations or scuffles, are problematic as well because a lot of players occupy a small space on the pitch. After the situation dissolves and the crowd of players is disentangled, the marked players have to be checked to see if they are correctly allocated to their place in the database.

Data collection can be described as an inherently social act of *transcription, translation, and inscription* (Latour & Woolgar 1979:77; Collins 2010). Actions and movements on the pitch are recognized, assigned to quantitative variables, and

recorded into a database. In the specific instance I was able to observe, this undertaking was the collective effort of a team. The creation of data here is a social collaboration in contrast to the solitary coder, whom I introduced in the last section. This form of coding is entirely different as it requires the synchronized efforts of different actors focused on observation and data inscription. From the vocal communication of observations to computer-guided database actualization and cross checking at the companies headquarter, the whole process requires a necessary amount of coordination, mutual understanding, and knowledge about the use of the soft-/hardware interface. This gives the whole process a tacit knowledge component because coders not only have to recognize and ascribe meaning to what is happening on the pitch but they also need actionable knowledge on how to capture this by using the computer–software interface. Adding to this difference is the placement of the coding team inside the stadium. In times of software failure, they can stand up and look at what is happening on the pitch, and possibly correct the software's error of mistaking one player for another. They are engulfed in the atmosphere of the live match unfolding and the volume of the crowd. Comparing these two different forms of coding exposes the different spatio-temporal settings and socio-mental operations performed by the coders, which are provided by '[…] distinctive phenomenal field(s) in which organizations of "work" are established and exhibited' (Lynch 1993:132). Learning how to code matches can be described as a learnable trade. It requires the acquisition of skills such as recognizing and categorizing what happens on the screen through the software template while using a computer-software ensemble:

We had to go through quite a bit of training […] it's a mix of knowing what you're supposed to do and reflexes […] it's very taxing […]. I need to relax afterwards. (Dok10.8)

This illustrates that the task of coding requires great skill. One of the recruiters I talked to told me that out of hundreds of applicants who apply for the job, only a handful of people are actually selected. The main criterion for hiring is an exceptional skill in hand-eye coordination. Depending on the coding procedure in a social setting, acts of communication and coordination may accompany this process.

2.2.3. Coding 'in the wild' Part III – Live-match coding and analysis

Compared to the previous instances of coding I was able to observe, this third instance is heavily connected with the interpretative and communicative act that performance analysts engage in. This entails the expression of *descriptive information and analytical/normative statements* (Camic, Gross & Lamont 2011:3) to other actors within a short time period. It is not simply an act of quantification and database updates. Judging from my interviewees, the live-match coding process in which analysts engage is very much connected to an interpretative process. During the match or at half-time, performance analysts may talk to the coaching staff. These interactions take place from different point of views since the analyst is usually

located in the stands while the coaching staff is sitting or standing in the dedicated

coaching area next to the pitch. The situation is defined by working in an

environment of the stadium while the live match is unfolding on the pitch.[47]

stadium (profile view)

analyst
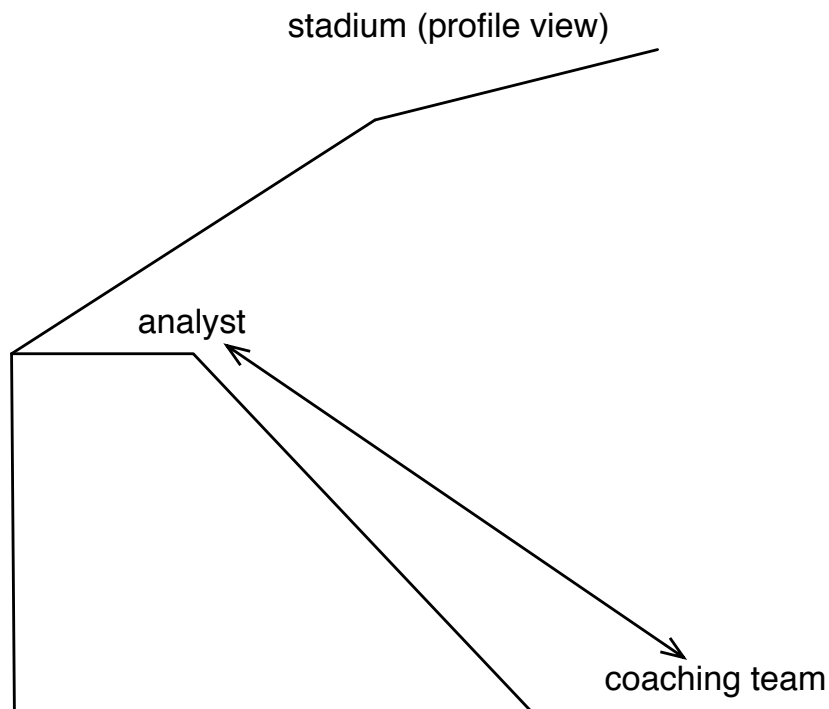
coaching team

Figure 9. Different actors' positions inside the stadium

On the basis of what the analyst in the stands is able to report, the coaching team is

taking this information into account in their decision-making process. In the

following section, I am going to describe what analysts are doing in the stands, what

[47] Sometimes analysts do not get a television feed inside the stadium and have to sit outside the

stadium near a broadcasting truck to get the television feed in order to perform the analysis.

they interpret, how they interpret, and how this is relevant for coaches in general. However, the analysts' interpretations are not necessary for the coach to make a decision; rather they deliver a kind of heuristically informed advice about the object of inquiry, namely, the match. Both are seeing it, but from a different point of view and with a different analytical toolset at hand.[48]

The analyst is a distant observer equipped with a computer and software, whereas the coach is on the sidelines of the pitch, trying to give directions to the players, discuss tactics with his assistants, and talk to players on the bench. My interviewees told me that this detachment is necessary so that they are not engulfed in the emotions unfolding next to the side of the pitch (see Maslovat & Franks 2008 as well), but can view the game from a distance with the aid of their analytic tools.

Going back to my observations, the analyst would usually sit in the stands (see Figure 9) in front of a computer running a programme such as Sportscode.[49] Such a programme allows the analyst to grasp the observable (tagging, coding, and interpreting) events, which unfold on the pitch via the television feed while being connected to the coaching team on the pitch with an audio headset. Legally, the Football Association (FA) does not allow analysts to be on the sidelines given that they usually do not possess a Pro-License which is a prerequisite for being allowed into the coaching zone next to the pitch.

The analyst has to perform multiple tasks and interactions. He or she has to

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[48] For a discussion of the different points of view between coaches and performance analysts, see Chapter 4.

[49] See http://sportstec.com/products/sportscode-2 (last accessed 29.11.2013) for an overview of the different types of software versions.

use the computer with a dedicated customizable tracking and coding programme while having ongoing interactions with the coaching team on the sidelines of the pitch via an audio headset. He or she has to be aware and react to multiple events. The programme has to be observed in its functionality, and if coding runs accordingly, then the tags attached to each player on the screen, which are initially indicated by two square brackets, have to be checked for correctness while the outflow of statistics has to be gauged. Simultaneously they are in contact with the coaching team.[50] Analysts who undertook this task told me this process was cognitively very taxing. The analysis process during a live match can be considered as '*bracketed*' (Goffman 1977:19)[51] to a certain degree.

> Brackets tell us when a frame begins and ends and encourage us to respect the constraints they impose. Brackets are external when they are not formally part of the activity, such as a school or theatre bell summoning us to take our seats. (Manning 1993:127)

This is mainly due to being constrained by the timeframes of the first half, the half-time, and the second half of the match.

The analyst in the stands is part of a socio-technical system which splits the analytic process between the analyst(s) and coaches. Before the match starts, the analyst interacts with the programme, marks players with the mouse cursor, reads the statistical representations via their numerical counterparts on the screen, and checks

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[50] This can be either with the head coach himself (as in the case of Sam Allardyce) or with his assistants.

[51] Schütz (1982) might have called this 'conceptually segmented'.

the graphical representations. While the calibration of the software happens right before the kick off, the actual coding and communication happens with the referee blowing his whistle to start the match. The referee blowing the whistle again, indicating the end of the match after 90 minutes plus overtime, marks the end of this process. While the teams are playing each other and the event is unfolding on the pitch, the programme is plugged into the live television feed and transforms the ongoing events into variables and categories via a pre-programmed tracking mechanism.[52] Players are marked with a mouse and assigned variables. Such categories consist of a variety of coded variables for example 'ball possession' or 'pass completion'. Ideally, these categories are mutually understood and pre-negotiated by both the coaching team on the pitch and the analyst(s). The communication process prior to the coding proceedings is important as an analyst can only code what is possible with the software and is limited to what the television feed can show. Therefore, live coded variables are largely different from data available by either *Opta* or *Prozone*, which are coded according to the companies' own regulations. The *Sportscode* software allows for a more customized and brokered type of coding.

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[52] The technological origin of performance analysis software/hardware is situated in military use and was initially used for missile tracking (see Chapter 1 for a brief history of the technology): 'The inscription devices, skills, and machines which are now current have often been featured in the past literature of *another field*' (Latour & Woolgar 1992:66).
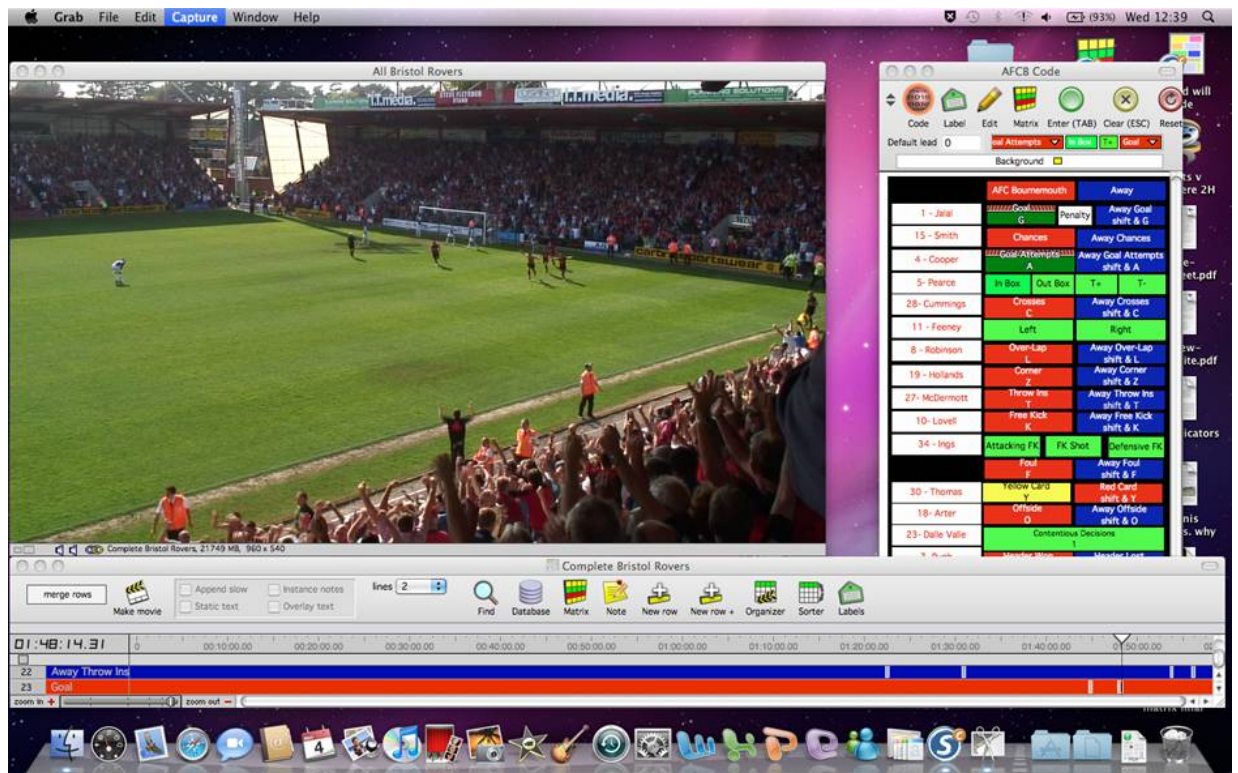
Figure 10. Screenshot from Sportscode showing the interface.[53]

Live coding by an analyst is admittedly less accurate and more of a heuristic device to interpret what is going on in the game, augmenting the coaches' field of vision and decision-making from a detached position in the stands aided by computer technology. Coding, conducted by *Opta* or *Prozone,* is usually done by a team of coders whereas live coding is mostly done by one or two analysts. What has to be coded during a live match is the product of the analyst telling the coach what is possible to code and the coach picking what he wants to have coded. Therefore, both

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[53] Screenshot was downloaded from http://solenthess.blogspot.de/2011/05/student-blog-from-interns-at-afc.html (last accessed 31.10.13).

actors are '*keying*' (Goffman 1974:43–44) the grounds for interpretation and communication. Keying means that: '[…] participants in the activity are meant to know and to openly acknowledge that a systematic alteration is involved, one that will radically reconstitute what it is for them that is going on' (Goffman 1974:45). This process refers to: '[…] conventions by which a given activity is transformed into something patterned on this activity, but seen as something quite different' (ibid. 43).

What the analyst codes should be understood and accepted by the coach, thereby creating a primary network of references:

> […] (C)onvincing the manager that my work will make his job easier is absolutely key in order to be heard. (Dok4.5)

> We were hired as an operator to use the technology, which was available. We had to deliver the data in a digestible way to the coach. (Dok1.2)

What is being coded allows the football game to have added meaning for both parties according to the principles of gathering and interpreting statistics.

Figure 11. Sam Allardyce equipped with a headset during the 2007–2008 season when he was the manager of Bolton Wanderers football club.[54]

Compared to the players and the coaching team, the analyst(s) usually perceive the game from a very different perspective. Furthermore, the analyst in the stands is seeing the match unfolding on the pitch with his/her peripheral vision, and television stations are filming the event and telecasting a live feed which consists of the standard camera angle capturing the events on the ball and multiple other camera angles (for example, a close-up of players or a view on the side lines to determine offside positions). These are interspersed with each other for replay purposes when, for example, a player is injured or the home team has had a couple of shots on goal that have not been replayed before. This steady live feed of player movements on the ball can be the input for the *Sportscode* programme. This allows the analysts to mark players visually and attach them to a container variable, which represents the

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[54] He is no longer coaching Bolton but, at the time of writing (June 2013), was manager at West Ham United.

actualized manifestation of the player's characteristics as an indexable category inside the database. After the marking process is complete, the events performed by the respective players can be coded. In every instance of the match, players involved visibly on the screen are then either manually coded by using a combination of keyboard and mouse as input devices, or are captured via pre-programmed pattern recognition that grasps player and ball movement on the pitch automatically.

Furthermore, a great deal of coordination between coaches and analysts may take place (ibid.). A good example is a match situation[55] that I was able to witness from the stands. I was able to take the analyst's point of view and see the *Sportscode* programme in action. During the second half, an analyst reported to the coaches who were unsatisfied with their team's performance and have asked for an evaluation. In a short, verbal report, the analyst concluded that the team's winger on the left and the respective defensive midfielder playing left showed a low percentage of completed passes. The coaches subsequently discussed substitute players and a change in tactics. The analyst listed possible substitutes in terms of strengths based on past performances[56] which are drawn up from a separate database. In this way, analysis during a live match with the aid of performance analysts creates an augmented environment that is different from just having the coaches' perspective inside the coaching area on the sidelines of the pitch.

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[55] This was a pre-season game and a friendly match against a foreign team. Unlike a league match, the players wore heart rate monitors as well, thereby adding another layer of data to be recorded. This extra layer is usually only grasped in training as the FA regulations forbid the use of such equipment during league matches.

[56] The indicators in this instance were average speed, which was communicated to the player 'being fast' (Dok1.7) and the pass-completion rate during the last friendly match.

A related example, which I was not able to observe, but was told about by various analysts, is the short half-time analysis conducted by the coaches in the locker room. During the first half, the analyst would select specific video sequences like conceded goals, frequently lost tackles against certain players, or constant marking errors by certain players in the defence. The visual marking of these sequences is either done upon request by the coaches or done based on the analysts' understanding of the live-match data and tactics during a match. An example of this might be the digital colouring of a certain space on the pitch in a video sequence to highlight the gap between the defenders and the midfielders. These sequences are presented to the coach at half-time in a separate room. The coach would decide which sequences are shown to players for the purpose of giving feedback and to tell them to avoid certain behaviours on the pitch, and:

> […] on request, call up certain passages of play. When Sam walks in at half-time, he can play those incidents on screen. It's a 15-minute window of opportunity, and another competitive edge we exploit.[57]
> (Mike Forde, Bolton Wanderers, 2007)

Sometimes the analyst would assist with this presentation by manually operating the software. Repeatedly, analysts told me that for their work to be effective it is necessary to not only have 'tactical knowledge about the game' (Dok4.2) but the ability to deem certain game situations important and to understand what is happening, namely, to perceive a multiplicity of errors conducted by certain

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[57] http://www.theguardian.com/football/2007/mar/17/newsstory.sport1 (last accessed 15.10.2013).

players in certain game situations, such as not marking the relevant attackers and midfielders; these abilities are essential in order to be able to undertake these markings and give their evaluation to the coaching team. A spatio-temporal understanding of unfolding interactions between players on the pitch seems to be a prerequisite to understanding what needs to be reported. If these understandings are shared and accepted, communication and mutual understanding are enabled. In this sense, '[…] shared cognitions determine what actions are possible and what has meaning' (Zucker 1983:2). This topic is further explored in Chapter 4.

2.3. Conclusion

Taking into account the types of coding procedures, I can conclude that there are different types of data and different types of coding procedures taking place within the realm of performance analysis. The coder inside the office building has no interactions with other coders as he or she works. He or she simply uses the program and the computer's input devices to classify his or her observations. The coders inside the stadium have to undertake a collaborative effort to quantitatively code the matches. They communicate observations verbally to other coders who inscribe the match events into the database. A software expert and a quality assurance team in the back office supervise the whole process. Furthermore, the coders themselves are engulfed in the actual setting of the football match, which has unique but different audiovisual properties from the stadium atmosphere created by the crowd, the

weather conditions, and the immediate happenings on the pitch. Compared to coders situated in a detached office building, the live context differs in terms of the surrounding factors. The type of data that is produced is fundamentally different as they do not use the limited camera angle of the television feed, but are using a fixed camera system and a multi-screen setup to capture the movement of the players and the ball in their totality.

The performance analyst borrows from both methodologies of the different types of coders. He or she codes match statistics via the television feed in a live setting inside the stadium, and uses the statistical databases for interpretation before, during, and after the match.[58] The biggest difference is the practised feedback process in which the analyst directly communicates with the members of staff in the coaching area voluntarily and on demand:

> Yes, we do have a schedule. We meet up to three times a week […] sometimes more, sometimes less, really depends on how many matches we are playing. […] (S)ometimes he [the coach] sends me emails when he wants something about somebody specifically […] I have to pull it out of the database and send it to him. That happens quite often these days. (Dok13.4)

His or her influence is more directed towards the decision-making processes of the coaches on the sidelines than analysts who may use third-party data. Vocal transmission of his or her interpretations happens without the informational intermediary. This means that interpretations are directly communicated without the

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[58] See Chapter 3 for an in-depth exploration of the interpretative process.

use of video sequences or written dossiers whereas the other statistics produced by the coders are integrated into the organizational workflow of the club with a time lag of one or two days after the match has been played. The data that the performance analyst produces is also less detailed in terms of depth of the events coded, and is more concerned with elements such as player movement, ball possession, and passing quotas. He or she may also be the only coder involved who speaks to the coaching team about findings/recordings and the players during half-time by giving immediate feedback based on his or her interpretations. Hence, there is a distinction in the different ways coding is conducted by different types of actors. *Inscription agents* who work for performance analysis companies are not involved inside the organization of football clubs. Their sole purpose is to create match statistics, and they do so inside the stadium and in detached office buildings. Performance analysts, on the other hand, use such data but create live data on their own during matches. Hence, they need to be proficient in the act of coding matches.

The job of a performance analyst is to interpret and communicate match statistics. They select certain statistics and furthermore change their representations of them to make them understandable and digestible for other actors beyond their numerical inscription in a database. These match statistics, which are present throughout the sequence either in their original form, or in an abbreviated form such as a PowerPoint presentation to the coaching team. Depending on the different contextual orientation towards the pre-match or the post-match phase, statistics are used to foster particular forms of interpretation through the use of socio-technical setups that include software, hardware, and presentational settings. Hence, the tasks

performance analysts are performing fulfil the defining features of 'social knowledge in the making' (Gross, Camic & Lamont 2011) as described in Chapter 1.

Performance analysts use and produce artefacts in which statistics are the factor binding the observational categorizations made during football matches and their translated inscription into a computational database. The data they use is created socially, interpreted, and distributed by them as a form of 'social knowledge' (Camic, Gross & Lamont 2011). To go back to the beginning of this chapter, this specific type of knowledge can be characterized by:

> [...] the technologies and tools of knowledge-making – that is, the epistemic principles, cognitive schemata, theoretical models, conceptual artefacts, technical instruments, methodological procedures, tacit understandings, and material devices by which descriptive and normative statements about the social world are produced, assessed, represented, communicated, and preserved. (ibid. 78)

In this sense, '*classificatory schema*' (Schütz 1967; Schütz & Luckmann 1973) determine the type of statistics to be created. As such, this chapter laid out the groundwork of how knowledge creation and mediation is carried out via material devices such as computers, software, and cameras and began to explore the role of statistics in the sense-making processes of performance analysts. The next chapter deepens the focus on knowledge, as I will consider the different ways match statistics are interpreted and mediated by performance analysts.

3. Socio-material interpretation, mediation, and the calendar

keywords

[knowledge-making; calendar structures practice; patterns; match analysis; categories; variables]

The second chapter focused on the practice of coding and delved into the process of how match statistics are created. This chapter picks up the thread of match statistics interpretation. The intention is to show 'technologies and tools of knowledge-making' (Gross, Camic & Lamont 2011:3) in the context in which they are used. The second criterion for social knowledge that Gross, Camic, and Lamont point out is 'normative statements' (ibid.), which draw from descriptive information that, in turn, can be used to recommend consequent decisions and actions, or not.

The focus of the third chapter lies in showing how these types of statements are constructed (based on 'technologies and tools' (ibid.)) in the form of the different variables that are sometimes aggregated and related to each other[59] within the interpretative process in which performance analysts engage. However, the process of interpretation is heavily entrenched in the match-day calendar as the overarching structure that orders their analytical focus. Depending on whether the performance

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[59] See sections 3.3. and 3.4. for a lengthy discussion of variables and key performance indicators.

analysts are in the pre-match, live match, or post-match phase, their interpretative analysis and their interactions change quite a bit. In the second chapter, I described the features of live-match analysis that can accompany an on-the-fly coding process. During such an event, the analyst not only has to oversee the coding process but also proceeds to interpret on the spot what he or she sees in order to give feedback to the coaching team:

> The coaching staff may want to check something during the game someone's spotted, and you have to be able to view incidents back and provide stats during play. When required we can provide the manager and his coaches with a first half stats and clips package at the interval to aid his team talk. (Laurence Stuart, Hull City AFC)[60]

Hence, this chapter will be mostly descriptive and will show what the typical workweek of a performance analyst looks like. This serves to show how the match-day calendar is set up and how it structures the different 'types' (Schütz 1982:31ff; Weick, 1995) of analysis that performance analysts conduct. Therefore, the calendar influences the order of 'sensemaking'[61] (Weick 1995) in the specific 'lifeworld' (Schütz/Luckmann 1974) inside a football club. This leads to a threefold structure of

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[60] http://www.footymatters.com/articles/features/the-crucial-role-of-performance-analysis-in-football/ (last accessed 11.12.2011).

[61] 'The basic idea of sensemaking is that reality is an on-going accomplishment that emerges from efforts to create order and make retrospective sense of what occurs' (Weick 1993:635).

the workweek. The threefold sequence of interpretative processes has a considerable influence on the organization and categorization of everyday experiences ('*Alltagserfahrungen*') (ibid.) of performance analysts. The trajectories of the differently oriented tasks of the workweek determine the various ways in which performance analysis is undertaken. Hence, each part may be characterized as a sort of shift of the teleological focus.

