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Knowledge transfer in the football industry: a sectorial analysis of factors and determinants

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Abstract

Purpose – Over recent decades, knowledge transfer processes and knowledge-intensive organizations have been increasingly investigated from several perspectives. Knowledge translation activated by knowledge-intensive organizations is supported by several factors, among which intangible assets play a significant role. Our research mainly investigates the relationship between the knowledge owned by knowledge workers in source organizations and the process of its translation to recipient organizations. Specifically, this paper aims at analyzing knowledge translation and organizational performance in the football industry, uncovering both the role of professional football players' skills transfer and the determinants of achieving positive performance at the organizational level.

Design/methodology/approach – A quantitative method is adopted, using both bivariate linear regression analysis and network analysis. Using key aspects of Nakauchi *et al.*'s (2007) knowledge transfer framework, intra-organizational dynamics are analyzed based on measurements of the performance of professional football players before and after transferring from one club (the source organization) to another (the recipient organization).

Findings – Our research results are mainly intended to show the factors that influence knowledge translation in the light of team performance improvement. Our empirical analysis shows the need for the coexistence of a combination of factors, especially the quality of the source and recipient organizations and of the relationship between them, to achieve the transferability of professional football players' capabilities and performance.

Practical implications – The academic community, practitioners and policymakers can draw on the theoretical and practical advances made by the findings to address knowledge translation issues with an improved understanding of its factors and determinants.

Originality/value – Despite some limitations to the study, we identify the factors, determinants and contexts that facilitate the transfer of knowledge and specialist knowledge and thus contribute to the successful operation of contemporary organizations. Moreover, the results of our analysis are applicable to all economic sectors.

Keywords Knowledge transfer, Knowledge translation, Factors, Determinants, Performance, Intangibles, Football industry

Paper type Research paper

1. Introduction

Over recent decades, knowledge transfer (KT) processes and knowledge-intensive organizations (KIO) (Secundo *et al.*, 2017) have been increasingly investigated from several intra- and inter-organizational perspectives (Albino *et al.*, 1998; Argote and Fahrenkopf, 2016; Hawkins and Mohammad, 2012; Lombardi, 2019; Nakauchi *et al.*, 2017; Secundo *et al.*, 2019). Knowledge flows and knowledge sharing between actors (individuals

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and organizations) have become a key issue in analyzing the internal and external interplay of organizations, especially recognizing the phases and forms of knowledge transformation (Raven *et al.*, 2011) and knowledge translation (Argote and Fahrenkopf, 2016; Graham *et al.*, 2006; Liyanage *et al.*, 2009; Seaton, 2002). Knowledge translation "involves processing new knowledge, interpreting it according to the needs and interests of a specific organization and transforming it into forms that are more suitable for the specific organizational context of application" (Simeone *et al.*, 2017); it therefore plays a particularly crucial role in sustaining an organization's competitiveness and facilitating collaboration with the environment (Jones and Mahon, 2018).

The knowledge translation activities of KIOs are supported by several factors (Krylova *et al.*, 2016; Lönnqvist and Laihonen, 2017), among which intangible assets play an important role (Bontis, 1998; Guthrie *et al.*, 2012; Lombardi and Dumay, 2017; Roos *et al.*, 2011; Wiig, 1997). Specific factors found to be related to KIO (Nurmi, 1998; Secundo *et al.*, 2017) are knowledge workers (Alvesson, 2004; Brenneckea and Rankb, 2016; Robertson and Swan, 2003) and skills and competence (Heckman and Kautz, 2012; Kuhn and Weinberger, 2005). In the football industry, intangible assets assume several forms, including human resources and knowledge workers (professional football players), club branding, taking part in specific league competitions, information and communication technology (Trequattrini *et al.*, 2017a) and improvements to business processes affecting performance and competitiveness. Thus, the impact of knowledge translation and the identification of the factors and determinants of KT in this field provide significant insight into the successful operation of contemporary organizations in all economic sectors.

Our research investigates the knowledge possessed by knowledge workers belonging to source organizations and its process of translation