I intend to unpack these shifting orientations during each stage of the workweek. Moreover, I want to show the specific ways analysts conduct their interpretation. It has to be noted, though, that this chapter focuses mainly on the topic of match analysis as a form of 'sensemaking' (Weick 1995) and the subsequent communication of match statistics is mainly oriented towards the coaching team. Hence, I will focus on how analysts operate within the social setting of the club, how they perceive their work and, most importantly, how they construct their interpretative statements in relation to the variables of match statistics.

As I have shown in the first chapter, ideas about performance can be traced back historically to a pen-and-paper approach to analysing matches with simple variables like shots and passes. However, the development I was able to observe was heavily reliant on computer-assisted analysis and screen work. Largely, screen work is not carried out by the coaching team but by specialized performance analysts. One might consider this a specific type of division of labour as coaches are analysing live matches from the side lines as well, but they do so either without analysts, or with an analyst helping them from the stand and/or during half-time.

As I have explained previously, knowledge creation can be described as a process that can be an object-oriented action. In the case of performance analysis, the

interpretative work the analysts are conducting is largely done while facing a computer screen. Modern knowledge based on artefacts can be characterized as work with 'epistemic objects' and 'epistemic practices' (Knorr Cetina 2001).[62] These can be described as concrete things in development but are subject to a process of flexible change. The core 'knowledge artefact' in this thesis is statistical match data. So far, I have shown how match statistics are constructed, and I will now go further to show how they are interpreted by performance analysts.

Sociologically speaking, I am going from the wider structural features of calendar events, which also structure the workweek for other members of the club such as players or coaches, to a micro-sociological focus on performance analysts' practices in a social context.

3.1. Starting the sequence

One of my field sites for qualitative data collection was a friendly match in the pre-

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[62] 'The *lack in completeness of being* is crucial: objects of knowledge in many fields have material instantiations, but they must simultaneously be conceived of as unfolding structures of absences […]. Epistemic objects frequently exist simultaneously in a variety of forms. They have multiple instantiations which range from figurative, mathematical, and other representations to material realizations' (Knorr Cetina 2001:191). In this sense, match statistics are incomplete representations of football matches since they only record certain actions grounded in the coding schema.

season preparation window. This experience led me to ask further interviewees about the specific characteristics of the phase leading up to the first match day. The following paragraphs can be considered as exemplary for this timeframe.

In the first week of a new season, and approaching the first match, the performance analysts' focus lies on the imminent opponent. This is considered to be quite a tricky undertaking as the opposing team will likely have signed new players and may also have different tactics in place. Hence, match data from previous season may not yield 'that much certainty' (Dok4.2) about the opponent's tactics and personnel. Nevertheless, match statistics from the previous season are reviewed concerning the remaining players and the dominant tactics derived from reviewing past performances:

> Of course we look at the stats from last season. We want to know who we're up against. […] We want to know what they are capable of, […] but there are other factors as well. You can never be sure how well the new signings fit in. (Dok 2.3)

The new players are reviewed via video analysis and, possibly, match data from their former clubs. This depends on the availability of statistics via a subscription to the relevant data packages. Statistics of match performances are seen as indicative of estimated behaviour displayed by teams and players on the pitch. Match statistics packages, in general, can be bought from companies such as OptaSports (who hold the legal licence by the FA to create such match statistics of the Premier League) or from the lower leagues and other European leagues

authorized by their specific representative bodies. Companies like OptaSports provide a database of quantitative statistics for each player within the Premier League with highlighted key performance indicators (KPIs) (these can be single variables or a combination of variables in relation to each other), and an overall rating metric can be viewed via OptaSports' web-based database application.[63] The raw statistical variables can, in turn, be exported into spreadsheet applications such as Microsoft Excel or incorporated into database programmes such as Microsoft Access.

The analysts I interviewed regularly mentioned that, after a few match days, the tactics and the attributes of the new players within certain emerging formations become apparent, and the statistical data usually starts to become more solidified. This allows them to see how the elements (players or coaches) may affect the way teams are playing. Hence, the analysts categorize statistical properties as a means of interpretation when they emerge. After a few match days, the statistics of their own team show certain trends as well. One could take a look at, for example, the safe percentages of the goalkeeper or the work rate of the new defensive midfielder. In this sense, work rate is a KPI and consists of different variables such as intercepted passes, kilometres covered, and successful tackles. In a specific case, I was able to observe the analytical process of a team's defensive midfielder. The performance analysts concluded that the player was dedicated to breaking up the passing game of a specific midfielder of the other team and to following him around the pitch. In turn,

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[63] Contrary to the Prozone software, which runs on only Microsoft Windows computers, OptaSports' interface runs as a web-based application and can be accessed from any computer with a current Internet browser.

these preferences for movement and passing were extracted from the databases based on the opposing team's midfielder's past performances. When I asked how this midfielder differed from others, the analysts told me that when players defend, they usually have guidelines on how to do so. They can either mark a specific player (to orient themselves towards another actor) or mark a specific zone on the pitch (set spatio-temporal orientation). A KPI can be considered as an interpretative category deduced from actors' orientation based mainly on actions and aesthetic features of movement and coded actions. These indicators are usually negotiated with the coaching team as deliverables on a weekly basis and concern either the team's collective effort or the individual effort of specific players.

'Event variables' (Dok6.5) can include passes between players, which are not only related to one match but also receive 'time stamps' (Dok7.4) in the database, which allows the analysts to look for 'trends in performance' (Dok6.3). Hence, variables are not only coded by actions on the pitch but also by when they took place, which can be accessed on a timeline. Longitudinal case studies on certain KPIs at the end of the season or after certain time intervals (such as after a set number of played games) are common as well:

> We make our reviews after every individual game, but then we trend our performance throughout the season. […] Sam [Allardyce] sets targets, and we break the season into five phases. They are eight-game phases for the first four and then six games at the end. […] We've got benchmarks, and one that we do look at is knockdowns. Every time we play the ball forward to the front, we're looking at

whether we win the flick-on, we win the ball that gets headed down (the second ball) because it's a great opportunity to gain possession in the opposition's half so we're constantly looking at how well we do that.[64] (David Woodfine, West Ham United)

For example, these longitudinal case studies can concern averages on goals conceded after set pieces such as corners or free kicks. According to my interviewees, it seems to be even trickier to estimate the opponent's style of play when a new coach is in place at the opposing club and that is thus another variable that should be taken into account. Match statistics are 'variablisations' of team versus team encounters, which are generated by specific methods of data gathering as shown in the second chapter.

According to my interviewees, certain coaches may have a preferred style of how they want a team to play, and they try to communicate this to the team during training via verbal communication, gestures, and even demonstrations in person. An example may be the preference to play with a 4-3-3 formation, which emphasizes fast vertical passing and wingers who play the side of the field and hold their position during a counter-attack. On the other end of the spectrum, certain coaches may develop a style of play that arises out of the players' capabilities. The performance analyst's job is to track the preferred style of play with accompanying written reports, in-person briefings, or presentations to a variety of actors inside the club sphere. It is crucial to mention at this point that such mutual understanding of

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[64] http://www.dailymail.co.uk/sport/football/article-2430369/Sam-Allardyce-100th-West-Ham-match-Sportsmail-reveals-life-Hammers-numbers-game-Big-Sam.html (last accessed 30.09.2013).

(a) what can be coded/tracked, and (b) which variables relate to the coaches' preferred style of playing football is highly contingent on how well performance analysts and the coaching team interact on a personal and conceptual level (see Chapter 4).

The next section will examine the match-day calendar, which structures the workweek and subsequent work tasks of performance analysts on a wider temporal scale, and focus on specific types of analysis that are the result of a structured workweek.

3.2. The 'structuring' calendar

One of the main drivers that heavily structures the workweek of performance analysts is the match-day calendar that is superimposed by the Football Association. The FA acts as a governing organization setting up the match-day calendar while considering the scheduling of other cup competitions such as the UEFA Europa League and the FA Cup. The games of national teams have to be taken into account as well. Not every game takes place on the weekend, and some may take place midweek. The following diagram is taken from a presentation conducted by Barry Drust showing what the workweek looks like at Liverpool FC during the 2010–2011 season in terms of the different types of analyses their performance analysis team has to conduct.

	M	Tu	W	Th	F	Sa	Su
W1	Po	Po/Pr	Pr	Pr	Pr	Li	Po
W2	Pr	Pr	Li	Po	Pr	Pr	Li
W3	Po	Pr	Pr	Pr	Li	Po	Po
W4	Po	Po/Pr	Pr	Pr	Pr	Li	Po

Figure 12. Weekly calendar for a team of performance analysts.[65]

Pr=Pre-match/Li=Live match/Po=Post-match/WX=week of the month

Actually, I should be doing three things at once. […] You can get bogged down by the workload and all the reports. […] You have to be strict and work on the essential stuff, especially before a game. (Dok9.7)

We'd love to do a lot more analyses, but we can't. There is only so much you can do during the week. Our schedule is tremendously

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[65] The graphical representation is abstracted from a talk Barry Drust gave at the WCF in 2011.

limiting, especially when we have our [European] matches during the week. (Dok4.9)

These statements show that time constraints greatly limit the analyst's ability to complete different goal-oriented tasks. The match-day calendar requires analysts to shift focus from working towards, during and after a match. However, the shift between the focused activities is not clear-cut and seamless. Different actors within the organization may request the performance analyst to work for them as well. For instance, when the board of a club has to determine which transfer targets may be pursued further, the analyst may have to do a presentation in front of the board highlighting the different KPIs that are relevant to the role the player should fulfil (e.g. tackles are more relevant for defenders than for strikers). These tasks can take away time from other tasks for the first team. My interviewees told me that those interruptions can make their schedule quite hectic at times.

During a regular week with a match on the weekend, the briefing sessions usually culminate on Thursday or Friday with additional short video-briefings on the actual match day. In this sense, performance analysts have the duty to pick certain 'match stats' that they deem worthy of communicating or may have been requested to obtain by the coaching staff as well.

The work procedures of the performance analysts are highly anchored in a temporal sequence governed by the match-day calendar (see Figure 12), which acts as a structuring device: for example, the post-match analysis is centred on reviewing the latest game. On a broader temporal scale, analysis starts in the pre-season phase in the summer during which these sequences of analyses are set in motion. The

process of statistical data collection and of mediation among the relevant actors (coaches/players) is an ongoing activity with recurrent characteristics until the football season ends. The time between matches is generally divided between match review, opponent scouting, and live-match preparation. The tasks set up via the match calendar are manifested in different micro-scaled interactions between staff members, such as the performance analysts and the players. The interlinking of consecutive sequences of orientations (and the accompanying interactions) are repeated every week. Match data collection, analysis, and interaction happen in a regularly occurring pattern. Conversely, the focus of analysis is dictated by the matches, which have to be played by the clubs on certain days of the week. These chains of interactions tie the scheduled frames of analysis to specific types of actor-to-actor relations, which will be addressed in the following paragraphs.

After a match, the performance analysts' focus shifts towards the pre-match phase, which is concerned with finding out how the opponent may play in terms of potential tactics. Hence, this type of analysis is geared towards the future in order to anticipate the opponent's tactics. The live-match analysis is inherently different since it is carried out 'on-the-fly' as the game happens. Patterns of reoccurring events are deduced from match statistics and are reported to the coaching staff.

Once the season starts, analysis is undertaken on a weekly basis and differs considerably from a lay perspective on match statistics as statistics are only available to clubs with a subscription or, to a lesser extent, to media partners.[66] As I noted in the introduction to this thesis, the match that performance analysts see and analyze is

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[66]Simon Edgar, marketing manager at Prozone Sports (http://www.plainsoccer.com/2009/11/prozone-performance-analysis-in.html last accessed 13.02.2012).

different from what the football fans see. A large part of their work happens in front of a screen, even if they are present inside the stadium and especially when they code live matches and have to report to the coaching team. On one occasion, I met an analyst inside a stadium during a friendly match. He described his role as being involved mainly in the scouting process. During our conversation, he told me that he feared that the opposing team would perform something on the pitch that he either failed to recognize in the course of his analysis, or that he remembered seeing something in the statistics but judged it as irrelevant.

Depending on how many analysts are employed at a club, a division of labour between the focuses of analysis can be established. Certain analysts I interviewed had multiple responsibilities during the week, such as scouting players, post-match analysis, and youth team analysis. Others were employed in a team in which each analyst had their own specific niche, such as acting solely as live-match analysts. Generally speaking, the task of analysis can be dealt with by a team of up to seven analysts, who are part of the sports science branch of a football club[67] and, as I argued in the first chapter, are *embedded* in the hierarchically-ordered organization of the club.

This subsection shows how the temporality of the match-day schedule works as a structuring device (see Figure 12; Zerubavel 1981) that draws up what is necessary[68] for analysts to do their work tasks with time being the constraining

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[67] An example of this can be observed on the club's homepage, like the one of Leicester FC. Parts of the staff are divided into different categories (see http://www.lcfc.com/team/science_staff/ last accessed 17.09.2013).

[68] In this sense, the timely necessities of different types of analyses create different affordances.

factor. The analysts' focus shifts from one activity to another as the trajectory of the analysis changes. Past performances of the team need to be reviewed, and the future opponent has to be scoped out and statistically dismantled. As I have pointed out earlier in this chapter, these seemingly ritualistic tasks are sometimes disrupted by interference from other actors within the club.

Generally speaking, there are three different types of analytic foci, which are interlinked, and sometimes overlap. These foci can be divided into (a) pre-match, (b) live-match and (c) post-match. Nevertheless, the fundamental knowledge artefact remains the statistical match data, which is captured via a combination of video cameras (or just a video feed), computers, and dedicated software put together by the analyst and/or a third-party company. The boundaries between the analytical foci are sometimes blurred and/or overlap in practice because of the immediacy of, for example, the live-match preparation. The analytical process can be described as an embodied practice (Knoblauch 2012:54; Suchman 1988) via the socio-technical interface of the computer and the software.[69]

In the following sections I attempt to further unpack the different types of analyses. I also explain in what ways perceptions, interactions, and affordances shape each phase of analysis.

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[69] The underlying expertise that makes this practice possible will be dealt with in chapter 4.

3.3. Pre-match and post-match analysis

'Before the game is after the game'.[70] Sepp Herberger

Compared to the live-match analysis and coding procedures I described in the second chapter, the pre-match and post-match procedures are very different. These distinct modes of interpretation happen in other environments, which are usually located outside the stadium. Sequentially and with regard to task, these two types of analyses are very different. Post-match analysis involves the most recent match played and is usually focused not only on the mistakes made by the players, such as not marking certain players during set pieces, but also on events evaluated as positive, such as scored goals. The presentation to the players involved is highly dependent on the coaches' input and whether they prefer to communicate the perceived actions of the players on the pitch with a focus on mistakes, or by stressing the positive and showing well executed plays. In essence, it is mainly an exercise in reflexivity (Archer 2007) about a past event in which the participants are directly involved. In this sense, I mean the process of narrated reflection and thinking (Archer 2007:40–41) concerning events that happened in the past. Match situations like conceded goals are pointed out, and the coaches or the analysts identify the perceived mistakes in the play, such as a conceded goal.[71] This narration is 'footed'[72]

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[70] http://www.spiegel.de/international/germany/like-chess-only-without-the-dice-german-football-s-greatest-sayings-a-558638-2.html

[71] A further exploration of this topic will take place in Chapter 5 'Creating the reflexive footballer'

(Goffman 1981:127ff) via the manipulation of video sequences:

> A change of footing implies a change in the alignment we take up to ourselves and the others present as expressed in the way we manage the production or reception of an utterance. (Goffman 1981:128)

In one instance, an analyst showed me his conclusion by pointing his index finger at a video screen:

> […] [Y]ou can see player X(b11) movements. What makes a great defender is not what he does when he has the ball but what he does off the ball. See, he anticipates the opponent's movement, he narrows the space. (Dok9.3)

In another instance, I was able to observe when an analyst booted up what looked like a giant television screen mounted on the wall of their office. This was a large touchscreen monitor onto which the video signal was transferred. Match footage was stopped via pointing and swiping on the screen's surface, and players were highlighted and virtually moved into a different position on screen. The analyst explained that this different position was considered to be preferable for the selected player to prevent certain perceived mistakes from being committed, like not being

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[72] In this specific example, 'footing' means that the mode of interaction is determined by the analyst. He or she anchors the communicative act by drawing attention to what happens on the screen with words and gestures.

aware of a player who had moved out of position. In this sense, spatio-temporal movement, like total kilometres run, can be considered as a category for performance evaluation. The football game has already taken place, and the deemed to be decisive events are evaluated and dissected:

Here you can see a panoramic video of the pitch. You can overlay graphics, stitch all the players together, and you can see how fast they run, all the good stuff. That's great from a coaching point of view to be able to see the team all the time; see the shape of the team. (Dok2.5)

Figure 13. Screenshot of performance analysis software. On the right-hand side is a visual representation of passing sequences. Left of this visualized variable is the video feed used for coding. Below the video feed is a so-called 'heat map', which highlights the space on the pitch that a player occupied the most during a match. The left-hand side is reserved for a search function that allows the search of variables, such as passes, teams, players, and competitions.

This example shows that the video signal, which the VideohubElite performance analysis software allows for different points of view of what has happened on the pitch during a match. In this instance, the television feed is accompanied by a graphic abstraction of illustrated passes. This perspective is another key difference from how fans watch the game on the television screen or inside the stadium because it allows the analyst to see the movement of all the players and the ball from a quasi bird's-eye point of view.

Usually after a league match, the analyst (or the team of analysts) is busy reviewing the team's statistics and feeding them back to the coaches. The next step is to make them available for other departments such as the medical and fitness branch, which is involved in the conditioning and recovery of players. The evaluation of a player's fitness can, for example, be a deciding factor for players to be excluded from the starting lineup, especially during weeks where games are played both in the middle of the week and on the weekend, so that players can be rested for the next game. Whether or not they are advised to rest is indicated by their statistical performance in the last match. However, my interviewees told me that this advice is

sometimes overruled by the coaching team if, for example, they do not have a good backup player or are of the opinion the player should still play. Over the course of the season, coaches can decide, based on evaluations of the medical staff, if a player is too exhausted from the last game and needs a rest.

Informational 'time lags' (Sasaki 2009:31) between match data availability is a consistent post-match feature as well. For example, Prozone data is available 24 hours after the match is over and consists of not only match events but also of movement and position data. Analysts weave this statistical data into their own database, which allows analysts to track the development of each player and the team overall in order to create a longer-term development report to the coaching team.[73] Each data point receives a time stamp, which allows analysts to engage in comparisons of performance between games based on types of variables. Another common feature is the creation of meta-metrics (or meta-categories) by relating several variables to each other to create categories of evaluation for teams and players about, for example, their attacking style. In such a database, players are coded into a sort of container variable with certain fixed attributes (for example, date of birth, left footed or right footed, and position on field such as midfielder or striker). Compiled statistics present themselves as '[…] objective recordings and examinations of events' (Dok2.6). This data is fed back to the coaching team throughout the workweek, especially in the pre-game analysis phase. Variables such

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[73] As I have mentioned previously, such trend reports may be created when coaches are not satisfied with certain players in certain positions on the pitch or, usually, in different negotiated intervals (like after a third or half of the season's matches).

as pass completion rate or small dossiers are created for key opponent players.[74]

Going back to the weekly feedback loop between analysts and coaches, the main 'boundary object' (Bowker & Star 1999), which is passed on by the analysts, is generally a mediated version of what the analysts call 'event data' (Dok4.4). It is a boundary object in that it allows performance analysts and coaches to communicate and coordinate even if they understand it differently. Analysts are aware that they need to make data 'coach friendly' (Dok2.5) This data consists of frequencies of events such as number of completed passes, total kilometres run, or shots on goal. Event data can be combined into KPIs, meaning that the player's individual performance during a game (or during training) can be measured by relating these types of variables to evaluate their performance. Compared to live-match data, training sessions are usually undertaken with players wearing a heart-rate/GPS monitor and, therefore, providing further data that mainly serves the medical branch of the team (who can look at a player's exhaustion levels); the monitor can also deliver event and position data during training matches without the need of cameras. Clubs may employ a combination of filming and GPS/heart-rate devices during training:

> […] [T]he GPS data the players have on the training field where […]
> a sports scientist can see players run from here to here, […] and
> measure the physiological response compared to how fast the players

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[74] For example, the category 'weaknesses while defending' (Dok5.1) can be based on statistical tracking of failed passes when the striker is narrowing the space and puts defenders under pressure.

run. This is a very powerful tool to measure the player's fitness. (Dok2.8)

The predominant software that analysts use (Prozone3 or Prozone Matchviewer) also shapes what is possible in terms of interpreting the data. Prozone, as a company, not only creates the dataset but also delivers the software, which the analysts use for interpretation. Therefore, analysts receive pre-framed statistical data, which not only enables analysis but is also constrained by the variables that Prozone initially sets up to be coded.

As I have mentioned before, a club's own team of coders can conduct the data-capturing process as well. The software allows the graphic representation of data (see Figure 13), such as the circulation of the ball, while also showing the movement of the players on the pitch. In this sense, a mediated version of the football match is delivered to clubs, which is initially pre-filtered by the performance analysis companies. The software combined with the analyst's interpretative capability can be seen as the 'grid of perception' (Martin 2011:130) through which statistics may be passed on to other actors who request, for example, a dossier on the teams current statistics.

Besides the data on their own players (and the team as a whole), which is constantly fed back to the coaches, categories for the evaluation of the opponent are created. Such categories would be for example, 'attacking strengths', 'ability to create space', or 'goal-scoring opportunities' (Dok 5.2). Categories are then related to either (key) players, who are regarded as noteworthy based on statistical inferences by the analyst, or dedicated to the whole team. Furthermore, sub-

categories emerge: goal-scoring opportunities can be divided by distinguishing between inside or outside the penalty box, which adds spatial dimensions to the numerical occurrence of action-oriented variables as means of interpretation. What the analysts perform in this type of task is different from the feedback process of purely delivering simple event data, like the total amount of sprints by the wingers, to the coaching team. The categories that are used have the quality of relating certain variables to others, and analysts theorize about the perceived importance of players in certain match situations based on their match statistics. Interpretation is, therefore, a key part of the analytic process.

3.4. Categories and relating variables

I have previously mentioned that KPIs are one of the main statistical elements that are being communicated between the analyst and the coaching team. They can consist of single variables or multiple variables in relation to each other. Usually, coaches request certain KPIs from the analysts. As I have mentioned earlier, the analyst draws these sets of variables from the database and transforms them into a more 'coach-friendly format' (Dok2.5) that can be characterized as either a short bulletin or a PowerPoint presentation. This process has been labelled a 'feedback process' (Dok4.1) by my interviewees and happens every week of the season. The predominant activity, which involves data interpretation and mediation, is split not only between pre-match, live-match and post-match, but also between members

inside the analysis team. A possible affiliation may be collaboration with the scouting department in order to initially pitch potential players to coaches/the board or simply supplying data dossiers. The contract department may also use player statistics when the contract of a player is negotiated. Similar to technical analysis in the financial markets, initial scouting and long-term observations via match data is called 'technical scouting' (Dok6.4).

Performance analysts not only have to conduct analysis but also select certain statistics, interpret them, and present the findings to the coaching team to convey their own insights into the dataset. I call this the process of *mediation*. However, this may mean multiple things and has to be clearly defined. The dictionary definition is:

mediation |miːdɪˈeɪʃ(ə)n|

• be a means of conveying: this important ministry of mediating the power of the word.

• form a link between: structures which mediate gender divisions.

• connected indirectly through another person or thing; involving an intermediate agency: public law institutions are a type of mediate state administration.[75]

Broadly speaking, what is happening in a visible and technically graspable manner during a football match is put into a different cognitive and physical form and transmitted (in the sense of being communicated) towards other actors.

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[75] New Oxford American Dictionary (2011).
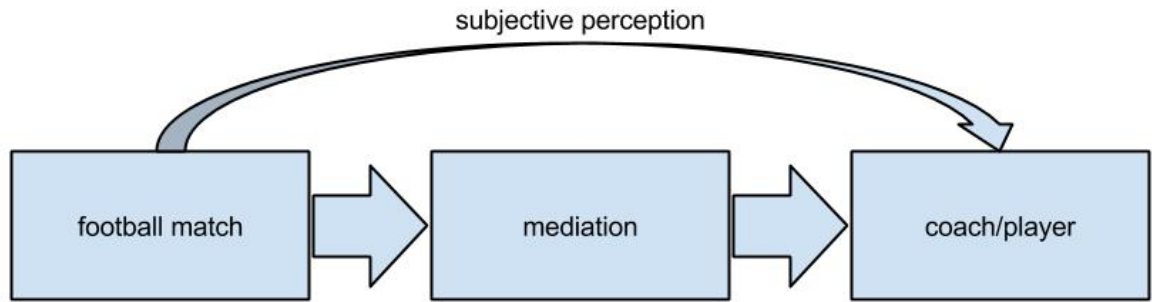
Figure 14. Besides perceiving the football match on the sidelines, coaches and players alike are confronted by mediated interpretations of statistical data.

During the workweek, the tangible results of the analytical work are manifested and saved into a computerized database, transformed, and put into paper dossiers consisting of player profiles with certain team-specific details about their strengths/weaknesses and added graphical representations of signature plays. All this information for a single week can amount to over 60 pages. Compiling these dossiers can be considered as an act of 'scripting' (Dyke & Bryant 2011:362), the production of knowledge into a transmissible form. When time is scarce, the information is sometimes compressed into PowerPoint presentations as 'acts of transmitting information' (Knoblauch 2013:50–66; Stark & Paravel 2008) to the coaching team and/or the players. Certain analysts I interviewed told me that they attach relevant video files of exemplary scenes on a USB stick in order to underpin the data.

These mediated interpretations as communiqués are broken down into categories of quantitative match data usually carried out in a video-presentation:

[…] The coaches, yeah, they definitely need to see something visual. You just can't bombard them with numbers. The opponents, you know, if you're a left-back and you're playing next week. {pause} You wanna see who is your direct opponent, what winger you're gonna face, what are his characteristics, what does he like to do, the ball, the patterns, that's really important. (Dok4.9)

The dossiers, based on statistics interpreted by the analyst, serve the coaching team as guiding information for anticipating the uncertain behaviour of the opposing team (Dok2.1) in the next match. Besides statistics being a form of knowledge for performance analysts, interpretations of match statistics as mediated artefacts can be considered as a form of knowledge as well, which can influence subsequent decision-making and action by other actors within the club. The analyst needs to decide how to present this information to the respective player(s) based on his or her own interpretations. Sometimes, this information is conveyed to substitute players during a match. Before entering the field, an assistant coach may brief the player on the type of plays he should engage in with simplified diagrams on a sheet of paper, but may also show him diagrams of assessed weaknesses in, for example, the defensive midfielder's style of play or the parts of the pitch he should use for movement.

When developing a player scouting report, certain quantified match variables are looked at over time in order to draw out comparisons between players. If a coach, for example, wants to sign a *creative* midfielder, then the analyst will likely look at the database with a focus on certain KPIs that seem (and ideally are agreed upon) to

be indicative of what *creativity* entails for players who are classified as midfielders from a quantitative perspective.

Creativity

Player Name	Team	League Name	Season	Total Assists	Goal Assist Set Piece	Chances Created (all)	Chances Created (all) per 90	Chances Created Open Play	Crosses Attempted	Crossing Accuracy	Dribbles Attempted	Dribbles Attempted per 90	Dribble Success Rate	Through Balls
Eden Hazard	Lille	French Ligue 1	11/12	10	4	62	2.4	49	75	20%	131	5.1	46%	12
Eden Hazard	Lille	French Ligue 1	10/11	10	0	99	2.9	85	113	21%	220	6.4	46%	7
Eden Hazard	Lille	French Ligue 1	09/10	8	1	56	1.9	49	96	15%	158	5.3	38%	9
Eden Hazard	Lille	Champions League	11/12	1	0	12	2.0	11	26	12%	38	6.3	61%	3
Eden Hazard	Lille	Europa League	10/11	0	0	15	3.5	13	9	44%	39	9.2	49%	1
Eden Hazard	Lille	Europa League	09/10	2	0	11	1.5	11	19	21%	44	6.0	50%	3
Player A	Team A	French Ligue 1	11/12	2	0	18	1.1	15	25	16%	30	1.9	37%	3
Player B	Team B	French Ligue 1	11/12	5	4	69	3.1	35	79	22%	49	2.2	35%	9
Attacking Midfielder Average		French Ligue 1	11/12	3.4	0.9	32.4	1.6	25.0	52.7	19%	62.8	3.1	40%	4.4

Figure 15. Measuring creativity by compiling a report with different variables. This example shows how the 'creativity' of a player is operationalized in quantitative measurements. This category is composed of quantitative indicators gathered throughout the season.

According to my interviewees, these sheets are considered a prerequisite for scouting a player in a live match:

As performance analysts have evolved into performance analysis departments, a lot work in recruitment as well, not only supplying the head coach with analysis but also the scouting staff by using objective data to identify players and compare them with our own players. (Dok1.6)

Eliciting such statistical comprehension can be part of a pre-selection mechanism to decide which players will be scouted in person and may be negotiated with later on. An exemplary process may look like this: the coaching team wants to sign new players and communicates with the analysts about the type of player they want and the type of characteristics they are looking for. The performance analysts then scan their database and create an initial list of players. This database is largely supplied via the software package of a performance analysis[76] company.

In order to be able to conduct this procedure, the interaction between the coaches and the analysts has to be grounded on tacit knowledge components (see the fourth chapter). Analysts need to have an understanding of, for example, the categories of players and the style of play these players convey. This understanding is usually fostered in the educational process. It is invoked not only in theoretical knowledge about, for example, tactics and positions of players on the pitch, but is also an interactional element in terms of actual communication with people working inside the club who occupy a different position than the analysts.[77] When the coach

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[76] At the time of writing (March 2013), other companies like StatsDNA are providing software that also allows the analyst to 'plug-in' data.

[77] See Chapter 4 for a further discussion on this topic.

is looking to strengthen his squad with a holding midfielder, who is also creative in his passing game, the analyst has to translate and interpret what the coach actually means by those types of qualities, which require 'interactional expertise' (Collins 2010:136ff; see the fourth chapter). In order for this to happen, there needs to be a mutual understanding on a conceptual level between the two parties. To a certain degree, this involves an understanding of the concepts embedded in the language they are using. The KPIs are a sort of Rosetta Stone, which can anchor and enable communicative work, in which the coaching team and the analyst have come together to agree on certain match statistics as indicative of a player's ability, depending on the player's position and a combination of various statistical variables in relation to each other. The following sheet can be considered an example of the outcome of such an agreement.

Duels

Player Name	Team	League Name	Season	Total Duels Contested	Duels Won %	Groud Duels Contested	Groud Duels Won %	Aerial Duels Contested	Aerial Duels Won %	Flick Ons	Flick On Success Rate
Eden Hazard	Lille	French Ligue 1	11/12	384	47.9%	368	49.7%	16	6.3%	27	55.6%
Eden Hazard	Lille	French Ligue 1	10/11	572	49.7%	521	52.0%	51	25.5%	52	34.6%
Eden Hazard	Lille	French Ligue 1	09/10	487	49.1%	443	51.9%	44	20.5%	38	34.2%
Eden Hazard	Lille	Champions League	11/12	87	55.2%	82	54.9%	5	60.0%	8	62.5%
Eden Hazard	Lille	Europa League	10/11	78	59.0%	72	58.3%	6	66.7%	6	16.7%
Eden Hazard	Lille	Europa League	09/10	117	52.1%	107	55.1%	10	20.0%	14	64.3%
Player A	Team A	French Ligue 1	11/12	138	42.8%	122	43.4%	16	37.5%	15	13.3%
Player B	Team B	French Ligue 1	11/12	201	36.3%	155	36.1%	46	37.0%	22	18.2%
Attacking Midfielder Average		French Ligue 1	11/12	256	44.3%	222	45.3%	35	37.7%	23	31.2%

Figure 16. Measurement of duels.

In this example, the player is evaluated on his capability to conduct duels with other players on the pitch. Again, different variables and metavariables build this evaluative category.

Additional observations by analysts and coach-requested categories, such as the attacking tactics of the next opponent, are also added into dossiers compiled weekly. All of this is happening in a social environment with hierarchical features and different forms of agency,[78] which are attached to different types of actors. In this sense, the *process* of analysis can be decoupled from the analyst conveying his or her conclusions to other actors. When conducting opposition analysis, performance analysts may look at how goals are created by the team they are examining. Statistics are drawn up to figure out which players are mainly involved in the process of goal scoring, and the passing sequences are reconstructed. The first thing the analysts may look for is not only who scored but also who was involved in the sequence of play that led to the goal being scored. Hence, the importance of certain players' participating in the play is considered according to their actions.[79] Not only are statistical regularities being looked at but also movements of players, for example, during a counter-attack, which tends to be more of an exercise in applied geometry.

Database maintenance can differ considerably between clubs and is determined by the club's policies, the analysts' approach to gathering statistical data,

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[78] By agency I mean capacities for action ('*Handlungsfähigkeit*').

[79] An example of this is passes, the relevant plays, and looking at how good passing was based on pass-completion rates related to certain players or certain areas on the pitch.

or the software package in use. While certain clubs just buy the raw numerical datasets, which can be transferred into a simple Excel sheet, others prefer to have the accompanying software package (for example Prozone3), which not only handles the storage of quantitative data but also allows for the annotation of qualitative observations:

> Some of my colleagues have a simpler approach. […] Yes, some even use the old Excel. […] We use a combination of Opta and Prozone. (Dok8.9)

Usually, the coaching team determines which types of data the players should see, and they have the last word on the content of a presentation. Hence, the type of statistical data that is distributed/made available is highly dependent on the relationship between coaches, analysts, and players. An example can unfold as follows: an analyst is advised to present a compilation of defence errors, the relevant performance indicators (such as incomplete passes), and graphical abstractions of match sequences/reoccurring patterns of play. In short, information distribution in the form of match data is largely determined by the hierarchical order of actors. The coaching team has the last word and acts as 'information gatekeepers' (Barzilai-Nahon, K. 2009; Lewin 1947). They control the passage of data towards players. Therefore, a funnel of information is created from constructing the statistics initially to the interpretative process conducted by the analysts, to the dossiers given to the coaching team, and to the presentation about the strengths and weaknesses of the upcoming opponent.

3.5. Conclusion

The previous two chapters were an attempt to encapsulate the threefold sequence of how match statistics are created, interpreted within their immediate social contexts and communicated to others. These tasks are embedded in the match-day calendar. In this sense, the calendar more or less predetermines performance analysts' orientation towards the tasks during a workweek. However, this sequence of creating, interpreting, and mediating statistics can be interrupted by requests from other actors within the club's organization. Besides the actual quantitative database, the interpretative process is largely driven by visual representation of match statistics via video sequences, and by creating reports about different variables as performance measurements, which are sometimes aggregated into meta-categories such as 'creativity'. Those reports and audiovisual presentations to other actors represent selected snippets of data that differ greatly depending on whether they are shown to the coaching team or to the players. Hence, the coaching team acts as 'gatekeepers' of the mediated interpretations.

The fourth chapter will deal with the prerequisite tacit knowledge that allows match-data creation, interpretation, and mediation for other actors. Tacit knowledge glues the whole sequence together as components are required for performance analysts to go about their work and cannot be solely rooted in their ability to operate performance analysis software. It requires significant amounts of 'football knowledge' and a sort of interactional expertise to talk meaningfully about football. Hence, the fourth chapter will delve deeper into the tacit knowledge that performance analysts possess. The fifth chapter will then focus on the relationship between performance analysts and players by examining how youth teams receive

the support of performance analysts.

4. Tacit knowledge, expertise, and dissonance

keywords

[types of data; tacit/explicit social knowledge; expertise; diffusion into practice]

> Rather, to understand human experience one must start by trying to understand all the things that might count as knowledge and then work out how humans might use them. (Collins 2010:6)

> Tacit knowledge drives language, science, education, management, sport, bicycle riding, art, and our relationship to machines. (ibid.:1)

In this chapter, I am going to look at the different aspects of knowledge that underpin the interpretative and interactional capabilities of performance analysts. The overarching sociological theme of this chapter is the concept of tacit and explicit knowledge. I am going to show that performance analysts possess types of tacit knowledge that they potentially share with other actors within the boundaries of the football club. Tacit knowledge in this instance rests on a grasp of football tactics,

terminology and concepts. This can be considered as a factor that enables communication with other actors within the football club who share this knowledge. Furthermore, I am going to show that performance analysts have experienced distinct phases of socialization in which they learned the different knowledge components of the match analysis process, football knowledge and interpersonal communication capabilities. In consequence, performance analysts argue that they possess a distinct form of explicit expert knowledge as a means for decision-making, which they claim is more 'scientific' than the coaches' more 'emotional' way of reasoning. However, this may lead to dissonance between them and other actors within the organization.

The following section will feature an explanation of how social knowledge is actually practised[80] by going into further detail about the work of performance analysts inside professional football clubs. Sociologically speaking, this chapter will feature the concepts of tacit and explicit knowledge as explained in *Tacit and Explicit Knowledge* by Harry Collins (2010) and his exploration of expertise in collaboration with Robert Evans in *Rethinking Expertise* (2007). Tacit knowledge in this specific sense can be described as being 'embodied' (Joas 1996:xxi) by the actors who possess the knowledge and, in a sociological sense, share it with others. However, Collins (2010:2) argues that this type of knowledge can only be uncovered by understanding the social context in which the relevant reasoning, decision-making, and interaction processes unfold. Polanyi (1967:60) defines tacit knowledge as being embodied and unable to be made explicit. Collins (2010:19) uses the dictionary definition of tacit knowledge, which describes something that is

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[80] By practise I mean the '[…] modes of working and doing […]' (Amsterdamska 2008:206).

not explicit, and codifies different types of tacit knowledge in his analytical framework. Relational tacit knowledge is depended on the 'contingencies of social life' (Collins 2010:x) and is considered tacit because it depends on the social context and interactions between different actors. By contrast somatic-limit tacit knowledge is linked to 'the nature of the human body and brain' (ibid.). This means there are limitations inherent to the capacity of humans who are able to conduct certain tasks but are limited in scope because of, for example, their cognitive limitations. Schema for acts of categorization, such as the selection of variables to collect in a statistical database can be established by humans. This allows them to enable computers to conduct a mass collection and indexation of variables that is beyond their ability to remember. Furthermore, Collins (2010:125) considers strong tacit knowledge to be collective tacit knowledge. One of Collins studies concerns specific laboratory techniques that are transferred between laboratories. This can be troublesome at some point because technical instructions may not be sufficient to reproduce technical machinery or certain work procedures. Face-to-face interactions can '[…] enable things that are not spoken to be passed on in ways that may not be visible or apparent' (Collins 2010:3). He also offers a strategy for grasping different elements that apply to the context of interactions (e.g. human <-> human or human <-> machine) by '[…] trying to understand all the things that might count as knowledge and then work out how humans might use them' (Collins 2010:21). Sociologically, tacit knowledge is not only about the factor of embodiment. It is also about the identifiable practices (Bourdieu 1984; Amsterdamska 2007):

[in] which human beings confront and structure the situated tasks with which they are engaged. These activities may be intentional or unintentional, interpersonally cooperative, or antagonistic, but they are inherently multifaceted, woven of cognitive, emotional, semiotic, appreciative, normative, and material components which carry different valences in different contexts. (Gross, Camic & Lamont 2011:7)

While Chapters 2 and 3 focused on the practices performance analysts engage in, such as coding, interpretation and mediation, this chapter focuses largely on the prerequisites and conditions that allow them to engage in these practices. In this sense, the shared understanding of concepts in interactions is tacit knowledge that enables them to be part of a community. These shared understandings are ultimately rooted in practice, which can be expressed communicatively via interactions between different types of actors. The closed nature of the professional football club enables this specifically because knowledge is distributed within its boundaries. Furthermore, performance analysts claim to turn what is implicit about football matches into explicit manifestations via creation, interpretation and mediation of statistics. Nevertheless, having access to the statistical datasets of matches that contain coded quantified information about players may not be sufficient to conduct performance analysis. Likewise, as I have briefly mentioned, this 'scientific' style of football analysis has to be mutually accepted as a valid methodology to invoke reciprocal interactions in which tacit knowledge is shared.

As I have shown in Chapter 2, classification and abstraction via the act of quantitative coding and database inscription allows the rendering of layers of observational elements via a computer over a period of ninety minutes. As I have briefly mentioned, such technologically enhanced capabilities are described as somatic-limit tacit knowledge (Collins 2010:11). This concept represents the sheer limitations of humans' capabilities to encode such an amount of quantitative data without the aid of a computer while the software, which can do so, enables such processes. Coding as an act of inscription (Latour 1987) was done manually via pen and paper in the 1990s, whereas statistics today are created with the use of a computer. This allows direct inscription via the pressing of keys on a keyboard. Actions on the pitch are now digitally enhanced with sophisticated tracking technology, but humans by and large, still conduct the process of coding (see Chapter 2). As I have shown in Chapter 3, another aspect that constitutes the practice of performance analysts is the mediation of statistics, as numbers alone are hardly considered to be an entity to which non-practitioners can relate, particularly if they are not interested in statistics.

Judging from my fieldwork data, the analysts I interviewed did not play football on a professional level. However, they were still able to talk about football and the required skills in a meaningful way. One could ask the question: how are they able to do this? In order to answer this, I will draw from authors of the *Sociology of Scientific Knowledge* and the work on expertise, which involves tacit knowledge (Collins & Evans 2002, 2007; Collins 2010, 2011). In this sense Collins and Evans (2002; 2007) distinguish between 'contributory' or 'interactional' expertise. They define expertise as the mastery of the tacit knowledge of a domain of

practice. This means that 'interactional' expertise can be expressed via mastery of the domain's language while 'contributory' expertise can be explained as the ability to fully engage in the dedicated practices within a specific area (Collins & Evans 2007; Collins 2011). Judging from fieldwork data performance, analysts possess certain types of tacit knowledge and experience via exposure and socialization. Conceptually, 'interactional' expertise can be acquired by 'deep immersion in the linguistic discourse of the domain alone' (Collins 2011:3). This means that a very particular type of socialisation can be adequate to gain 'interactional' expertise. As I have said before, in this case, it is the ability of performance analysts' to talk about football and the required skills meaningfully without having played top tier football. Hence the capabilities to code matches as acts of classification can be seen as an expression of 'interactional expertise' as analysts are able to recognize passes towards other players.

From a knowledge standpoint, one could ask what makes a PowerPoint presentation by a performance analyst on the opponent's preferred tactics mutually understood by the players and the coaches? Analysts may perform their analysis on their own, but they produce their assessments for the coaching team and the players. Therefore, they engage in acts of communication. Interactions between actors can be successful if there is common knowledge about the underlying meaning of the concepts inherent to the interaction. Both parties need to have an understanding of what they are talking about to make the knowledge transfer happen. In this case, the understanding and communication about football games, while using the right terminology, can be an indication of 'interactional expertise', which is learned via socialization. In this specific case the 'interactional' expertise of performance

analysts allows them to perform communicative acts based on a commonly shared understanding of football, meaning, for instance, an understanding of tactics, which includes distinguishing players in terms of their position (as strikers or midfielders) and technical abilities (like pass accuracy and abilities to out-dribble other players). Hence, football terminology needs to be contextualized in interactions by demonstrating the '[…] understanding of game mechanics' (Dok 2.9) in order for interactions between actors to taken up successfully in the sense that communication happens as an act of mutual understanding. Both parties have to 'master the language of the domain' (Collins & Evans 2007:86). In sum, the linguistic concepts the actors are using to communicate need to be shared, and their underlying meaning has to be understood.

On a level that is harder to grasp empirically, personal rapport may be a necessary prerequisite to enable this specific type of communication as well. Comparatively, certain technologies, such as the computational interface, stabilize incremental parts of action in relation to objects because they represent an established standard for operating the software in order to conduct interpretations. In this sense, they '[…] bestow on them a certain expected form […]' (Knoblauch 2013:56).

According to my interviewees, learning how these concepts unfold in a social setting happens as part of the practical side of performance analysts' education. In addition to the courses they have to undertake in university, my interviewees told me that their degree also required a practical placement programme in which they learned how the taught concepts were actually applied 'in the wild'. Not only did they have to learn the concepts and terminology of performance analysis and football

but also the ability to conduct such tasks in the actual organizational environment of a club with other actors involved.

On the front stage outside the organization, certain statistical snippets are also available for the layman observer through the Sunday paper, the television recap shows, or even analysis-oriented fan sites. What happens in situ behind the scenes within the club hemisphere is usually hidden to the outsider. Being inside these closed-off compounds yields a great deal of tacit knowledge that goes beyond 'having a good understanding of football' (Dok2.9).

In this instance, Collins (2001; 2010:150ff) makes a similar argument when he studied a group of scientists who wanted to build a laser based on detailed research papers explaining the setup. However, they failed in doing so because of certain elements of tacit knowledge that could not be learned from those research papers alone. Only after a member of the successful group who built the laser came to visit the lab and interacted with the scientists were they able to successfully replicate the project.

I briefly mentioned this in the beginning of the thesis, but to a certain degree I had to undergo a similar process while doing my fieldwork in order to understand not only what performance analysts are talking about but also the type of obstacles they are facing. I had to learn to understand the language and concepts of football and the way performance analysts conduct their practice, and how they related to other actors within the club hemisphere. However, I did not gain expertise in dealing or interacting with other actors besides performance analysts. Given the fact that I also did not earn a degree with a specialization in performance analysis, I am not claiming to possess the same type of expertise performance analysts have acquired. I

had to gain an understanding of how performance analysis is practised, which is something that usually is hidden from the public. Hence, there are barriers according to which certain elements and types of social knowledge can be observed and shared. What may be invisible to an outsider is shared tacit knowledge among members of the club. Knowledge about certain enacted playing patterns, for instance, is mostly available between insiders. If one pays close attention to the televised match, you may encounter the so-called playbooks, which illustrate patterns of play. These can be observed when a player is substituted or there is an injury break during the match. In those instances, an assistant coach may brief the sub or players in the pitch via a physical book (some even use digital surfaces) of plays he should make and which position he should take up on the pitch during certain situations.

4.1. The physical, virtual, and social barriers of tacit knowledge

According to my interviewees the interpretations of performance analysts are only shared within the clubs' boundaries. While media outlets make use of statistics as well in their (live) telecasts and publications, there are distinctively different types of statistics that circulate into the world of media and into the world of clubs. In the main, two different types of companies provide statistical match data in the UK: Prozone Sports and Opta Sports. Prozone has been marketing its data mainly to clubs whereas Opta has usually catered to the media. As of 2012, each of the two companies is now trying to dip into the territory of their competitor. Opta has

produced a new software product called OptaPro,[81] which is geared towards clubs. The software functions as a web-based application allowing usage with sufficiently fast Internet access and a compatible browser. While they used to be just a match statistics provider, they are now selling the software frontend to make it usable for performance analysts by allowing them to compare statistics, videos and graphical abstractions.

Let us think about what actually may be tacit knowledge in a football-specific context. A fan who watches a game inside the stadium or on a TV from home has a different perspective. He or she has no access to performance analysis' databases or the Prozone analysis software; all the data encountered is found in media articles and is likely to be offered in snippets rather than in the entirety of the database.

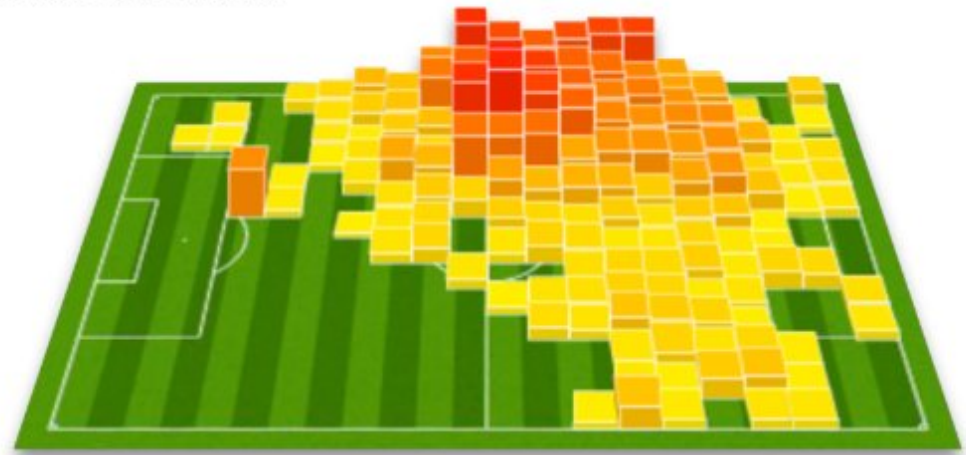[81] see http://www.optasports.com/news-area/news-opta-launch-optapro.aspx (last accessed 20.12.2012).

Figure 17. Example of the use of abbreviated media snippets of match statistics in the form of visualized movement data of a player during a match.[82]

Only members of the inner circle of the club (such as analysts and coaches) know what type of exercises went into the training (e.g. via rehearsing specific set pieces), if players have personal problems that might hinder their performance, or what kind of conclusions are drawn for the opponent's possible tactics via statistical inference. Pattern observation is one of the dominant practices of the analysis team when opponent statistics are interpreted. Numerical regularities of item combinations (e.g. players passing the ball to the player who passes the ball towards the forwards after a counter-attack the most frequently) are identified and quickly derived from the database, which is not fully available to the layperson. Only snippets and more general juxtapositions are available, like the aforementioned StatsZone software for the general football fan on his mobile phone. These can be seen, for example, on the

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[82] see http://www.spiegel.de/sport/fussball/david-alaba-und-franck-ribery-bayerns-herz-schlaegt-links-a-885709.html (last accessed 30.11.2013).

post-match analysis articles on *The Guardian*'s website[83] or the *Match of the Day* broadcast by the BBC.
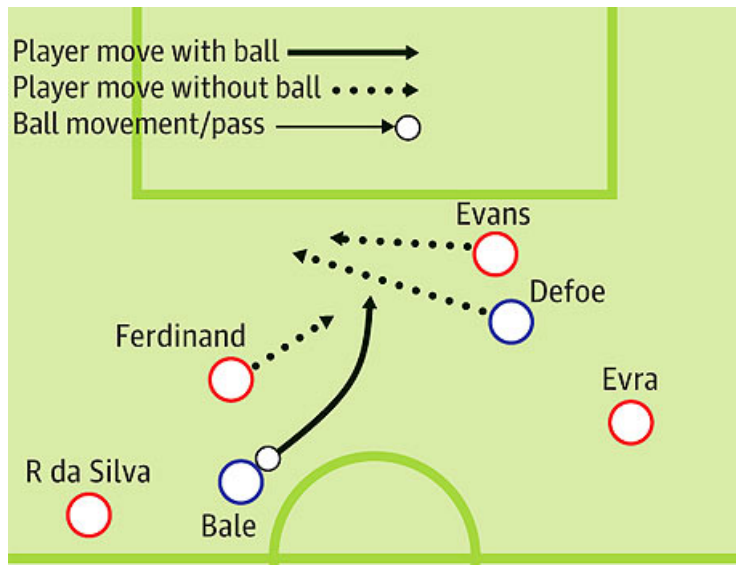

Figure 18. This 'chalkboard' is used by The Guardian *in the match reports to illustrate certain plays during a game based on Opta statistics.*

The layman can see the television image or experience the stadium atmosphere, but the complete layer of numerical abstractions is only available to those who have access to the database.[84] What is also hidden are the strategizing sessions of the inner circle of coaches or the practice sessions. The two training compounds that I was able to visit were secured areas located in more rural and suburban areas on the

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[83] http://guardian.touch-line.com/ (last accessed 24.03.2013).

[84] According to certain analysts I interviewed, this hinders the development of further insights since statistics experts do not have access to the databases of Opta or Prozone and, therefore, cannot tinker with it (Sloan School of Management Statistics in Sport Conference 2012 panel transcript).

outskirts of the inner cities with a guard and a wall surrounding the area. From what my interviewees tell me, sometimes the training also takes place inside of the stadium with no external spectators allowed. The distribution of knowledge based on match statistics is concealed to a certain degree. While *The Guardian* may have access to the same Opta data set as a club, they do not have the interpretative conclusions of analysts and do not know which statistical elements have been communicated to other actors inside the club. Depending on the contractual obligations, performance analysis companies only provide the media with certain pre-formatted data snippets to use in their reports. Interpretative mediation inside the clubs is, therefore, not visible and not available to the outsider. The practical component of planning, the understanding of inner team dynamics in terms of hierarchy, and the actual training of skill sets or plays remain hidden to the everyday football fan. Like a complete set of match statistics from Prozone, these hidden processes represent concealed 'relational tacit knowledge' (Collins 2010:91ff) only available to certain experts with access within certain boundaries.[85] However Collins points out that this 'relational tacit knowledge' is rather weak and is tacit mainly because of the secrecy of the organization:

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[85] As of writing these lines in the fall of 2013, the rules for the availability of statistics have changed. Companies like Opta and Prozone have loosened the rules for access to their databases to case studies conducted by research institutions and press coverage. Manchester City even went as far as to open one (see http://www.optasportspro.com/en/about/optapro-blog/posts/2012/mcfc-analytics-a-response.aspx last accessed 20.12.2013).

[…] the knowledge is vouchsafed to those within the appropriate social network or social space […] but hidden from those who do not belong to the in-group. The very idea is to demarcate those who have spent time in the right networks from those who have not. (Collins 2010:92)

The layperson will experience the match live inside the stadium, on the television broadcast, and through more general third-person accounts in the media, but without the underlying layer of in-depth numerical abstractions and without paying the subscription fee. Without a subscription to, for example, Opta's data sets, he or she would have to either manually (with pen and paper) or digitally (with a combination of video feed, computer, and software) code all the events that are visible on the screen. Doing this without a computer could be considered a form of manual notational analysis (Hughes & Franks 2004:103ff; Carling, Williams & Reilly:51ff; see Chapter 1). Therefore, the described components of tacit knowledge can be considered as 'relational'; they arise out of the barriers of access to information and the lack of transparency of the inner workings of the organization. Not only do the barriers of membership and the barriers of a club's compound keep knowledge on the inside,[86] but so does the virtual barrier of access to electronic databases of match statistics.

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[86] Exceptions to this rule are present as well: recent exploits by an anonymous footballer who has a column in *The Guardian* (The Secret Footballer) and recently published a book (*I Am the Secret Footballer*, 2012) have detailed behind-the-scenes accounts of events in the Premiership.

Statistics are created, interpreted, and distributed among different types of actors. Those to whom performance analysts communicate their knowledge determine the way the statistics are presented. The coaching team might receive a lengthy report on the different strategies and tactics the next opponent might employ whereas the players may only see video sequences of players they may face primarily in their positions on the pitch. The interpretative process analysts practice involves them selecting and evaluating different types of statistical variables from their database of match statistics and the visual manifestations in the video footage from such matches. If the coaches request a report on their upcoming opponent, analysts may dissect the opposing team in terms of defensive and offensive tactics. Hence, if performance analysts understand football terminology and concepts, this enables the communication between them and the players and coaching team via mutual understanding. A prerequisite for the analyst to undertake the interpretation of match statistics is the creation of such statistical data sets. However, the main factor that promotes the communication is the reciprocal acceptance of performance analysis as a legitimate methodology from the coaches and/or players:

> Deep inside Roberto Martinez's home stands a 60-inch, pen-touch television screen; it is linked to his personal computer which is loaded with Prozone's most advanced software. After returning from a match, Wigan's Spanish manager […] will spend hours locked away watching his side's latest game again and again; often, he will need to see the fixture ten times before he is satisfied. (Anderson & Sally 2013:7)

Hence, there are certain physical, virtual and even social barriers that either enable or disable a reciprocal knowledge exchange and conceal certain layers of tacit knowledge. The next section will deal with how analysts learn to conduct their practice via socialization.

4.2. Performance analysis education and conceptual fluency

> The good football analyst is usually an ex-football player because only football players have been in the right position to engage in lots of conversation about football with other people who can talk fluently about the practice of football. But access can sometimes be gained without practical accomplishment, and then, as has been shown, the practical accomplishment is not a condition of the conceptual fluency. (Collins 2010:147–148)

According to my interviewees, professional football clubs in England in 2012, when I conducted my fieldwork research, had a different type of organizational setup than ten years before. Part of this setup revolved either around a dedicated department of performance analysis or performance analysts who were employed to work with different actors within the club but mainly with the coaching team and the players on a day-to-day basis.

To give the reader a better idea as to how a club may be set up, I am going to draw from a talk at the World Football Congress 2011[87] in Nagoya, Japan, which can be considered an example of what my interviewees described, and what I was able to collect in the ongoing series – *Science and Football*. The latest volume is the seventh edition (Nunome, Drust & Dawson 2012). One section in this series is specifically dedicated to the topic of performance analysis.[88] During this conference, Barry Drust of Liverpool FC gave a presentation and also talked about the organization of his home club.[89] He is also employed at the faculty of Liverpool's John Moores University as a reader in 'Applied Exercise Physiology'[90] and teaches in the Performance Analysis BA. This university was the first UK institution to establish a BA in Performance Analysis with the hope of further professionalizing the practice of performance analysis. In his talk, he gave an insight into his job at the club and his role in the educational sector. David Stark and Vedrés Balázs (2010:1165ff) call this position a 'structural fold':

> Actors at the structural fold are multiple insiders participating in
> dense cohesive ties that provide close familiarity with the operations

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[87] I was not physically present at that conference, but was able to catch the replayed transmission on the Internet (http://www.youtube.com/user/wcsf2011) (last accessed 23.10.2013).

[88] Visits to other Sport Science conferences confirmed this observation with dedicated panels on the topic as well.

[89] The presentation can be accessed here:

https://www.youtube.com/watch?feature=player_embedded&v=oojX13ZVAkw (last accessed 19.05.2013).

[90] see http://www.ljmu.ac.uk/sps/76111.htm (last accessed 20.06.2013).

of the members in their group. Because they are members of more than one cohesive group, they have familiar access to diverse resources. [...] This combination of familiarity and diversity facilitates the work of recombining resources. (ibid.:1166)

Herein lies an example in which the analysts transcend the boundaries of their organization while occupying the role of the performance analyst. Specifically, this example signifies the overlapping competencies of working in a club environment while taking on obligations in an educational environment. This specific presentation contained theoretical and practical content drawn from Drust's own career experience. His involvement with John Moores University indicated that performance analysis may be part of a higher-education degree. At the time of writing these passages (May 2013), 24 universities in the UK and Ireland[91] offered performance analysis either as a module in their sports science BA/MSc degrees or as a specialized BA/MSc on the topic.

When I asked my interviewees who had gone to university and went on to become professional analysts about their formal education, their main concern was to do with the lack of skills acquired during their university courses. It was the actual placements and their first jobs as analysts that gave them the necessary skills to do their work within a club. This twofold development of skills can be described as learning 'repertoires for action' (Swidler 2001:6):

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[91] see http://thevideoanalyst.com/list-of-courses-teaching-performance-analysis-in-sport/ (last accessed 30.05.2013).

At the beginning of an action process, goals are frequently unspecific and only vaguely understood. They become clearer once the actor has a better understanding of the possible means to achieve the ends; even new goals will arise on the basis of newly available means. (Joas 1997:273)

I will now go on to describe what the majority of my interviewees with a background in sports science felt they actually got out of their formal education. The modularized portion of their BA or MSc consisted of learning the mechanics of football in terms of official rules, tactics and the language ascribed to actual happenings on pitch. They also learned how to use the performance analysis software and had to retrospectively analyse matches and present their findings in front of the class. A large part of this knowledge is available in the form of handbooks on the topic, which describe the different ways to conduct analysis.[92] However, the placement part of their degree, in which they had to stay with a club as an assistant analyst, was deemed to be as important, if not more important, than their curriculum in class. In the placement, they had to actually work with coaches and players, communicate with them about their analysis, and find out that not everyone on the team might be as interested and enthusiastic about video/statistical analysis as they were. At this stage, they have realized that coaches may pay a lot of attention to very specific behaviours on the pitch, which the analysts grabbed from the database. An agreement between the coaches and the analysts is represented by KPIs, which

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[92] An in-depth breakdown on how 'football knowledge' and being able to conduct performance analysis intertwine will be explored in the second half of this chapter.

were described and explained in Chapter 3. This agreement presents a specific aspect of tacit knowledge. When conducting live-match analysis, the analyst has to be able to grasp the unfolding tactics of a team during a match. This is a necessary prerequisite for the coaching team and for performance analysts' communication to be functional when communicating at half-time or during the match.

Analysts also need to supply coaches with data collections and dossiers that are relevant to the desired style of play. When a team is supposed to be playing very defensively and operates with counter-attacks as guidelines for in-game behaviour set up by the coaching team,[93] the analyst then has to provide video snippets, statistical categories (for example, pass sequences after recovering the ball), and interpretations for the coaches that they deem to be relevant for this style of play.

The analyst has to select statistical data in light of what may be relevant for the players and coaches. A general category could be the ascribed 'strengths' of the left-backs during offensive plays (e.g. crosses or speed). When the team uses counter-attacks as a main style for offensive play, analysts might look at the opponent's statistics in situations where the opposing team seems to be disorganized and not cover the space on the pitch effectively, thereby leaving space in certain areas of the pitch that can be exploited. Behaviour in past games is seen as indicative of future behaviour. Certain players might also be of interest in the case of

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[93] Further specific sequences of play in, for example, the case of scoring or conceding a goal are part of the 'match plan', which instructs the whole team to behave in certain ways after such an event has happened. An example might be when the team scores a goal they should retreat deep into their part of the pitch and try to initiate counter-attacks by trying to get the ball or waiting for the opponent to make a mistake – such as a sloppy pass – that can be intercepted.

comparing them against their own teammates. In one instance, an analyst explained to me that the centre-backs were initiating plays after receiving the ball from the goalkeeper and liked to pass the ball towards the wingers upfront. Nevertheless, he considered them to be not very fast and to have trouble in duels against smaller and faster players. He underpinned this by showing me video sequences in which they lost out against players because their movements were not quick enough. Therefore, looking at the opposing team and numerical representations of coded movements and events such as passes, explicitly codifies what, in other cases, would have remained tacit to the observer; in this case, the display of player/team patterns in order to draw out certain characteristics of play are interlinked with the coaching team's emphasis on the style of play they want the players to perform. What is considered 'slow' in the preceding example is manifested in a numerical indexation of the running speed of defenders in miles per hour as a metric of captured movement of the player on the pitch. Hence performance analysts are making what has been tacit within the video footage of the actual game into an explicitly quantified variable. Similar categorizations of the movement patterns of players are turned into quantified variables that include direction, duration and type of movement as distinguishable among different running speeds.

Conceptual understanding and conceptual fluency are fundamental to allowing knowledge transfer between analysts and coaches. This subsection shows that performance analysts undergo a specific type of skill acquisition via the route of formal education and practical application. Their work practice relies not only on the fact that they conduct their match analyses but also on being able to communicate their findings to other actors. Hence, they are not only required to have the

knowledge of football tactics and jargon but also to be able to communicate their conclusions to staff and players, who are, essentially, non-practitioners.

4.3. Understanding football I

The last subsection showed that performance analysts can uncover implicit elements of football matches, which they code, collect, select, transform and pass on to the coaches and players. Generally speaking, analysts are adding another layer of meaning to the match footage one may see on the television screen by drawing out the patterns of play and converting them into explicitly quantified manifestations of events; this is a necessity to working with certain coaches who use trained patterns of plays in their training, which they want the team to be able to implement during games:

> My template for everything is organisation. With the ball you have to know the movement patterns, the rotation, the fluidity, and positioning of the team. Then there's our defensive organisation […], so if it is not going well we have a default mechanism which makes us hard to beat, and we can pass our way into the game again. Rest

with the ball. Then we'll build again. (Brendan Rodgers, Liverpool FC, 2012)[94]

The performance analyst has to understand those patterns conceptually and is advised to measure how those patterns worked out during the games based on their analysis. This is relevant for set pieces or penalties:

> This is a prime example of what I am talking about […]. We identified their weaknesses during set pieces, and the coaches used that knowledge in the next game […]. You see this goal? That is perfect execution […] [T]hey have trained this over and over. (Dok3.3)

> Mignolet knew that Walters had dispatched four of his previous five penalties towards a keeper's bottom right corner. [...] You study those things as a goalkeeper. All credit to the guys at the training ground who helped me analyse those things. You have to be lucky that you dive the same way, but I was very pleased.[95] (Simon Mignolet, Goalkeeper, Liverpool FC)

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[94] http://eplindex.com/14987/brendan-rodgers-tactical-approach-liverpool-adapt-tikitaka.html (last accessed 14.11.13).

[95] http://www.liverpoolecho.co.uk/sport/football/football-news/liverpool-fc-goalkeeper-simon-mignolet-5749307 (last accessed 20.11.2013).

The tacit knowledge base layer of interactions between coaches and analysts is the shared understanding of tactics, which is necessary when looking at statistics that they deem to be relevant for examining the strengths and weaknesses of the opposing team. To understand the coaches' way of thinking, the analysts have to be exposed to the coaches' ideas till the coaches ideas become conceptual understandings:

> I've worked with X(b24) before; we are on the same page. I know what he wants and he knows what I can do […]. He has a very distinct style; you see it in all the teams he's coached […]. I know how he wants his teams to perform, and I know the variables I need to keep an eye on. (Dok4.5)

In Collinsean (2010:119) terms 'strong tacit knowledge'[96] combines the elements you may have learned if you participated in formal performance analysis training in university (by learning the basics of match analysis), took part in the social world of a football club over a period of time (know how to communicate with other actors inside the club), and cultivated a relationship of mutual understanding on a conceptual level with a coach or multiple coaches. Therefore, multiple factors come into play to establish a reciprocal relationship.

Theoretically speaking, football tactics in this sense are based on estimations of the capabilities of the team, the opponent's past performances, and the coaches' preferred strategy. During training and, ideally, during matches patterns of actions are performed by a multitude of players on the pitch. These can be specific set pieces

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[96] Collins would also refer to this as 'collective' tacit knowledge (Collins 2010:85).

with enacted distractions (e.g. a player running to the side to draw a player out of the wall during a free-kick situation) or specific types of pass combinations by offensive players after the ball has been recovered to initiate a counter-attack (for example the 'ten-second rule' for attacking plays after a turnover while only employing vertical passes). This orientation is communicated between players, analysts, and the coaching team with the trajectory of live-match execution. Sociologically, one can describe such capabilities as 'tacit knowledge-laden interactional expertise' (Collins & Evans 2007:10) based on a distinct linguistic expertise in natural language. As I have shown previously in this chapter, performance analysis may be taught in university courses through books, and statistics may be inscribed in computational systems. Knowledge transfer can only be achieved if both parties have a mutual understanding of the concepts they are communicating. Having a mutual understanding of these tactics, for example knowing how a team executes an offside trap, is a form of 'strong tacit knowledge' (Collins 2010:119), which is enacted socially (by the football team) and instructed by the coach. Observing and categorizing these actions with the correct football terminology is a process of learning tacit knowledge by participating in practice and seeing the conceptual elements, such as 'aggressive pressing,'[97] carried out by different players. 'Strong tacit knowledge' is social and can be learned by participating in a social world and interacting with other actors.

In contrast to these quantitative manifestations, as an observer of a football game you are exposed to the perceptual flux of the match through your own eyes and

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[97] This can mean that pressing is conducted far up the pitch or by a multitude of players who are instructed to narrow the space for the holding player once the ball is lost.

ears. You would need special software to operate the detailed data tracking and share the same increments of tacit knowledge about football to have the same perspective as analysts. Besides the data of their own team players (and the team as a whole), which are constantly fed back to the coaches, categories for the evaluation of the opponent are created. Such categories would be, for example, 'attacking strengths' (Dok7.1), the 'ability to create space' or 'goal-scoring opportunities' (Dok 5.2). Categories are related to either (key) players who are regarded as noteworthy based on statistical inferences by the analyst or dedicated to the whole team. Furthermore, sub-categories emerge and 'goal-scoring opportunities' can be divided by distinguishing between inside or outside the penalty box; this adds spatial dimensions to the numerical occurrence of action-oriented variables used as a means of interpretation.

4.4. Understanding football II

When the offensive lineup of an opposing team is analyzed, analysts are not only examining, for example, whether the identified striker scored or missed goals, but also which players were involved in the creation of these goals and, therefore, they are creating a context for each quantified (meta)variable.

In order to be able to undertake the interpretation, statistical data is being filtered for passing sequences, etc. This is done by the analysts who replays video

sequences to look at the involved players, marks them with the software, and creates abstracted graphical diagrams using the provided software.
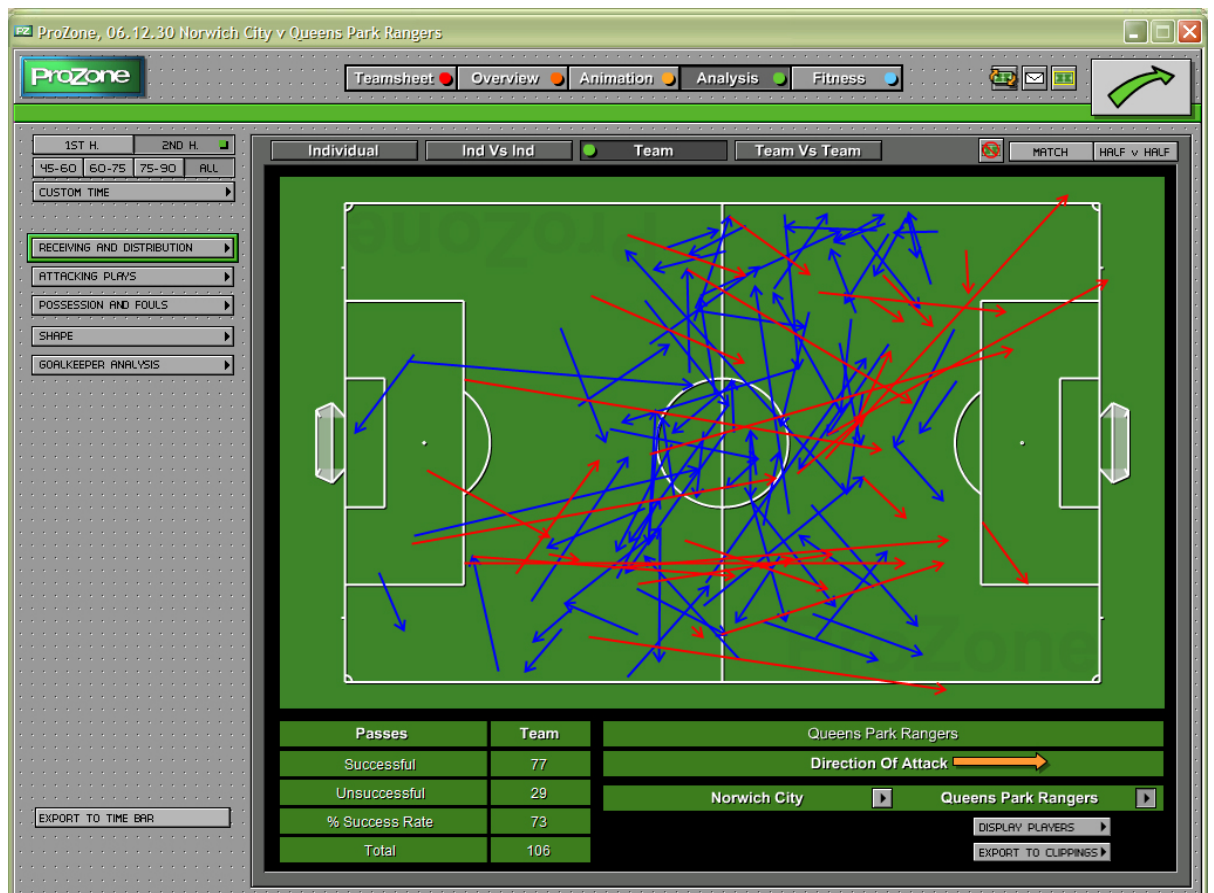

Figure 19. Screenshot of Prozone3 with different visualized variables that concern passes from Queens Park Rangers against Norwich City.

Players and events are identified via computer-assisted tracking. An analyst could look at which player passes the ball towards the wingers or the offensive midfielders most frequently. This is done in order to find 'patterns of play.' Patterns are forms of

play that were explained to me as either 'trained behaviour' (Dok2.2) or 'individual player strengths' (Dok1.9). These patterns depend on the movement of players and the direction of, for example, their passes. Subsequently, patterns of passes are identified in the statistical data and categorized by their importance according to the position of the player and their responsibilities in each quadrant of the pitch. The field of play is divided into separate spatial quadrants, which is a device used by coaches like José Mourinho,[98] who is an advocate of performance analysis as an aid in his coaching practice.
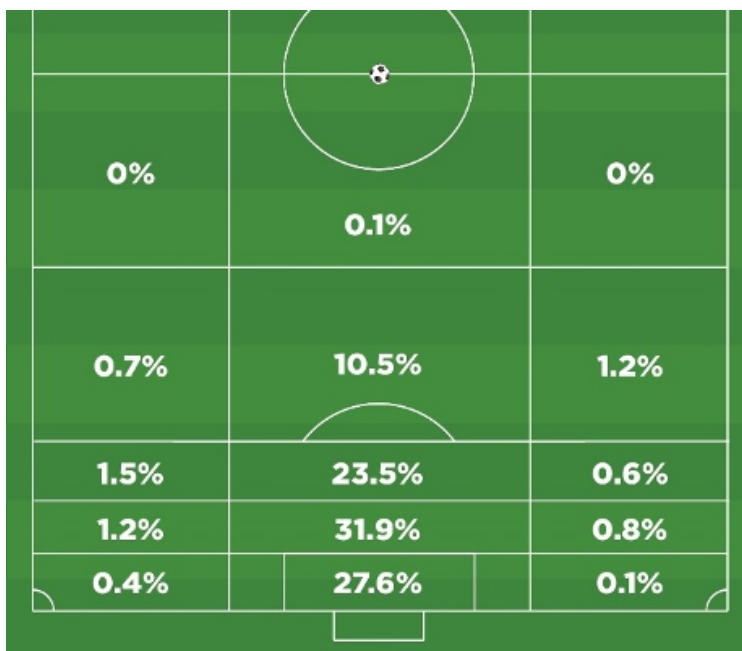

Figure 20. This illustration is an example of league-wide percentages of goals struck from each quadrant of the pitch. The preceding figure can be seen as exemplary for analysis in which games are reconstructed, and the field of play is divided into

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[98] See *Der Spiegel* 11/2010.

geometrical units with ascribed meanings. In this case, each quadrant represents the

percentage of goals scored in the respective quadrant over the course of a season.

In order to identify common patterns or trends, games are broken up into different phases, such as how the next opponent played in the first half of their past games, and which players are involved in certain events in which they display their supposed strengths and weaknesses. Phases also include sub-categories, such as the behaviour of the opposing team during a counter-attack or the behaviour of defenders during set pieces.

Analysis, therefore, entails layering categories of certain types of plays into codified and small-chunked sequences on the pitch that can be brought up visually in the software (see Figure 19.). The quality of strengths and weaknesses is regarded as contextual, not only given certain phases of the match but also given certain types of events such as set pieces or sequences like the events that happen after the ball is recovered. Special attention is also paid not only to the patterns of movement of players who are involved in specific plays, (such as those who are actively involved in passing or dribbling the ball), but also to the movement of players off the ball. In this sense, one could look again at 'the creation of goals' (Dok7.2) as a category for inquiry. This categorical type of interpretation cannot be comprehended from just looking at the statistics. One analyst showed me that he had identified a player who blocks the path for the emerging fellow defender who would leave his position in the back four during set pieces and run into the penalty area of the opposite team. He showed me that this player (and, henceforth, the accompanying meta-category

'creation of goal-scoring opportunities') could be identified by using a combination of video footage, statistics, and graphics. He looked at the statistics and said that a large number of goals had been scored after a corner and saw that defender X(b2) would be frequently involved in the creation of goals by giving assists or by scoring himself. Nevertheless, the video footage showed that his teammate X(b9) (a midfielder) would try to block the path for this player during set plays to enable his goal-scoring potential. Analysts considered this player of equal importance during the play. The interpretation of 'creation of goal-scoring opportunities' is a relational category between players, movements/actions and attributed importance. One analyst showed me a specific sequence and said, 'During this play, we got under a lot of pressure' (Dok5.4). Analysts speak of reoccurring patterns of play that are observable and can be derived from a variety of game event data, such as a lack of pass completions in midfield. 'Goal conversion' (Dok5.8) is another example of a meta-category in which multiple variables are combined and related to each other. Here, the metric of scored goals is divided by the shots a player has taken. Conversion rate is measured in percentages. Engaging in those acts of classification requires the tacit knowledge involved in recognizing those categorizations by understanding the underlying conceptual elements that comprise this category and being able to relate the different variables which form this metric.

As I have mentioned before, this interpretation cannot be understood from looking at the statistics and abstract graphical representations in isolation. Analysts conduct a back-and-forth process of analysis between the study of video sequences, abstract graphical representations and the numerical manifestations in the database. Hence, the tacit knowledge base layer that enables such interpretative capabilities

relies not only on understanding the jargon, concepts, and rules of football, but also on being able to conduct analyses related to these factors through using the socio-technical machinery.

My interviewees would ask each other and themselves specific types of questions. Analysts use position data in specific sequences during a match. They are interested in finding answers to 'How the midfield of the opposing team behaves when their attacking plays are broken up?' (Dok2.7), or 'What types of attacking plays are observable?' (Dok5.9). Analysts look for statistical regularities; however, there are different ways of finding these. Reasoning is, therefore, undertaken by looking not only at similarities but also differences in occurrences of events during the categorized phases of the game. Some analysts whom I interviewed used a more numerically driven approach and were able to relate statistical variables to look at the numbers first. Some would even export the data set into Excel to conduct their analysis. These spread sheets would be mediated via, for example, pie charts or histograms.

As I have mentioned before, most analysts whom I interviewed use designated software and data packages like the one Prozone offers and this is considered the predominant way of conducting analysis.[99] Specifically, Prozone

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[99] The other major performance analysis company is (or was) Amisco Sports, who employed a similar multi-camera/-software system but has since merged with Prozone and now operates under the Prozone label. (see http://www.prozonesports.com/news-article-prozone-amisco-join-forces-to-advance-sports-performance-analysis.html accessed 31.10.13).

offers analysts access to graphical representations of statistical data[100] immediately

once they receive the database update for the current game. As described in Chapter

3, mediation is the translation of interpreted statistical data as graphical abstractions,

dossier-style summaries, or recorded television sequences when interacting with

coaches or players. Analysts will pursue and show different game situations in which

tactics play out and proceed to present graphical abstractions of predominant patterns

of play.

4.5. Disapproval, disinterest, and claims to 'scientificity'

As I have indicated previously, the relationship between the analysts and the coaches

is not necessarily harmonious. Different opinions between coaches and analysts can

lead to dissonance. For example, disapproval of statistics was one of the main

themes that my interviewees had to face with the coaching team or the players.

Disapproval can be detrimental to the relationship between analysts and coaches:

> The shift still happens in the UK as well. A lot of the coaches don't
>
> buy into it, they don't understand it. They don't use technology; they
>
> think it clouds the issue. […] The thing is, all of the clubs have it.
>
> […] They have employed that person, and there was such a buzz

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[100] In the later part of this chapter, I will talk about the relationship between data and graphical

representation in depth.

about [it]; everyone's got it. (Dok1.7)

In turn, the analyst's knowledge about computer and software usage is necessary to be able to undertake this form of analysis:

> A lot of the clubs have excellent coaches, but they're pretty much computer illiterate; they would never use computers and technology. This is changing with the younger generation of coaches who've come into the game and use the technology themselves. They are happy to do it, but our role as performance analysts is to support them and make sure they're using it correctly. (Dok8.6)

This can be considered as a privileged prerequisite since other staff members of the club may lack this specific knowledge or are not in favour of using it. My interviewees told me that certain coaches might not consider using a computer at all or even possess the (partially tacit) knowledge to use one. Coaches and analysts have to be on the same page conceptually:

> […] [I]f he doesn't accept me or doesn't like me, I'm doing my work for nothing. (Dok7.4)

> I've worked with a coach who was not interested in my opinions at all […]. [H]e just didn't care about statistics; he didn't use any of the reports I gave him. (Dok11.5)

Besides embodying knowledge in a tacit sense, Michael Polanyi (1966) argues that the explicit counterpart is ultimately rooted in an embodied tacit understanding that allows an application of this type of knowledge. Tacit understanding of how to make decisions in football matches can vary distinctly between the coaching team and the analyst. However, as Collins points out, embodied knowledge is not suspended in a frictionless environment but unfolds in a social context (Collins 2010:8). Analysts themselves refer to statistics as 'objective scientific data' (Dok1.1). As I have shown in Chapter 2, this data, which consists of statistics of match events, represents the manual 'inscription' (Suchman, 2007:279; Collins, 2010:19–20; Latour & Woolgar, 1979) of actions on the pitch into a quantitatively coded computational database. These statistics may serve them as 'epistemic objects' (Moore & Maton, 2001; Knorr Cetina 2001) for the analyst's reasoning and subsequently, if accepted, the coaches' decision-making. Such an object

> […] regulates how knowledge comes to be viewed as legitimate through altering relations between the arbitrary and non-arbitrary in knowledge; i.e. whether knowledge claims are legitimated on the basis of external relations of power or by principles intrinsic to knowledge itself. (Moore & Maton 2001:5)

In this sense, the meaning of these statistics arises out of the process of interpretation by the performance analyst. In the practical context of the football

clubs, these interpretations are not the outcome of elaborate mathematical models applied to the data set. My interviews and the performance analysis literature suggests that knowledge about game events and player movements from the coaching team is partially framed as the opposite and is regarded as 'subjective and 'imprecise' (Dok1.8). Statistics are an apparently objective form of scientific evidence that are regarded as superior to human capacities to remember events and therefore they are thought to objectively inform decision-making and evaluation of what happened during half-time in a match. This contrast is elaborated further in sports science handbooks, which serve as guides for sports scientists who specialize in performance analysis:

> The evidence from these studies, combined with many others from the field of applied psychology (such as experiments that investigate the reliability of eyewitness testimony of criminal events) leads one to believe that the processing of visual information through the human information processing system is extremely problematic [...] if one requires an objective, unbiased accounting of past events. (Hughes & Franks 2004:9)

This connects to what my interviewees told me. While coaches undertake their own analyses on the pitch, their point of view is limited to observations from the side lines. My interviewees stressed that coaches are emotionally involved in the game, and they are not capable of remembering all the events that happen during a match and are, therefore, '[…] not capable of making rationally informed decisions

based on objective facts' (Dok1.6).

As I have mentioned before, a certain dissonance between actors arose out of my interviews. One topic that emerged from my material was that analysts have difficulties communicating with certain (mostly seasoned) coaches. They expressed disappointment that their work is sometimes disregarded, publicly or internally downgraded and de-contextualized. Although interviewing coaches was unfortunately not possible owing to access restrictions, public utterances during media interviews may mirror these sentiments: 'You can have all the computers in the world, but your eyes have to be the judge' (Harry Redknapp, *The Times*, 15.01.2012).

The dichotomy, which became apparent from my interviews was that the analysts considered themselves to be reasoning by way of using 'objective scientific facts' (Dok4.7), a position which was diametrically opposed to the coaches' argument that their knowledge and experience:

> […] apparently is worth more than 60 pages full of numbers. (Dok4.2)

> Different clubs have different ways of employing performance analysis. Some clubs use it wildly different. At Org(12), I was doing my work, but nobody was really interested (Dok 11.4).

> Well, to be honest, we just use it [the software] as a video-editing tool on request by the head coach. The analysis we conduct is very, very

basic. (Dok11.6)

One specific case that an interviewee recounted to me can be considered exemplary for this line of argument. It illustrates the reoccurring narrative that analysts reported in which statistics tend to be taken out of context: for example, when a game was lost, coaches would use supposedly 'bad statistics' to scold players and, therefore, make them responsible for the team's loss or overall weak performance. In this sense, statistics served as a 'blaming device' (Wilkinson 2006:34) to underpin the coaches' view of things. In contrast, analysts would argue that the opponent's tactics and the wrong tactics of their own team were the defining factor in losing. The analysts were using a mode of reasoning that involved giving a more technical account based on their interpretations. In this sense, both sides used match statistics to support their respective arguments but employed different argumentation in their conversations. In the specific instance recounted to me, the coach used statistics mostly for allocating blame and conducting appraisals, whereas the analysts' assessments were mostly based on the relevance of statistics and the choice of tactics. Nevertheless, both sides seemed to be using the quantitative data after the fact as a means of interpretation and communication with the players. Studies that reflect this opinion are apparent in the literature concerning performance analysis, and mirror the opinion of my interviewees:

Studies have shown international level soccer coaches could only recollect 30 per cent of the key factors that determined successful soccer performance and were less than 45 per cent correct in the post-

game assessment of what occurred during a game [...]. Another study found no difference between novice and experienced gymnastic coaches in distinguishing differences between two performances [...]. In fact, the experienced coaches were more likely to report a difference in performance when none existed and were very confident in their decisions even when incorrect [...] when combined with emotions and personal bias of the observer, [this] may cause a distorted perception of the game in total. (Hughes & Franks 2008:3)

Besides mentioning a more general disapproval of their methods, my interviewees told me that one of the main hurdles they had to deal with were how to motivate players to actually engage with this type of method and having to sometimes accept that they may face a lack of interest. According to the analysts I interviewed, the main thing they had to learn when placed at a club was how to connect with different actors who would have different agendas within the realm of the club:

You have to deal with big personalities, different stakeholders […] football clubs are a very intense environment […]. I guess it's more of a personality trait and a skill. (Dok4.6)

If you're gonna go and work in the applied world, you need to understand it's a jungle out there, and some very, very dangerous people [are] around. Think of the coach, you know you can see the

coach as a battle-scarred lion [...]. He has heard three million sports science students tell him what he can do to improve his players. He is under pressure, so the reality is [that] in the Premier League you've only got six games till people gonna start talking about you being sacked. [...] If he's got six games to save his job, he's gonna do the things he trusts and believes in. He's not gonna necessarily listen to some young person who's got some idea about science. (Barry Drust, Liverpool FC)[101]

Part of the work of performance analysts also consists of presenting their analysis to other members of the organization. Although analysts are mostly interacting with coaches and players, other parts of the organization want to be supplied with statistical information and summaries of certain codified variables. While the coaching team is more interested in learning about information from match to match, by comparison the board of directors may want a more long-term perspective on the team's development in order to evaluate the work of the coaching team. In one form or another, statistics are diffused into different parts of the organization via the performance analysts' mediation. My interviewees told me that they have to adjust not only the content of their presentation but also the way they present that information. Communication among coaches, players and analysts was described to me as more informal and casual while, for example, talking to members of the board had prescribed elements that were manifested in a more formal dress code and formal language:

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[101] see http://www.youtube.com/watch?v=oojX13ZVAkw (last accessed 21.11.2013).

You can talk to the boys differently; sometimes they take the piss out of you, sometimes you take the piss out of them [laughs] [...]. [W]hen the coach needs to know something, I come over for a cup of tea and we'll talk [...]. (Dok16.9)

[...] [Y]eah, sometimes he [the head coach] calls me up in the evening, and I'll send him a file or look into the database [...]. [H]e likes to think about football when he's home as well. (Dok14.5)

Coming from a social science background, I am familiar with quantitative methods for conducting research when looking at statistical datasets. Although performance analysts claim to be able to look at football matches and distil 'objective scientific data' (Dok1.1) via the creation and interpretation of statistics, they are likely not statisticians in the conventional sense but rather use a variety of different inputs to foster their interpretation. Performance analysts mainly use a combination of augmented video-feed analysis, look at very specific variables in the data set, and visualize certain variables either on a static screen image or within the recorded video feed. My interviewees told me that football is a very different game compared to other sports such as baseball. It is less fragmented with many long sequences of play, which would make probability calculations difficult in a practical setting. However, I was told that probabilistic mathematical models have been in the making for a few years and are tested behind the scenes:

What we're trying to come up with is a model, a robust model to clearly identify [...] associating a level of blame to defenders concerning certain events, basically creating a model [that] is much more robust looking at tackles, clearances, receptions, and whatever [*inaudible*] not in isolation however. (Dok4.8)

Well you know, sometimes video doesn't tell you enough to understand it; I think that we have layers in the data, which we don't use. It won't be entirely objective – at some stage you'll have to come back to the subjective. If we can work with such models, we would be able to identify the trends and patterns quicker. (Dok4.9)

In the future, my colleagues may not necessarily have a sports science background […]; of course, they still have to know everything about football. […] [T]hey will have a background in math or physics. (Dok6.3)

To my current knowledge, these new models have yet to be fully implemented in the decision-making. However, certain interviewees confirmed that the betting companies, who are also customers of performance analysis dataset providers, have developed more elaborate models to a greater degree that, for example, influence the calculation of the initial odds for football matches. My own inquiries to set up interviews with representatives of betting companies were all politely declined. To my knowledge, statistical inference in professional football is

comparatively simple in terms of how statistics are used and interpreted.[102] However, statistics are still important and remain the mediated knowledge artefact, which is passed on between various actors in different forms, such as digitalized video footage and abstracted graphical representations of the statistical data of game events. The visual aspect is deemed to be especially important for the process of information mediation. In this specific case, coaches and players alike are largely not interested in 'just numbers' (Dok5.8), or they dismiss the methods of performance analysis entirely and instead refer to personal experience and intuition as more important.

Hence, there seems to be a degree of dissonance between analysts and certain types of coaches who either do not like statistics, or who are against the methods of performance analysis as such and, therefore, have a non-reciprocal relationship with the analysts on their team. Despite the fact that performance analysts work with large quantitative databases, the operations they carry out on an interpretative level do not (so far at least) involve statistical calculations but rather revolve around monitoring certain variables and using graphical representations and video footage to highlight their findings.

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[102] A couple of analysts mentioned that statistical prediction models have been in the making since 2010 (Dok3.1). Although they refused to tell me about the specific type of models in use, they said that these models use statistical data from past matches of opposing teams, for example, in order to not only gauge the players' future performances but also to find out more about the relatedness of each player's performance indicators via the use of correlations .

4.6. Conclusion

To summarize the findings of this chapter, one can say that performance analysts undergo distinct forms of socialization without themselves having real contributory expertise (Collins & Evans 2007) of playing high level football. However, they have developed the interactional expertise to talk meaningfully to players who possess contributory expertise and/or coaches, who, at least in the past, had that contributory expertise: 'To acquire collective tacit knowledge without engaging in or having the ability to engage in collective practices is known as acquiring interactional expertise' (Collins 2010:136). Performance analysts usually have a completed degree in sports science in which performance analysis as a method was either taught as part of their curriculum or was gained via a specialized MSc degree. My interviewees told me that during their time in university, they learned not only the rules, terminology and concepts of football but also the ways to conduct performance analysis via software tools. Part of their studies included placements at clubs where they had to conduct analyses 'in the wild'. This helped them to learn how to relate to coaches and players in terms of not only demonstrating their knowledge about football and the accompanying conceptual underpinnings, but also to learn that rapport on a personal level may be necessary to have a reciprocal relationship; sometimes they would find out that certain coaches were not interested in performance analysis at all.

This observation ties into another finding, namely, that performance analysts claim that they make implicit elements of football games explicit by coding the unfolding events of matches into quantitative databases that they deem to be 'objective scientific data' (Dok1.1.). They contrast this type of knowledge and

computer expertise with the more 'emotional' and less accurate perspective the coaches have when it comes to reviewing player and team behaviour. Despite their claim of being scientific, my interviewees were not statisticians in the usual sense. Their ways of conducting interpretations involve looking, for example, not only at specific coach-requested variables like passes or shots but also at metavariables in which different variables are related to each other. Hence, they cycle back and forth between the match data, the visualized variables and the video sequences to conduct their analysis.

5. Creating the reflexive footballer

keywords
[youth academies; socialization; reflexivity; role-taking]

> […] (T)he players will review their performance in different ways. […] The perspective is different if you are able to look at the whole pitch via video and see the other players on the pitch as well. […] It is crucial to see the space your opponent gives you and the movement patterns they engage in. (Dok8.4)

This chapter ends the empirical presentation of my inquiry. It will mainly illustrate the relationship between players and performance analysts, while focusing on their role within youth academies. In this specific context, analysts facilitate the socialization of youth players, in particular to help them become familiar with recognizing and reflecting their own and other players' performances. Such acts of facilitation, I will argue, are not merely acts of telling a player how he has played but are actually acts of showing and telling designed to help the player become more reflexive (Rich & Chalfen 1999:51). I will draw on the old sociological concept of 'role-taking', a concept derived from the Symbolic Interactionist tradition (Mead 1937; Blumer 1969), and on the notion of 'reflexivity' (Archer 2007; Giddens 1991). In a Blumerian sense, players are encouraged to:

> [...] address oneself [...] from the standpoint of an organized context of interrelated activities of others. [...] [O]ne becomes to oneself a complex object having to engage in specific activities that mark the game, such as filling a specialized part. [...] In taking the roles of diverse people implicated in the game, one is in a position to weave together their different perspectives of one into a complex object of oneself. (Blumer & Morrione 2004:64)

This involves a form 'reflexivity' in which players review their games retrospectively to improve future performances. In this sense 'reflexivity' can be defined as a conscious consideration (Archer 2009:45; 2007) of a player who reflects on his actions in relation to the game he has played with others players. The

performance analyst guides this process. Throughout my fieldwork process, I noticed that the practice of pro-player-level performance analysis has been implemented on a youth level too. As an example, I will take a more detailed look at youth academies to show how the outlook of a 'performance review' can be learned from a very early age onwards.

5.1. Relating interactionist principles

The review process between players and performance analysts can be explained as a form of the 'role-taking' concept (Mead 1934:73ff; 150ff). I will now explain this concept in greater detail and relate it to the overall theory of Symbolic Interactionism. The original concept was used in *'Mind, Self, and Society'* (Mead 1934) and is explained by relating the development of children and how they learn how to become members of society. The cornerstone of this theory is the game metaphor, which takes up an important part in this specific process. Generally, three stages characterize this Meadian concept, which was later on rephrased by Herbert Blumer (1969).

Broadly speaking, the problematic issue to do with Mead's contribution to sociology was that most of his work was never intentionally published in one publication (Joas & Knöbl 2009:127ff). Most of the literature that is classified as written by George Herbert Mead was compiled in edited volumes like his best known work, *'Mind, Self, and Society'* (1934). Blumer, a student of Mead, later

coined the term 'Symbolic Interactionism' (Blumer [1939] 1951) and clarified and rephrased Mead's work into an approach that is considered to be part of the canon of classical sociological theory (Joas & Knöbl 2009). Blumer was in line with Charles Horton Cooley, who thought of '[...] interactionism as a framework through which reality was interpreted' (Cooley 1964:8).

The basic tenet of Symbolic Interactionism is that actions conducted by humans are grounded in meanings we attribute to the things around us. Those meanings arise out of interaction with each other (Blumer 1969).

> The first premise is that human beings act toward things on the basis of the meanings that the things have for them. [...] The second premise is that [the] meaning of such things is derived from or arises out of the social interaction that one has with one's fellows. The third premise is that these meanings are handled in and modified through an interpretative process used by the person in dealing with the things he encounters (Blumer, 1969:2).

Reflection on those tenets suggests that they may be regarded as grounding principles upon which human interactions can be explained sociologically. If one takes a look at interactions between players and analysts, both parties know about the rules of how to play football, and both have the knowledge of how players on the pitch ought to act in their specific positions (for example, as defenders) within the organization of a team in certain match situations (see Chapter 4 on the role of tacit knowledge that performance analysts possess). For example, when a team has the

ball and moves forward, or when the opposing team has the ball and attacks, defenders based on their assigned role and their interpretation of the role act in ways that ideally take into account not only what types of actions certain game situations entail, but also what the orders of the coaching team consist of in specific situations.

In the context of performance analysis, the player is being shown how he acted in certain match situations. I observed that analysts would divide sequences into snippets of actions, which are then scrutinized with the player. As I have shown in the last chapter, performance analysts have a specific type of 'specialist tacit knowledge-laden expertise' (Collins & Evans 2007:69). Parts of the analysts' interpretations are usually shown to the player in the form of narrated video sequences:

> I show them videos of reoccurring events in the match. [...] [O]ur player X(b16) lost the ball a lot when we were in possession. It is my job to show him how this happened. Of course, I am not showing him all the footage... mostly short videos; they just don't like to look at numbers [...]. The visual aspect is the most important one. (Dok.9.7)

The video sequences have an attributed meaning built into the narration by the analyst since he/she would label player behaviour as either erroneous, well executed, or improved upon. However, this can be categorized as a third-hand assessment. Therefore, match situations are layered with meaning; for example, an analyst may point out that in certain match situations there are a multitude of options for playing passes that might have been the better option for the player. Analysts

might state their opinions via their outlook on quantitative variables and video analysis of match sequences:

> You see, a player runs ten kilometres in a game, that's a lot. That data heavily influences the tactics of the team, the opposition, the state of the game, are they three-nil down; there are all kinds of factors that influence [the] context of the match events. (Dok9.1)

The act of reviewing performance is followed by an act of sharing meaning that includes the mental act of third-person reflexivity. This means that the analyst assesses the player's performance by pointing out what he has done well, and what could be improved in his opinion. However, players might contest the analysis. During this interaction, the player has to decide what to do with the interpretations of his performance and how to act on them.

Conversely, players on a youth-level team learn about the intricate mechanics of the game of football and gather the interpretative competence to be able to 'read the game' (Dok10.4) and reflect on their own performance via the help of a performance analyst. The interactions between players and performance analysts partly revolve around retrospectively taking the role of another player who they may play against. The focus lies on the players who are playing their position on an advanced level. Mead used the baseball game as an example to explain this similar process:

> [The child] must know what everyone else is going to do in order to carry out his own play. He has to take all of these roles. They do not

have to be present in the consciousness at the same time, but at some moments he has to have three or four individuals present in his own attitude, such as the one who is going to throw the ball, the one who is going to catch it, and so on. (Mead 1934:151)

When the response of the other becomes an essential part in the experience or conduct of the individual; when taking the attitude of the other becomes an essential part in his behaviour – then the individual appears in his own experience as a self and until this happens he does not appear as a self. (Mead, 1937:195)

The act of communication between players and analysts is conducted with a computational material intermediary that partially constitutes the communicative act. Meaning is conveyed via the use of computer software showing video images and abstracted graphical patterns that I have illustrated in Chapters 3 and 4.

As I have shown in Chapter 5, analysts largely believe match statistics to be 'evidence' ('hard scientific facts' (Dok8.4)) regarding the performance of players, which in a mediated form can be shown either on a large projector screen in front of the whole team, on a computer in front of, for example, the strikers, or to an individual player on a tablet. The format of the presentation changes according to the immediacy of feedback and the timeframe. Assessments are, therefore, not only concerned about their own team's players but also the players of the opposing team. This whole process of consultation is done with the player reflecting on his performance and engaging in acts of reflexivity.

5.2. Learning about performance – Inside youth academies

> […] [D]on't forget the youth teams; they have dedicated analysts too
> […]. [T]hey oversee the development of the youngsters […]; they
> help to determine which players can play in the first team based on
> their performances […]. (Dok9.5)

To my knowledge, almost every current Premier League club operates an academy for youth players. They are built with the intention of developing talents who, ideally, become Premier League players. In these academies, players are trained not only in the technical and tactical skills of football but also in conducting a reflexive analysis of their own performance, ideally developing an improvement in future training sessions and matches. Judging from my fieldwork data, youth players are now systematically trained to learn from a performance analyst not only how to improve their own performance on the pitch but also how to analyze and grasp the opponent's strengths and weaknesses.

The previous chapters have shown how match statistics are created, and how they can be integrated into the organizational workflow in present-day professional football. I showed how these statistics are created, how they are infused into the organization of the club, and how they are interpreted by performance analysts based on their tacit knowledge. The first team is supported by an analyst (or a team of analysts), but the youth players are seemingly not short of statistical support either. According to my interviewees and my own observations, certain clubs have performance analysts assigned solely to the youth academy. By contrast, other clubs

have analysts working with both the first team and the academy. One such analyst commented in an interview: '[…] I have to spread myself thin. There are plenty of things to do […] of course the first team is my priority' (Dok18.2).

I was able to listen to frequent presentations at sports science conferences on youth development during the education of potential professional football players.

After having seen presentations on youth academy football, I became interested in interviewing the performance analysts involved in this process of socialization, and I wanted to see how this practice applies to the professional level. In order to see all the elements unfold, I was allowed to visit two academy compounds and observe the process. I have since observed similar practices and models of developing youth players presented at sports science conferences as well; therefore, I may speculate that this type of assistance in youth academies links adult professional players and youth players via the process of performance analysis. The next generation of players may possess an acquired familiarity with the technology and the review process due to its implementation at an early age:

> We try to expose our youth players to our methods as early as possible […]. [N]o, it's not like the first team. We do a few review sessions and make them familiar with what we do […]. [I]t's very relaxed; there is no pressure […]. [W]e encourage the lads to watch the video sequences on their own as well. (Dok15.2)

In one of the academies that I was able to visit, the players were split up among different age groups, such as under 12, under 16, or under 21. Depending to

the player's age group, they were sorted into different teams that coincided with the different conceptual types of performance analysis to which they were exposed. In essence, analytical practices were customized to each age group. The room layout for the different age brackets was different, and intended to provide an appropriate environment. For instance, the under-16 players had a room equipped with video games, a pool table, a sofa area, and one computer running a dedicated analysis software. At this stage, the players should familiarize themselves with analysis in a no-pressure environment and '[…] let 15-year-olds be 15-year-olds' (Dok.13.4).

While their own technical skill training, such as shooting from a distance, was reviewed with video material to point out errors in their posture and/or technical execution, the under 16-year-olds were largely encouraged to look at the performance of players in the Premier League. The performance analyst showed them certain match scenes in which, for example, the team worked well together, such as the marking of the offensive players by the defenders and defensive midfielders, highlighting the importance of the link between different positions on the pitch, or the passes of midfielders and strikers that led up to goals or chances on goal. Demonstrating these types of play largely revolves around the review of video footage with the players to point out such patterns:

I think it's obvious, but you have to show it again and again […]; you can see the opponent's main strategy very clearly. […] [I]f you look at how they won their last games, you'll see that they scored a lot of goals after counter-attacks […]. Our plan was to let them have the

ball as much as possible […]. They are not used to it; they just pass the ball […]. [T]heir midfielders can't cope with this style. (Dok5.2)

There is one moment in the match when you can clearly see the formation of your opponent […] pay attention when you watch the next football match, pay attention to the teams at kick off. […] [A]fterwards, strategy and tactics can change very quickly, the players start moving around the pitch. […] We help the players to recognize what's happening. (Dok 13.8)

[…] (T)he players need to become aware of what's happening, other teams may press far up the pitch. The players need to see these movements and switch it up […]. [Y]es, I cannot stress this enough: they have to act on what they see. (Dok 7.4)

As with presentations to professional players, great emphasis was put on visual imagery for the performance analysts' narration by using graphics and video sequences. Specific attention was drawn to the youth players' respective positions of play and how first-team players performed this specific role. The youth players were asked to comment on what they saw; they had to point out the perceived positives and negatives of plays as well as player and team behaviour from their perspective. Similar guided feedback happens with the professional players. The youth player's role can be considered that of an apprentice who is made aware of what he does well on the pitch, and what he does not do well. He may also be exposed to players who

not only are on a higher skill level but also have more experience playing at that level. The role of the performance analyst is to help the young players reflect on their performance while making it tangibly visible in numbers, video sequences and graphical representations. Therefore, players are slowly introduced to the method of performance analysis from an early age onward, so they can learn from exemplary performances.

To observe, analyze and think about behaviour on the pitch can be explained, as argued above, by the sociological concepts of 'role-taking' and 'reflexivity'. George Herbert Mead (1937) described role-taking first as a cognitive mental act and later as a performance. In this specific case of inquiry, the process is centred on the fact that the perceptual field of the youth player is narrowly focused on a screen usually showing his own performance or the other players' performances. He is encouraged to undertake a mental re-engagement concerning his behaviour on the pitch, thinking about interactions and actions; this can be described as an act of reflexivity, which I shall discuss later on.

When the actions of another player or a multitude of other players are made visible, the youth player is supposed to mentally '[…] put himself into the shoes of the other […]' (Broadie 2008:155) in order to gain insight into the other players' ways of doing things in specific match situations. The examination of an opponent allows the player not only to review his performance but also to think about building his skill set tactically or technically. He can engage mentally with the point of view of other players. Interestingly, mentally taking the point of view of the other revolves around not only observing and (ideally) internalizing the opponents' behaviours but also observing how other teams' players dealt with the players they are likely to play

against. One analyst told me about briefing a left-back about the player he is diametrically positioned against, given the position this player usually inherits on the pitch, which is the winger who plays in midfield on the right side. The analyst would show the left-back player hand patterns of movement for this specific player,[103] such as the way he engages in one-on-one encounters (e.g., dribbling or passes), and then he would show them how the opposing players would act. Therefore, 'role-taking' (Mead 1937) not only extends to the next possible opponent as it represents the imagining of the interactional and relational context between players in specific game situations. Although I was not able to interview any players directly, this practice seems to have an impact on in-game performances:

> Every player has his own script: what to do; when to do it; information on the player he's up against, including weight, height, age, strengths, weaknesses; even what that opponent is likely to do when the ball comes to him in certain situations [...]. We memorize every single set piece—where we have to stand, run, and end up. We even memorize this for the other players, so we know where everyone else will be at any given time. (Anonymous, 2012:79)

Furthermore, I observed that the analysts would sometimes stop the video sequences. They would encourage the youth player to reflect on the different options players might have in certain game situations, which, for example, concern the passing game. Upon thinking about it, the player would express his own

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[103] This can be about the player's ability to accelerate his movement or the preferred movement after receiving the ball.

interpretations. The analyst would resume the video sequences pointing out the actual choice made by the highlighted player. The other options for passing were highlighted by the analyst via a graphical interface, drawing lines and arrows onto the paused video image. The analyst intended to show not only the range of possibilities in actions by the player but also how other players might act in certain situations. In this sense, thinking and reflection as modes of reflexivity represents acts of making sense of the world and, in this specific case, the game of football. Introspection into performance on the pitch can be conceptualized as being guided by the performance analyst.

The under-12 players receive different treatment from the analysts. Their way of being encountering performance analysis can be considered more playful. Analysts might talk about the matches of the previous weekend that the youth player has watched. They may encourage them to talk about their favourite moments from a match featuring certain players and encourage them to try out some of the movements and technical skills in the subsequent training session. The players in their last year as under-12 are confronted with video footage of their own performances during home games. These taped matches are not yet coded into statistics.

Overall, I observed that analyses of movement and technique were the most prominent among the interactions analysts have with youth players. Players are drawn to, for example, the execution of shots on goal in terms of technique and posture (O'Donoghue 2010:2). This activity can be circumscribed as 'mechanical analysis' (Lees 2008). At this stage, such 'mechanical analysis' is deemed to be important, but the precursor to a systematic statistics-based analysis of their

performance is still present. The principle of 'reflexivity'[104] is dealt with in a much gentler fashion and is indicated by the room setup I described earlier. According to the presentations I saw at the conferences, these environments are created so that players can get to know the workings of performance analysis in a low-pressure atmosphere. Players are encouraged to review match footage on their own and are encouraged to mark and collect highlights from the footage of their own performances. These highlights were supposedly saved into a database. At the end of the season, the players have the obligation to turn these highlights into a video reel layered with their own soundtrack. In the specific case I was shown, a video was layered with swear-word-heavy hip-hop music and lens-flare effects, giving it the style of a music video. One analyst whom I spoke to and who was responsible for this task told me that the intention behind such a highlight reel was to have the players engage with their own performance and revisit their skills visually and mentally by re-assembling the footage via the use of computer software. This task is intentionally designed to sensitize them to indicators of performance.

5.3. Role-taking and material-guided reflexivity

Usually, the analysts' assessments are also presented to the coaching team, who may set up training exercises that reflect past match situations to improve upon the perceived mistakes. This practice of linking the review assessments to practical

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[104] In the sense that youth players view themselves and their performance retrospectively.

training sessions is a common theme in the literature on performance analysis and is consistent with what my interviewees told me. A similar approach is taken when the analyst briefs the player on the opponents' strengths and weaknesses. Statistical assessments are shown via the presentation of video sequences of plays and are more focused on specific players or parts of the team, such as centre-backs or strikers. As a textbook on performance analysis puts it:

> First, detailed information from match analysis of the opposing team characteristics can allow the coach to set up realistic match situations to prepare for the opposition's particular style of play and tactics such as set-piece plays. Various strengths and weaknesses will be highlighted and special attention paid to how they can be countered or exploited. (Carling,Williams & Reilly:100)

If you treat the presentation of a performance analyst to a player as an object that transpires and unfolds throughout the interaction, then this object is necessarily filtered and constructed through the analyst's interpretations. He or she has thoughts, ideas, and categories (e.g. what is a well-defended ball or a well-timed pass) that are drawn from quantitative match statistics and the coinciding video sequences, which often are exemplary for certain recurring statistical categories, such as missed passes. Not all of the passes are shown, but specific sequences are shown that are described as representations of statistical manifestations (for example, a low accuracy in the passing game or a high accuracy of passes during certain phases of the match). This is done to show how player behaviour in certain situations could improve or to

highlight what has been done well. The negative – what can be improved – is largely pointed out by drawing onto the video image of match sequences and manipulating player' positions. One analyst showed me how his interpretations would be conveyed. He artificially isolated a player on the screen and moved him around via the use of a computer mouse and the onscreen cursor towards positions on the pitch to which the players should have moved or passed. In this sense, players are encouraged to re-engage with the played matches visually and mentally.

In this sense meaning (or in this case, assessment of performance) arises out of human–object interactions in the sense that the analyst develops his or her interpretations (as bundles of meaning) via interacting with a computer-software setup (see Chapters 4 and 5). When meaning and, interpretative assessments are shared with the players, an analyst can guide the reflexive thinking of a player in terms of performance. He or she does this by giving the player his or her own assessments based on statistical data, thus reflecting a re-interpretation of his behaviour. By looking at the video image, the match statistics, and the graphical abstractions, what is happening can be described as '[…] projecting oneself into the role of others, and appraising from their standpoint the situation, oneself in the situation, and possible lines of action' (Bartusch & Matsueda 1996:147).

Mead's (1934:150ff) emphasis was on children, and how they learn to be members of society; he specifically showed how 'role-taking' is a factor in learning how to play games. However, given my observations, what I have described as 'role-taking' in this specific case may be considered as a continuously actualized process

that is performed in a quasi-ritualistic[105] fashion as a specific form of learning. This procedure is geared towards the improvement of the player's capabilities.

Judging from my fieldwork observations when youth players are exposed to performance analysis initially, their own performance is not so much the centre of focus. The emphasis is put on learning how to interpret performance, to critique, and to emulate technical or tactical abilities during training or games. 'Role-taking' is performed via showing the performances of other players that either play the same position of the youth player or who are the opponents of, for example, an exemplary defensive midfielder. Common patterns of match behaviour in certain match situations are selected including the anticipation of plays or potential pro-active movements towards the player who is holding the ball:

> You want players to be aware what [player] X(b18) and X(b7) are doing so well. Their passing game is sharp, and they cover a lot of ground. They always put in a lot of effort; that's how they get into the game. […] It's vital for them to learn that effort and skill go hand in hand. (Dok4.3)

In one example, an analyst was explaining to me how he showed the youth player sequences of a defensive midfielder marking a player up close or trying to block certain pathways for passing. The youth player was given the task to recognize this pattern. If this was not happening, the analyst would point out the patterns, thereby sensitizing the youth player to develop a way of recognizing recurring

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[105] By 'ritualistic' I mean the regular reoccurrence of this practice.

patterns on the pitch by a specific player or among a specific group of players. A much simpler and 'after the fact' means of analysis can be seen during a live television broadcast at half-time when commentators dissect certain events of a match in a similar fashion.

The second stage of learning involved the player's own performance, which builds onto elements of the first stage but encourages the player to create video highlight reels as mentioned earlier. These reels would include situations that were well played according to the player's own point of view. This practice encourages the youth player to look for positive behaviour (what he has learned from observing other players) and incorporate it into his own analysis.

The third stage of the learning model combines all the elements, adds the numerical layer of game events, and is very close in terms of the processes to what I have observed and what my interviews have taught me about what happens at the pro-player level. It is common to do this with a portable laptop or even a tablet that allows image manipulation and image control via finger gestures. Interpersonal interactions happen by using a: '[…] wired, programmed, and content-filled, textually elaborated surface that fascinates through its ability to frame and present a world' (Knorr Cetina & Bruegger 2002:297). The use of a touchscreen device is slightly different from using a laptop. The analyst may point out certain movements of players with his/her finger touching the screen. The manipulation of an image on a regular computer monitor is done via the use of a mouse or a touch pad. Effectively, the tablet is operated on the screen's surface with finger swipes to forward or reverse video sequences or even draw arrows towards, for example, multiple opportunities for passing to other players. Tablet computers in this sense change the haptic

material interaction between the players and the analysts because the traditional 'point-and-click' interface using a mouse changes to a physical engagement with a digital surface that allows you to literally point and draw with your fingers. The human–computer interaction is in a transition phase bracketed by the consultation sessions with players and analysts. The statistics database and the analysis reports can be accessed through the software interface as well if they are shared. The process of 'material-guided reflexivity' is anchored in the use of such socio-technical devices.

In this sense, both types of players (youth and pro players) share a kind of practised 'reflexivity' and 'role-taking.' Since the inception of performance analysis in its current form, guided by trained specialists with the appropriate technology, youth players are being brought up in a learning environment where these skills of observation, analysis, and further mental re-enactment are learned as a skill set. This happens in a fairly standardized form given the software in use, the way analysts conduct their analyses and how they communicate their interpretations.

5.4. Conclusion

To summarize my empirical findings concerning the relationship between players and performance analysts on a youth level, three insights may be asserted. First of all, the implementation of performance analysis methods from an early age onwards is intended to normalize or even internalize what I call 'role-taking' and 'material-guided reflexivity' in the player. Both of my visits to youth academies indicate that

young players are socialized with these types of review and preparation rituals from an early age. A multi-stage way of socializing youth players can be dissected, which furthers the intention of reflexive analysis and role-taking as trainable skills. Therefore, three different but interconnected ways of learning can be summarized as follows:

A. Youth players learn to reflect on other players who play their position on a pro level, and they are encouraged to try out behavioural conclusions in training.

B. Youth players are encouraged to imagine how it would be to play against opposing players based on other players' behaviour towards these players during a game and based on the other players' performance indicators.

C. Youth players learn how to reflect on their own performance during matches, which is initially communicated through video sequences but, later is aided by statistically coded match material. Interpretation is mediated via the interactional work of the responsible performance analyst.

Performance analysis interactions with pro players include all these elements but are mainly focused on the player/team performances and the opposition. Reflexivity is achieved when players review their own performance and put it into the context of either specific training sessions or match sequences. In addition, players may perform a certain version of 'role-taking' when engaging with the performances of other players. On a youth player level, players are, encouraged to look at the performances of Premier League players. Furthermore, they are

encouraged to try to emulate certain moves or certain plays in training. Learning in this instance may be considered a form of simulating behaviour. According to my interviewees, pro players and youth players are engaged in reviewing the performances of the upcoming opposing team to look at common patterns of play or special skills.

The focus was of this chapter on the role of performance analysts in youth academies, and how the sociological concepts of role-taking and reflexivity can be used to analyze how they facilitate their review sessions with players. Visiting youth-training facilities and talking to performance analysts about their work led me to the conclusion that their task entails helping youth players and pro players alike by establishing a habitual way of reflexively analyzing their performance. The performance analyst's task is to recognize patterns in movement and actions on the pitch according to the tacit knowledge the analyst has of the game and what counts as positive and negative activities such as well-timed sprints or not marking assigned players, respectively. In this sense, communication of statistics in an abbreviated form is intended to engage the players in retrospectively reviewing their performance and anticipating the performance of opponents. Youth academies seem to play a special role in the players' education as they train the young players in recognizing their own behaviour and in being evaluated according to numerical manifestations of their actions in the match statistics. The performance analyst's task is to help them recognize the different ascribed markers of their performances and give them the opportunity to study other players, who serve as role models in terms of skill and tactics. The analysts are intending for the players to mentally engage with how it would be to play against a certain player. Players not only engage with their direct

counterpart (left-back opposing a right-winger), but they also engage with how players act in relation to other players, thereby learning to attribute individual player strengths and weaknesses not only individually but also in a context of match sequences related to other actors on the pitch.

According to my interviewees, computer-assisted education about performance analysis that involves elements of match statistics concerning youth players is a recent phenomenon, largely promoted within the last decade. Furthermore, this bundle of practices can be regarded as a type of systematization that is created in order to make players familiar with these types of interactions from an early age. I would like to speculate that if this succeeds, future generations of pro players may consider these sessions to be as normal as training free kicks on the pitch. This development could be further accelerated by the increasing presence of tablets and other screen-powered devices that are already in use.

6. Conclusion

In this conclusion, I am going to review the findings from the previous chapters of my thesis. Going back to the introduction, I set out to attempt a sociological analysis of performance analysis in football. My aim was to answer three questions: 1. How and by whom are match statistics produced? 2. How do performance analysts

interpret their quantified data inside a club setting? 3. How are performance analysts communicating their interpretations towards other actors inside the club? This chapter is an attempt to give answers to these questions based on my research.

In my literature review, I concluded that my thesis is an attempt to extend the paradigm of social knowledge laid out by Gross, Camic and Lamont (2011) to the topic of performance analysis in which I observed a certain form of social knowledge being produced, interpreted and communicated. I also aimed to relate my topic to the sociology of professions by pointing out that performance analysts undergo distinct sequences of socialization via a university degree in sports science with a specialization in performance analysis or a distinct BSc/MSc degree in sports science. Furthermore, they claim to possess important expert knowledge in the form of analytical knowledge based on match statistics, which can put them at odds with other actors within the football club such as the coaching team who may not be in favour of such methodology. The third goal was to relate my topic to the sociology of sports. Although I did not directly look at athletes, part of the work of performance analysts is to support footballers and it can be designated as part of this field of activity. I have since found out that this topic is understudied from a sociological point of view. While I found research on coaching (Jones, Armour & Potrac 2002; Potrac & Jones 2009), the only paper I found that related to the field of performance analysis was on the perspective of the coach and how they use performance analysis at the youth level. In contrast, my study was aimed at looking at how performance analysts go about conducting their practice not only on at the professional level but also through interactions within youth academies. Hence, the

study can be regarded as an inquiry which is not yet very well researched in the sociology of sports.

Hence, I am going to summarize my findings. Besides the literature review and the methodology section, the introductory first chapter established the context, origins, and development of performance analysis in England; it served as a framing device for the overall topic.

The second chapter showed how football match data is produced as a base layer for the work of performance analysts. My empirical inquiry showed how match data can be produced not only by a performance analyst for the clubs they are working for but also by performance analysis companies, who act as third-party statistics providers.
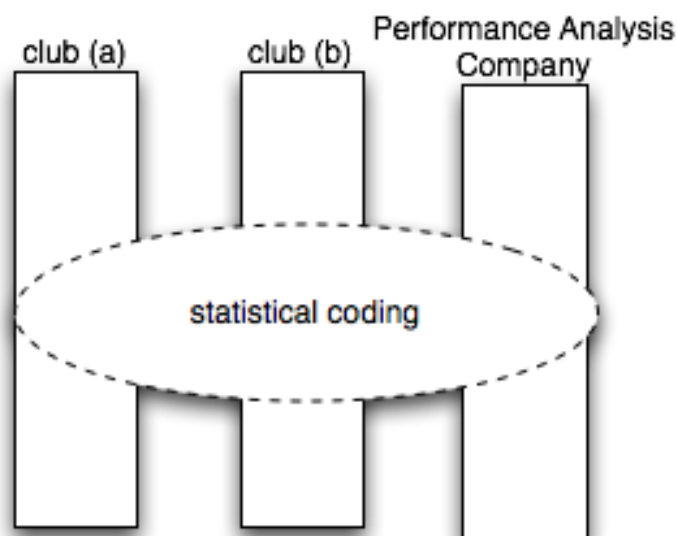

Figure 21. Statistical coding is present in various organizations

The socio-material production process happens via the use of distinct computer-software-camera setups not only inside the stadium but also in detached

office buildings. Match statistics can be produced by a multitude of actor constellations, ranging from coding the matches in a group setting to coding them individually. Therefore, Chapter 2 can be regarded as illustrative of how the framework of *Social Knowledge in the Making* (Gross, Camic & Lamont 2011) can be extended to studying the context of performance analysis.

The third chapter was a continuation of the theme of 'social knowledge' (ibid.) in a more descriptive manner by showing the workweek of performance analysts and how the match-day calendar structures the type of analysis they have to undertake. These workweek procedures are broken up by intermittent requests from other actors inside the club who may request certain reports from them. Depending on whether they are in the pre- or post-match analysis phase, they have to undertake different types of analyses either geared towards the next match or a retrospective review of the last match performance. The analysis reports they are providing are ultimately based on statistical variables and metavariables that, ideally, they have agreed with the coaching team. Usually, the coaching team requests a specific set of variables every week, which are called 'key performance indicators'.

Given this context of work, the fourth chapter is an examination of the different layers of 'tacit knowledge' (Collins 2010) that performance analysts possess, which allows them to engage in the analysis process and interact with other actors within the club. Performance analysts have undergone distinct types of socialization during their university degrees in which they learned not only the rules and jargon of football but also how to conduct analysis using the computer-software interface. Not only did they undertake university courses but they also completed placements at clubs. This exposed them to an environment in which they had to

adapt to the different actors to practice their craft 'in the wild'. Working inside the clubs led to potential dissonance between them and other actors who potentially disapproved of their claims to be using scientific methods. The key point that should be mentioned in this case is that performance analysts possess 'interactional expertise' (Collins/Evans 2007; Collins 2011) and are able to talk about football and the required skills in a meaningful way, but they do not possess contributory expertise at being able to play high level football.

Finally, the fifth chapter examined the role of performance analysts in youth academies. There I showed how players at the youth level are socialized into specific methods of performance analysis and described a distinct three-phase learning model to which they were exposed. The role of the performance analysts was to foster a greater degree of 'reflexivity' (Archer 2007), which included promoting forms of 'role-taking' (Mead 1934; Blumer 1969) about their performance by showing them video sequences and letting them compile their own video snippets of other players. This served the purpose of allowing young players to mentally take on their role and imagine how their actions on the pitch could be applied to their own training and game performance.

The analysis in this study reveals that performance analysts carry out distinct practices of knowledge creation and interpretation, and engage in interactions within an environment in which certain actors do not necessarily approve of using statistics-based analysis. My research indicates that performance analysis as a method is already heavily integrated into youth development academies and, as I have mentioned before, I speculate that future generations of players who go through such

distinct passages of socialization, and future generations of coaches may be much more accustomed to statistics-based performance analysis.

In terms of making an original contribution to knowledge, I would like to start with how my findings may contribute to the sociology of sport. Similar to Potrac et al. (2000), who argued that observational studies of coaching should be developed, my aim was to conduct a qualitative study that examined how performance analysts practice their work based on ethnographic observations and interview data. In this sense, one aim of the thesis was to show what performance analysts were actually doing and what type of actor constellations they face instead of taking a more prescriptive approach which can be found in handbooks that detail how to conduct performance analysis but do not necessarily show how this is worked out in a social context involving specific types of tacit knowledge dependent on interactions and involving relations that are not necessarily reciprocal. One of the main points of my study was to provide detail about the match analysis process and how performance analysts relate to players when conducting review sessions.

The following section will highlight how this thesis contributes to the sociology of knowledge as I have applied the framework described in *Social Knowledge in the Making* (Camic, Gross & Lamont 2011) to illuminate knowledge-making practices outside of the sciences and academia. Performance analysts measure and quantify actions that happen during a football pitch and communicate their interpretations to other actors within the football club, such as the coaching team who can use this statistical knowledge in an applied way to evaluate their players and the overall team performance. Furthermore these statistics are diffused as snippets into the public sphere via the media who use graphic representations of

statistics in their coverage of matches. I also showed how statistics as social knowledge are produced with an array of socio-technical devices, such as computers, software and cameras to capture live matches. However, these acts of inscription are still operated by humans who configure the hardware–software interface and perform acts of classification by translating events on the pitch into variables in a database via the use of the keyboard–mouse interface of the computer.

Another area my study can contribute to is the sociology of professions. As I have mentioned in the introduction to this thesis, Abbott's (1988) treatise on the sociology of professions was heavily focused on knowledge, but there was not a working relationship between his work and the sociology of knowledge. My thesis connected the two by showing how social knowledge-making can be seen as systems of abstract knowledge accessed via distinct observable practices that include coding, interpretation and mediation of match statistics. By examining the work of performance analysts, I have found that they claim to possess distinct systems of expert knowledge that lent authority to their analysis of players' performances via the use of statistics and socio-material configurations. Their educational biography highlighted completed university degrees, which allow them to undertake the practice of statistics-based match analysis. Furthermore, performance analysts may diffuse into different organizational contexts besides football clubs. They may work for performance analysis companies who contract them to clubs or national teams with whom they work during international tournaments. Wherever they move professionally they remain performance analysts with a distinct set of practices. This fits with Abbots approach to the sociology of professions (Abbott 1988). The key to identifying a profession lies in their system of abstract knowledge:

Any occupation can obtain licensure (e.g., beauticians) or develop ethics code (e.g., real estate), but only a knowledge system governed by abstractions can redefine its problems and tasks, defend them from interlopers, and seize new problems […]. Abstraction enables survival in the competitive system of professions. (ibid.:8–9)

The findings of my thesis also contribute the sociology of commensuration put forward by Wendy Espeland and Mitchell Stevens (2008): 'The challenge for this type of sociology is to show how quantitative authority is accomplished and mobilized, how it gets built into institutions, circulates, and creates enduring structures that shape and constrain cognition and behaviour (Esepland & Stevens 2008:419). In this sense I showed the role quantitative statistics can play within professional football clubs who possess access to statistical databases and have staff (i.e. performance analysts) who select and interpret statistics. They communicate their findings to other members of the club, such as the contract department and the board but also the coaches and the players. If mutually accepted as a valid means of evaluating the performance of players within teams: 'Statistics help to create the reality that they measure by providing a language for accessing it and techniques for its manipulation. The crucial test for this approach is not to establish the independence of measures but to explain their starring roles in the interactions that produce reality' (Espeland & Stevens 2008:419). Hence my thesis showed how match statistics and negotiated key performance indicators, (which consist of different variables related to each other) can provide a basis for coaches decision-

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making and reasoning when evaluating the players' performances or estimating their next opponent's tactics. Furthermore I showed how the different variables that constitute the database are created, and how they can be represented numerically and via graphic abstractions.

Furthermore my investigation into the topic of performance analysis in football illuminates the concept of performance in sports. The first chapter of this thesis contains a summary of the development of research on performance in sport psychology. The initial concept of performance in sports psychology was conceptualized differently. Judging from my inquiry, sports psychologists were mainly interested in researching how athletes conducted and attained high levels of performance. Their practical applications were largely focused on how performance could generally be improved by using psychological techniques. Furthermore the origins of their research grew out of laboratory studies. In contrast, performance analysts have an empirical approach that emphasizes the quantification and measurement of actions on the pitch. Their role was to mediate the plethora of statistics for other actors inside the club e.g. coaches who request certain variables, such as key performance indicators. However, their interactions with players were oriented to briefing them about their past performances and the future opponents they would be playing against in order to enable them to improve.

In terms of opening up a new stream of research based on the topic of this thesis, I envisage two different possible routes. One route could be focused on detailing how computer-assisted performance analysis works in other sporting activities, such as rugby or cricket. This focus could also lead to further investigations into the realm of how other actors perceive performance analysis

inside a football club. Groom, Cushion, and Nelson (2011) showed that it may be interesting to explore the coaching perspective, but the perspective of players would be interesting as well.[106] The other route I can see as fruitful would be to integrate this research into the sociology of quantification outlined by Espeland and Stevens (2008); this would focus on the quantification of everyday life within different contexts in society. As I have shown in this thesis, measuring match statistics, the interpretative process, and the communication of those results heavily relies on a socio-technical interface between actors and a computer interface. With the rise of 'smart' devices such as smart phones and smart watches, everyday activities such as kilometres covered, calories consumed, and personal heart rates can be tracked with specific apps that allow the user to create activity profiles via the technology. In essence, the principle of measuring everyday performance is similar to performance analysis in football with the difference that data is immediately available to the user and the potential for self-analysis exists. Future studies could generate an analytically interesting area of research that looked into the expansion of such devices and methods of analysis in different activities of daily life in addition to sports. Such development is coined 'the quantified self'.[107] The recent introduction of the Apple Watch shows how such tools for diagnosis can be incorporated into

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[106] Although my main aim was to reconstruct the practice of performance analysts I am aware that this topic of quantifying human behaviour and performance review could tie into larger sociological themes such as the Foucauldian principle of the panopticon (Foucault 1995). In this sense a further look might be taken at how the measuring of performance and the subsequent feedback sessions might be perceived from the perspectives of players.

[107] See http://www.nytimes.com/2010/05/02/magazine/02self-measurement-t.html (last accessed 22.10.11).

everyday life by measuring the heart rate or recognizing physical symptoms. Consequently, these tools could report these measures to medical practitioners supervising the patients or even send them to insurance companies[108] who could determine the costs of their services by evaluating the users' physical performance data.

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[108] See http://www.ft.com/intl/cms/s/0/c6ac2792-e179-11e4-9b30-00144feab7de.html#axzz3XmcZo0Iu (last acessed 14.04.15).

Bibliography

Abbott, A. D. (1988). *The system of professions: An essay on the division of expert labor*. Chicago, Ill: University of Chicago Press.

Abbott, A. D. (1999). *Department & discipline: Chicago sociology at one hundred*. Chicago, IL: University of Chicago Press.

Abbott, A. D. (2011). *Library Research Infrastructure for Humanistic and Social Scientific Scholarship in America in the Twentieth Century*, in: Knowledge in the Making, ed. M. Lamont, C. Camic, and N. Gross. University of Chicago Press, pp. 43-87.

Abend, G. (2008). *The Meaning of 'Theory'*, Sociological Theory 26(2), pp. 173-199.

Adams, T. L. (2014). *Sociology of professions: international divergences and research directions.* Work, Employment & Society 02/2014, 29(1), pp. 154-165.

Akerlof, G. A. (1970). *The Market for "Lemons": Quality Uncertainty and the Market Mechanism*. The Quarterly Journal of Economics, 84, 3, pp. 488-500.

Amsterdamska, O. (2007). *Practices, People, and Places*. In: Hackett, E. J., Amsterdamska, O., Lynch, M., & Wajcman, J. (Eds.). *The handbook of science and technology studies,* Cambridge: MIT Press, pp. 205-210.

Anderson, C., & Sally, D. (2013). *The numbers game: Why corners should be taken short, teams are only as good as their worst players, and changing managers doesn't change much*. London: Viking.

Anonymous (2012). *I am the Secret Footballer: Lifting the lid on the beautiful game*. London: Guardian Books.

Archer, M. S. (2003). *Structure, agency and the internal conversation*. Cambridge University Press.

Archer, M. S. (2007). *Making our way through the world: human reflexivity and social mobility*. Cambridge, UK, Cambridge University Press.

Atkinson, M. (2011.) *Physical cultural studies [Redux]*. Sociology of Sport Journal 28(1), pp. 135–144.

Atkinson, M., & Wilson, B. (2002). *Bodies, subcultures and sport*. Theory, Sport and Society, pp. 375-396.

Bartusch, D., & Matsueda, R. (1996). *Gender, Reflected Appraisals and Labeling: A Cross-Group Test of an Interactionist Theory of Delinquency*. Social Forces 75, pp. 145-177.

Becker, H. S. (1962). *The nature of a profession*. In Nelson B. Henry (Ed.), Education for the professions Chicago, IL: National Society for the Study of Education, pp. 27-46.

Berger, P. L., & Luckmann, T. (1966). *The social construction of reality: A treatise in the sociology of knowledge*. Garden City, N.Y: Doubleday.

Blumer, H. (1939). *Collective Behavior*. In Alfred M. Lee (ed.), New Outline of the Principles of Sociology. 2d ed., rev. New York: Barnes & Noble, pp. 167-222.

Blumer, H. (1969). *Symbolic interactionism: Perspective and method*. Englewood Cliffs, N.J: Prentice-Hall.

Blumer, H., Morrione, T. J. (2004). *George Herbert Mead and human conduct*. Walnut Creek, CA: AltaMira Press.

Bourdieu, P. (1974). *The School as a Conservative Force: Scholastic and Cultural Inequalities*. In: Eggleston, L. (ed.), Contemporary Research in the Sociology of Education. Methuen, London, pp. 32-46.

Bourdieu, P. (1977). *Outline of a Theory of Practice*. Cambridge and New York: Cambridge University Press.

Bourdieu, P. (1988). *Homo Academicus*. Cambridge: Polity Press.

Bourdieu, P. (1990). *The logic of practice*. Stanford, Calif: Stanford University Press.

Bowker, G. C., & Star, S. L. (1999). *Sorting Things Out: Classification and Its Consequences*, Cambridge, MA: MIT Press.

Bryant, A., & Charmaz, K. (2007). *The SAGE handbook of grounded theory*. Los Angeles: SAGE.

Camic, Charles (2001). *The Sociology of Knowledge*, in: Smelser, Neil & Baltes, Paul (eds.), International Encyclopedia of the Social and Behavioral Sciences, vol. 12, pp. 8143-48.

Camic, C., Gross, N., & Lamont, M. (2011). *Social knowledge in the making*. Chicago: University of Chicago Press.

Carling, C., Le Gall, F., Reilly, T., & Williams, A. M. (2009). *Do anthropometric and fitness characteristics vary according to birth date distribution in elite youth academy soccer players?*, Scandinavian Journal of Medicine & Science in Sports, 19(1), pp. 3–9.

Carling, C., Williams, A. M., & Reilly, T. (2005). *Handbook of soccer match analysis: A systematic approach to improving performance*. London: Routledge.

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Carruthers, Bruce G. (1995). *Accounting, ambiguity, and the new institutionalism*. Accounting, Organization and Society, 20(4), pp. 313-328.

Carson, M. (2013). *The manager: Inside the minds of football's leaders*. London : Bloomsbury.

Charlton, B., & Bragg, M. [1863] (2006). *The rules of association football, 1863*. Oxford: Bodleian Library.

Charmaz, K. (2000). Grounded theory: Objectivist and constructivist methods. In N.K. Denzin & Y.S. Lincoln (Eds.), Handbook of qualitative research. Thousand Oaks, CA: Sage, pp. 509–535.

Charmaz, K. (2006). *Constructing grounded theory: A practical guide through qualitative analysis*. London: Sage Publications.

Clarke, A. (2005). *Situational Analysis: Grounded Theory After the Postmodern Turn*. Thousand Oaks, CA: Sage Publications.

Cole, C. L. (2000). *Body studies in the sociology of sport*. In: Coakley, J. & Dunning, E. (Eds.), Handbook of sports studies London, Thousand Oaks and New Delhi: Sage, pp. 439-460.

Collins, H. M. (2001). *Tacit Knowledge, Trust, and the Q of Sapphire*, Social Studies of Science, 31, 1, pp. 71-85.

Collins, H. (2004). *Gravity's Shadow: The Search for Gravitational Waves*. Chicago: Chicago University Press.

Collins, H. (2010). *Tacit and explicit knowledge*. Chicago: University of Chicago Press.

Collins, H., & Evans, R. (2002). *The Third Wave of Science Studies: Studies of Expertise and Experience*. Social Studies of Sciences, Vol. 32, No. 2, pp. 235–296.

Collins, H., & Evans, R. (2007). *Rethinking Expertise*. Chicago: The University of Chicago Press.

Collins, H. (2011). *Gravity's ghost: Scientific discovery in the twenty-first century*. Chicago: The University of Chicago Press.

Collins, R. (1998). *The sociology of philosophies*. Cambridge: Harvard University Press.

Collins, R. (2004). *Interaction ritual chains*. Princeton: Princeton University Press.

Cooley, C. H. (1964). *Human nature and the social order*. New York: Schocken Books.

Corbin, J., & Strauss, A. L. (2008). *Basics of Qualitative Research: Grounded Theory Procedures and Techniques*. 3rd edition. Sage.

Csikszentmihalyi, M. (1975). *Beyond boredom and anxiety*. San Francisco: Jossey-Bass Publishers.

Dart, J. (2012). *Sports review: A content analysis of the International Review for the Sociology of Sport*, The Journal of Sport and Social Issues and the Sociology of Sport Journal across 25 Years, International Review of Sport. DOI: 10.1177/1012690212465736

Denzin, N. K., & Lincoln, Y. S. (2000). *Handbook of qualitative research*. Thousand Oaks, Calif: Sage Publications.

Denzin, N. K., & Mettlin, C. J. (1968). *Incomplete Professionalization: The Case of Pharmacy*. Social Forces, 46, 3, pp 375-381.

DiMaggio, P. (1997). *Culture and Cognition*. Annual Review of Sociology, 23, pp. 263-287.

DiMaggio, P.J., & Powell, W.W. (1983). The *Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields*. American Sociological Review, 48(2), pp.147-160.

DiMaggio, P., & Markus, H. R. (2010). *Culture and Social Psychology: Converging Perspectives*. Social Psychology Quarterly, 73, pp. 347-52.

Douglas, M. [1966] (1988). *Purity and Danger: an analysis of the concepts of pollution and taboo*. London: Ark Paperbacks.

Dunning, E. (1993). *Sport in the civilizing process: Aspects of the development of modern sport.* In: Dunning, E. Maguire, J. & Pearton, R. E. (Eds.), The sports process: A comparative and developmental approach, Champaign, IL: Human Kinetics, pp. 39-70.

Durkheim, E. (1951). *Suicide: A study in sociology*. Glencoe, Ill: Free Press.

Durkheim, E. (1982). *The rules of sociological method*. New York: Free Press.

Durkheim, E. (1984). *The division of labor in society*. New York: Free Press.

Durkheim, E. & Mauss, M. (1967). *Primitive classification*. Chicago: University of Chicago Press.

Dyke, M., & Bryant, I. (2012). *Sociology and learning*. In: Jarvis, P., & Watts, M. H., The Routledge international handbook of learning. London: Routledge.

Espeland, W., & Stevens, M. (1998). *Commensuration as a Social Process*, Annual Review of Sociology, 24, pp.312-43.

Espeland, W. & Stevens, M. (2008). *A Sociology of Quantification*. European Journal of Sociology, 49(3), pp. 401-436.

Evans, R., & Collins, H. (2007). *Expertise: From Attribute to Attribution and Back Again*. In: Hackett E., Amsterdamska O., Lynch, M. and Wajcman J. (eds.) *Handbook of Science and Technology Studies*, Cambridge, MA: MIT Press, pp. 609-30.

Fitz-Gibbon, C. T. (1990). *Performance indicators*. Clevedon, Avon, England: Multilingual Matters.

Foucault, M. (1994). *The Birth of the Clinic: An Archeology of Medical Perception*. Vintage.

Foucault, M. (1995). *Discipline and Punishment*. New York: Vintage Books.

Freidson, E. (1984). *The changing nature of professional control*. Annual Review of Sociology, 10, pp. 1-20.

Fuchs, A. H. (1998). *Psychology and "The Babe"*. Journal of the History of the Behavioral Sciences, 34, pp. 153–165.

Fullerton, H. S. (1921). *Why Babe Ruth is greatest home-run hitter*. Popular Science Monthly 99.4, pp. 19-21.

Garfinkel, H., & Sacks, H. (1970). *On formal structures of practical actions*. New York: Appleton-Century-Crofts, Educational Division.

Garfinkel, H., & Wieder, D. L. (1992). *Two incommensurable, asymmetrically alternate technologies of social analysis*. In: G. Watson & R. M. Seiler (Eds.), Text in context: Contributions to ethnomethodology. Newbury Park, CA: Sage. pp. 175-206.

Geertz, C. (1983). *Local knowledge: Further essays in interpretive anthropology*. New York: Basic Books.

Giddens, A. (1984). *The Constitution of Society*. Outline of the Theory of Structuration. Cambridge: Polity Press.

Giddens, A. (1991). *Modernity and self-identity: Self and society in the late modern age*. Stanford, California, Stanford University Press.

Gilbert, W. D., & Trudel, P. (2004). *Analysis of coaching science research published from 1970-2001*. Research Quarterly for Exercise and Sport. 75, pp. 388-399.

Gladwell, M. (2000). *The tipping point: How little things can make a big difference*. Boston: Little, Brown.

Glaser, B. G. (1978). *Theoretical Sensitivity: Advances in the Methodology of Grounded Theory*. Mill Valley, CA: Sociology Press.

Glaser, B. G. (1998). Doing grounded theory: Issues and discussions. Mill Valley, CA: Sociology Press.

Glaser, B. G. (2000). *The discovery of Grounded Theory*. Mill Valley, CA: Sociology Press.

Glaser, B. G. (2001). *The Grounded Theory Perspective: Conceptualization Contrasted with Description*. Mill Valley, Ca.: Sociology Press.

Glaser, B. G. (2003). *The Grounded Theory perspective II: Description's remodelling of grounded theory methodology*. Mill Valley, CA: Sociology Press.

Glaser, B. G., & Strauss, A. L. (1967). *The discovery of Grounded Theory: Strategies for qualitative research*. Chicago: Aldine Pub. Co.

Glaser, B. G., & Strauss, A. L. (1968). *Time for dying*. Chicago: Aldine.

Glaser, B. G., & Strauss, A. L. (1971*). Status passage*. Chicago: Aldine.

Godwyn, M., & Gittell, J. H. (2012). *Sociology of organizations: Structures and relationships*. Thousand Oaks: Pine Forge Press.

Goffman, E. (1961). *Encounters: Two studies in the sociology of interaction*. Indianapolis: Bobbs-Merrill.

Goffman, E. (1974). *Frame analysis*. New York: Harper & Row.

Goffman, E. (1977). *The arrangement between the sexes*. Theory and Society, 4 (3), pp. 301–332.

Goffman, E. (1981). *Encounters: Two studies in the sociology of interaction*. Indianapolis: Bobbs-Merrill.

Goode, W. J. (1961). *The librarian: From occupation to profession?,* Library Quarterly, 31, pp. 306-320.

Goode, W. J. (1969). *The theoretical limits of professionalization*. In A. Etzioni (Ed.), *The semi-professions and their organization* New York: Free Press. pp. 266-313.

Gorman, E., & Sandefur, R. (2011). *"Golden Age," Quiescence, and Revival: How the Sociology of Professions Became the Study of Knowledge-Based Work.* Work and Occupations, *38,* 3, pp. 275-302.

Gorski, P. (2009). *Social 'Mechanisms' and Comparative-Historical Sociology: A Critical Realist Proposal.* In: Wittrock, B., Hedström, P. (eds.), The Frontiers of Sociology, Björn Wittrock and Peter Hedström (eds.), Leiden: Brill.

Gradenwitz, A. (1923). *Making Sport a Science*. Scientific American, 129,6, 398.

Grbich, C. (2013). *Qualitative Data Analysis: An Introduction*. London: SAGE Publications Ltd.

Green, C. D. (2011). *The Chicago Cubs and the "headshrinker": An early foray into sports psychology*. Baseball Research Journal, 40, pp. 42-45.

Grint, K. (2005). *The Sociology of Work*. Cambridge: Polity.

Groom, R., Cushion, C., & Nelson, L. (2011). *The delivery of video-based performance analysis by England youth soccer coaches: Towards a grounded theory*. Journal of Applied Sport Psychology, 23, pp. 16-32.

Gross, N. (2008). *Richard Rorty: The making of an American philosopher*. Chicago: University of Chicago Press.

Gross, N. (2009). *A Pragmatist Theory of Social Mechanisms*. American Sociological Review, 74, 3, pp. 358-379.

Gross, N., & Fleming, C. (2011). *Academic Conferences and the Making of Philosophical Knowledge*. In: Camic, C., Gross, N. Lamont, M. (Eds.), *Social Knowledge in the Making*, Chicago: University of Chicago Press.

Hackett, E. J. [et al.] (2008). *The handbook of science and technology studies*. Cambridge, Mass., MIT Press.

Hoffer, G. J. (2002). *Coordinating Mechanisms in Care Provider Groups: Relational Coordination as a Mediator and Input Uncertainty as a Moderator of Performance Effects*. Management Science*, 48,* 11, pp. 1408-1426.

Hogle, L. F. (2008). *Emerging Medical Technologies* in: Hackett, E. J. [et al.], *The handbook of science and technology studies*. Cambridge, Mass.: MIT Press. pp. 841-874.

Holt, R., & Doyle, A. C. (1999). *A scandal in Bohemia*. Harlow, Essex: Pearson Education Ltd.

Hughes, M., & Franks, I. M. (2004). *Notational analysis of sport: Systems for better coaching and performance in sport.* London: Routledge.

Hughes, M., & Franks, I. M. (2008). *The essentials of performance analysis: An introduction.* London: Routledge.

Husserl, E. (1973), *Experience and Judgement*, trans. Churchill, J. S. and Ameriks, K., London: Routledge 1973.

James, N. (2006). *The role of notational analysis in soccer coaching.* International Journal of Sports Science & Coaching, 1, pp. 185–198.

Jensen, M. C., & Meckling, W. H. (2005). *Theory of the firm : managerial behavior, agency costs and ownership structure.* Theories of Corporate Governance : the Philosophical Foundations of Corporate Governance, 58.

Joas, H. (1996). *The creativity of action.* Chicago, Ill: University of Chicago Press.

Jones, R., Armour, K., & Potrac, P. (2002). *Understanding coaching practice: A suggested framework for social analysis*. Quest, 54(1), 34-48.

Jones, R. L., Amour, K., & Potrac, P. (2003). *Constructing expert knowledge: A case study of a top level professional soccer coach.* Sport, Education and Society, 8, pp. 213–229.

Jones, R., Potrac, P., Cushion, C., & Ronglan, L.T. (Eds.) (2011). *The sociology of sports coaching*. London: Routledge.

Johns, D. P., & Johns, J. S. (2000). *Surveillance, subjectivism and technologies of power: An analysis of the discursive practice of high-performance sport.* International Review for the Sociology of Sport, 35(2), pp. 219-234.

Johnson, C. M., Redmon, W. K., & Mawhinney, T. C. (2001). *Handbook of organizational performance: Behaviour analysis and management.* New York: Haworth Press.

Jung, J. & Dobbin, F. (2012). *Finance and Institutional Investors.* In: *The Oxford Handbook of the Sociology of Finance*, Cetina, K.K. and Preda, A. Oxford: Cambridge University Press, pp. 52-74.

Kaminski, M. M. (2004). *Games Prisoners Play*. Princeton, NJ: Princeton University Press.

Kornspan, A. S. (2007). *The early years of sport psychology: The work and influence of Pierre De Coubertin.* Journal of Sport Behavior, 30, pp. 77-93.

Kornspan, A. S. (2012). *History of Sport and Performance Psychology*. In S. M. Murphy (Ed.). The Oxford Handbook of Sport and Performance Psychology. New York: Oxford.

Knoblauch, H. (2013). *PowerPoint, communication, and the knowledge society*. Cambridge : Cambridge University Press.

Knorr Cetina, K. (1999). *Epistemic Cultures: How the Sciences make Knowledge*. Cambridge, MA: Harvard University Press.

Knorr Cetina, K. (2001). *Objectual Practice*, In T. Schatzki et al. (eds.), The Practice Turn in Contemporary Theory, London: Routledge, pp. 175-188.

Knorr Cetina, K. (2011). *Financial Analysis: Epistemic Profile of an Evaluative Science*. In: Social Knowledge in the Making, edited by Camic, Charles, Neil Gross, and Michele Lamont. Chicago, IL: University of Chicago Press, pp. 405-442

Lamont, M. (1992). *Money, Morals and Manners: The Culture of the French and the American Upper-Middle Class*. University of Chicago Press.

Lamont, M. (2009). *How professors think: Inside the curious world of academic judgment*. Cambridge, Mass: Harvard University Press.

Lamont, M., & Huutoniemi, K. (2011). *Comparing customary rules of fairness: Evaluative practices in various types of peer review panels.* In: Camic, C., Gross, N. and Lamont, M. (eds), Social Knowledge in the Making. Chicago: University of Chicago Press.

Landsberger, H. A. (1958). *Hawthorne revisited: Management and the worker : its critics, and developments in human relations in industry*. Ithaca, N.Y: Cornell University.

Larsen, O. (2001). *Charles Reep: a major influence on British and Norwegian football.* Soccer and Society, 2(3), pp. 55-78.

Latour, B. (1987). *Science in action: How to follow scientists and engineers through society*. Cambridge, Mass: Harvard University Press.

Latour, B. (1999). *Pandora's hope: Essays on the reality of science studies*. Cambridge, Mass: Harvard University Press.

Latour, B., & Woolgar, S. (1992). *Laboratory life: The social construction of scientific facts*. Beverly Hills: Sage Publications.

Lees, A. (2008). *Qualitative biomechanical analysis of technique*. In: M. Hughes and I.M. Franks (eds), The Essentials of Performance Analysis: An introduction London: Routledge, pp. 162–79.

Legewie, H. & Schervier-Legewie, B. (2004). *Research is Hard Work, it's Always a bit Suffering. Therefore on the Other Side it Should be Fun.* In Conversation With Heiner Legewie and Barbara Schervier-Legewie. Forum Qualitative Sozialforschung / Forum: Qualitative Social Research, 5(3), Art. 22.

Little, D. (2010). *"Theory" in sociology*, http://understandingsociety.blogspot.co.uk/2010/02/theory-in-sociology.html (accessed 08.05.2013)

Long, N. (2001). *Development sociology: Actor perspectives*. London: Routledge.

Lynch, M. (1993). *Scientific practice and ordinary action: Ethnomethodology and social studies of science.* Cambridge, England, Cambridge University Press.

McKinley, W., & Mone, M.A. (2003). *Micro and macro perspectives in organization theory: A Tale of incommensurability.* In: Knudsen, C. & Tsoukas, H. (Eds.), The Oxford handbook of organization theory: Meta-theoretical perspectives. Oxford: Oxford University Press, pp. 345-372.

Maguire, J. (1993). *Bodies, sportscultures, societies: A critical review of some theories in the sociology of the body.* International Review for the Sociology of Sport, 28(1), pp. 33-52.

Malcolm, D. (2012). *Sport and sociology*. Abingdon: Routledge.

Mannheim K. [1932] (1993). *The sociology of intellectuals*. Transl. D Pels. Theory, Culture & Society 10, pp. 69–80.

Manning, P. (1992). *Erving Goffman and modern sociology*. Stanford, Calif: Stanford University Press.

Martin, J. L. (2011). *The explanation of social action*. Oxford; New York: Oxford University Press.

Martin, V. B., & Gynnild, A. (2011). *Grounded Theory: The philosophy, method, and work of Barney Glaser.* Boca Raton: BrownWalker Press.

McGarry, T., O'Donoghue, P., & Sampaio, A. J. E. (2013). *Routledge handbook of sports performance analysis.* New York: Routledge.

McPherson, B. D., Curtis, J. E., & Loy, J. W. (1989). *The social significance of sport: An introduction to the sociology of sport*. Champaign, Ill: Human Kinetics Books.

Mead, G. H. (1934). *Mind, self & society from the standpoint of a social behaviorist.* Chicago, Ill: University of Chicago Press.

Merton, R. K. (1948). *The self-fulfilling prophecy*, Antioch Review, 8, pp. 193–210.

Merton, R.K. (1936). *The Unanticipated Consequences of Purposive Social Action*. American Sociological Review, 1(6), pp. 894-904.

Merton, R. K. (1958). *The functions of the professional association*. American Journal of Nursing, 58, pp. 50-54.

Merton, R. K. (1968). *The Matthew effect in science*. Science, 159, pp. 56-63.

Meyer, J. W., Krücken, G., & Drori, G. S. (2009). *World Society: The writings of John W. Meyer*. Oxford: Oxford University Press.

Meyer, J.W., Boli, J., Thomas, G. M., & Ramirez, F. O. (1997*). World Society and Nation States*. American Journal of Sociology , Vol. 103, No. 1, pp. 144-181.

Meyer, J. W., & Jepperson, R. (2000). *The 'Actors' of Modern Society: The Cultural Construction of Social Agency*. Sociological Theory 18, pp. 100-20.

Meyer, J., & Rowan, B. 1977. *Institutionalized Organizations: Formal Structure as Myth and Ceremony*. American Journal of Sociology 83, pp. 340-63.

Miller, D. (2009). *Stuff*. London: University College London.

Moore, R., & Maton, K. (2001). *Founding the sociology of knowledge: Basil Bernstein, intellectual fields and the epistemic device*. In: Morais, A., Neves, I., Davies, B. & Daniels, H. (eds) Towards a Sociology of Pedagogy: The contribution of Basil Bernstein to research. New York, Peter Lang, pp. 153-182.

Natanson, M. (1970). *Phenomenology and typification: A study in the philosophy of Alfred Schutz*. Social research: an international quarterly.

Nunome, H., Drust, B., & Dawson, B. (2012). *Science and football VII: the proceedings of the Seventh World Congress on Science and Football*. London: Routledge.

O'Donoghue, P. (2010). *Research methods for sport performance analysis*, London: Routledge.

Parsons, T. (1939). *The professions and social structure*. Indianapolis: Bobbs-Merrill.

Parsons, T. (1951). *The social system*. Glencoe, Ill: Free Press.

Parsons, T., & Shils, E. [1951] (2001). *Toward a general theory of action*. Cambridge: Harvard University Press.

Peirce, C. S. (1955). *Philosophical writings of Peirce*. New York: Dover Publications.

Peterson, G. (2005). *Problems in Comparative Research: The Example of Omnivorousness*. Poetics 33, pp. 257-282.

Pirsig, R. (1975). *Zen and the Art of Motorcycle Maintenance: An Inquiry into Values*. New York: Bantam Books.

Pinch, T., & Bijker, W. (1984). *The social construction of facts and artefacts: or how the sociology of science and the sociology of technology might benefit each other*. Social Studies of Science (Sage) 14 (3), pp. 388–441.

Polanyi, M. (1966). *The Logic of Tacit Inference*. Philosophy, 41, pp. 1-18.

Pollard, R. (2002*). Charles Reep (1904-2002): pioneer of notational and performance analysis in football*. Journal of Sports Sciences, 20*,* 10, pp. 853-855.

Popper, K. (1957), *The Poverty of Historicism*. Harper and Row, New York.

Potrac, P., & Jones, R. (2009). *Power, conflict and co-operation: Towards a micro-politics of coaching.* Quest, 61, pp. 223-236.

Potrac, P., Brewer, C., Jones, R.L., Armour, K.M. & Hoff. J. (2000). *Towards an holistic understanding of the coaching process*. Quest, 52(2), pp.186–199.

Potrac, P., Jones, R. L., & Amour, K. A. (2002). *It's all about getting respect: The coaching behaviors of an expert English soccer coach*. Sport, Education and Society, 7, pp. 183–202.

Poynter G. (2002). *Emotions in the Labour Process' European Journal of Psychotherapy*. Counselling and Health, Volume 5, No 3 September, pp. 247-261.

Preda, A. (1999). *The turn to things: Arguments for a sociological theory of things*. Sociological Quarterly, 40, pp. 347-366.

Rees, R., (1985). *The Theory of Principal and Agent—Part I*. Bulletin of Economic Research, 37(1), pp. 3-26.

Reilly, T., Cabri, J., & Araújo, D. (2008). *Science and football V: The proceedings of the Fifth World Congress on Science and Football*. London: Routledge.

Reilly, T., & Korkusuz, F. (2009). *Science and football VI: The proceedings of the Sixth World Congress on Science and Football*. London: Routledge.

Rhoads, J. K. (1991). *Critical issues in social theory*. University Park, Pa: Pennsylvania State Univ. Press.

Rich, M., & Chalfen, R. (1999). *Showing and telling asthma: Children teaching physicians with visual narrative*. Visual Sociology*, 14,* 1, pp. 51-71.

Rudik, P.A. (1962). *The psychology of sport. Psychological Science in the USSR*. Washington, DC: U.S. Joint Publications Research Service.

Safai, P. (2007). *A critical analysis of the development of sport medicine in Canada, 1955-1980.* International Review for the Sociology of Sport, 42(3), pp. 321-341.

Saks, M. (2010). *Analyzing the professions: the case for the Neo-Weberian approach*. Comparative Sociology, 9, pp. 887–915.

Sasaki, M. S. (2009). *New frontiers in comparative sociology*. Leiden: Brill.

Schatzki, T. (1996) Social Practices. *A Wittgensteinian Approach to Human Activity and the Social*. Cambridge: Cambridge University Press.

Schütz, A. (1982). *Collected papers*. Hague: M. Nijhoff.

Schütz, A., & Luckmann, T. (1973). *The Structures of the Life-World*, Vol.I+II, Northwestern University Press, Evanston.

Scott, W. R. (2008). *Institutions and organizations: Ideas and interests*. Los Angeles: Sage Publications.

Scott, T., Mannion, R., Davies, H., & Marshall, M. (2003). *The Quantitative Measurement of Organizational Culture in Health Care: A Review of the Available Instruments*. Health Services Research, 38, 3, pp. 923-945.

Selznick, P. 1996. *Institutionalism "Old" and "New"*. Administrative Science Quarterly, 41(2), pp. 270-277.

Simmel, G. (1917). *Grundfragen der Soziologie (Individuum und Gesellschaft)*. Berlin: G.J. Göschen.

Skinner, B. F. (1969). *Contingencies of reinforcement: A theoretical analysis*. New York: Appleton-Century-Crofts.

Star S.L., & Griesemer J.R. (1989). *Institutional Ecology, 'Translations' and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39*. In Social Studies of Science. 19, Nr. 4, pp. 387–420.

Stark, D. & Paravel, V. (2008). *PowerPoint in Public: Digital Technologies and the New Morphology of Demonstration*. Theory, Culture & Society, 25,5, pp. 30-55.

Stein, H. (2008). *Beyond the World Bank agenda: An institutional approach to development.* Chicago: University of Chicago Press.

Stiglitz, J. E. (1987). *Principal and agent*, The New Palgrave: A Dictionary of Economics, v. 3, pp. 966–71.

Stiglitz, J. E., & Mathewson, G. F. (1986). *New developments in the analysis of market structure: Proceedings of a conference held by the International Economic Association in Ottawa, Canada*. Cambridge, Mass: MIT Press.

Strauss, A. L. (1993). *Continual permutations of action*. New York: Aldine de Gruyter.

Strauss, A. L., & Corbin, Juliet (1990). *Grounded Theory Research: Procedures, Canons and Evaluative Criteria*, Zeitschrift für Soziologie, Issue 19, p. 418ff.

Swidler, A. (1986*). Culture in Action: Symbols and Strategies*. American Sociological Review, Vol. 52, No. 2, pp. 273-286.

Swidler, A. (2001). *Talk of love: How culture matters.* Chicago: University of Chicago Press.

Tavory, I., & Timmermans, S. (2009). *Two cases of ethnography*. Ethnography, 10, 3, pp. 243-263.

Theberge, N. (1991). *Reflections on the body in the sociology of sport*. Quest, 43(2), pp. 123-134.

Thorn, J., Palmer, P., & Reuther, D. (1984). *The hidden game of baseball: A revolutionary approach to baseball and its statistics.* Garden City, N.Y: Doubleday.

Timmermans, S., & Tavory, I. (2012). *Theory construction in qualitative research: From grounded theory to abductive analysis*. Sociological Theory, 30, 3, pp. 167-186.

Timmermans, S., & Tavory, I. (2007) *Advancing Ethnographic Research through Grounded Theory Practice.* In: Charmaz K. and Bryant, A. *The SAGE handbook of grounded theory*. Los Angeles: SAGE. pp. 493-513.

Turner, B. (2009). *The New Blackwell Companion to Social Theory*. Blackwell-Wiley, Oxford.

Turner, S. P. (1994). *The social theory of practices: Tradition, tacit knowledge, and presuppositions.* Chicago: University of Chicago Press.

Tracey, L. A. (2015*). Sociology of professions: international divergences and research directions.* Work, Employment & Society, 29, 1, pp. 154-165.

Vaisey, S. (2010). *From Contradiction to Coherence: Theory-Building in the Sociology of Culture*. Paper presented at the Annual Meetings of the American Sociological Association, Atlanta GA.

Van der Mars, H. (1989). *Systematic Observation: An Introduction*. In: Darst P.

et al. (Ed), Analyzing Physical Education and Sport Instruction. Champaign IL: Human Kinetics.

Vedrés, B., & Stark, D. (2010). *Structural Folds: Generative Disruption in Overlapping Groups.* American Journal of Sociology, v.115, pp. 1150-1190.

Vinberg, Ė. B. (2003), *A Course in Algebra.* American Mathematical Society.

Volti, R. (2011). *An introduction to the sociology of work and occupations.* Thousand Oaks: Sage.

Weber, K. (2005). *A toolkit for analyzing corporate cultural toolkits.* Poetics*, 33,* 3, pp. 227-252.

Weber, M. (1904). *The Objectivity of the Sociological and Social-Political Knowledge*, In: Shils, E. A., Finch, H. A., The methodology of the social sciences. Glencoe, Illinois: Free Press.

Weber, M. (1973). *Die „Objektivität" sozialwissenschaftlicher und sozialpolitischer Erkenntnis*, In: Gesammelte Aufsätze zur Wissenschaftslehre, Winkelman, Tübingen.

Weick, K. E. (1995). *Sensemaking in organizations.* Thousand Oaks: Sage Publications.

Whitley, R. (1984). *The Fragmented State of Management Studies: Reasons and Consequences.* Journal of Management Studies, 21, 3, 331-348.

Wiseman, A. W., Astiz, M. F., & Baker, D. P. (2013). *Globalization and Comparative Education Research: Misconceptions and Applications of Neo-Institutional Theory.* Journal of Supranational Policies of Education, 1, pp. 31-52.

Woolgar, S. (1988). *Knowledge and Reflexivity: New Frontiers in the Sociology of Knowledge.* London and Beverly Hills: Sage.

Zerubavel, E. (1981). *Hidden rhythms: Schedules and calendars in social life.* Chicago: University of Chicago Press.

Zucker, L. (1983). *Organizations as institutions.* In: Samuel B. Bacharach (ed), Perspectives in Organizational Sociology: Theory and Research. ASA Series, Vol. 2. Greenwich, CT: JAI Press.

Internet and print resources

www.bbc.co.uk/sport2/hi/football/teams/w/west_ham_utd/9622091.stm+&cd=5&hl
=en&ct=clnk&gl=de (last accessed 24.10.2013)

http://bundesligafanatic.com/hannover-come-up-short-with-franca-and-5-other-
botched-bundesliga-transfers (last accessed 28.06.2013)

http://www.businessofsoccer.com/2013/09/05/the-proliferation-of-data-driven-
analysis-in-football-part-one-the-scouts/ (last accessed 29.11.2013)

http://www.castrolfootball.com/ (last accessed 07.11.2013)

http://www.dw.de/scouting-for-the-german-team/a-16040814 (last accessed
30.11.2013)

http://eplindex.com/14987/brendan-rodgers-tactical-approach-liverpool-adapt-
tikitaka.html (last accessed 14.11.13)

http://www.football-dataco.com/ (last accessed 01.12.2013)

http://fourfourtwo.com/statszone/ (last accessed 22.03.2013)

http://www.ft.com/cms/s/2/9471db52-97bb-11e0-9c37-
00144feab49a.html#axzz1Pd78IO00 (accessed 16.06.2013)

http://www.ft.com/intl/cms/s/0/c6ac2792-e179-11e4-9b30-
00144feab7de.html#axzz3XmcZo0Iu (last acessed 14.04.15).

http://guardian.touch-line.com/ (last accessed 24.03.2013)

http://www.guardian.co.uk/business/2010/oct/29/tesco-clubcard-couple-depart (last
accessed 23.07.2013)

http://www.guardian.co.uk/football/goalline-technology (accessed 28.06.2013)

http://www.guardian.com/football/2013/aug/08/football-goal-decision-system (last
accessed 30.11.2013)

http://www.guardian.co.uk/world/prism (last accessed 28.06.2013)

http://www.liverpoolecho.co.uk/sport/football/football-news/liverpool-fc-
goalkeeper-simon-mignolet-5749307 (last accessed 20.11.2013)

http://www.ljmu.ac.uk/sps/76111.htm (last accessed 20.06.2013)

http://www.newstalk.ie/Shouldnt-Sam-Allardyce-be-getting-more-love (last accessed 03.12.2013)

http://www.nytimes.com/2010/05/02/magazine/02self-measurement-t.html (last accessed 22.10.11)

http://www.plainsoccer.com/2009/11/prozone-performance-analysis-in.html last accessed 13.02.2012)

http://www.prozonesports.com/news-article-a-decade-of-performance-analysis-development.html (last accessed 16.09.2013)

http://www.prozonesports.com/news-article-prozone-amisco-join-forces-to-advance-sports-performance-analysis.html (last accessed 31.10.2013)

http://www.sabr.org (last accessed on 18.07.2013)

http://www.dailymail.co.uk/sport/football/article-2430369/Sam-Allardyce-100th-West-Ham-match-Sportsmail-reveals-life-Hammers-numbers-game-Big-Sam.html (last accessed 30.09.2013)

http://www.thefa.com/~/media/Files/TheFAPortal/governance-docs/rules-of-the-association/fa-handbook-2012-13.ashx (last accessed 14.07.2013)

http://www.thefa.com/football-rules-governance (last accessed 09.11.2013)

http://www.theguardian.com/football/2011/feb/12/sunderland-tottenham-hotspur-premier-league (last accessed 06.06.2013)

http://www.theguardian.com/football/2007/mar/17/newsstory.sport1 (last accessed 20.11.2013)

http://thevideoanalyst.com/list-of-courses-teaching-performance-analysis-in-sport/ (last accessed 12.06.2013)

http://www.spiegel.de/sport/fussball/david-alaba-und-franck-ribery-bayerns-herz-schlaegt-links-a-885709.html (last accessed 30.11.2013)

http://sportstec.com/products/sportscode-2 (last accessed 29.11.2013)

http://www.sportpulse.net/content/fifa-bringing-change-offside-law-9003 (last accessed 28.6.2013)

http://sportsanalytics.tv/ (last accessed on 15.07.2013)

http://solenthess.blogspot.de/2011/05/student-blog-from-interns-at-afc.html (last accessed 31.10.13)

http://sportsillustrated.cnn.com/2012/writers/jen_chang/04/29/performance.analytics/index.html (last accessed 29.11.2013)

http://www.theguardian.com/football/2007/mar/17/newsstory.sport1 (last accessed 15.10.2013)

http://www.theguardian.com/football/blog/2013/jan/20/football-data-scouts-michu-transfer (last accessed 02.11.2013)

http://www.theguardian.com/football/2012/apr/20/arsene-wenger-robin-van-persie-arsenal (last accessed 23.10.2013)

http://www.youtube.com/user/wcsf2011 (last accessed 23.10.2013)

https://www.youtube.com/watch?feature=player_embedded&v=oojX13ZVAkw (last accessed 19.05.2013)

http://www.youtube.com/watch?v=w85fztm8iAA (last accessed 22.11.2013)

Der Spiegel 11/2010

Der Spiegel 04/2013

The Times, 15.01.2012

Declaration Page

This is to certify that the work contained within has been composed by me and is entirely my own work. No part of this thesis has been submitted for any other degree or professional qualification.

Friedrich Eierdanz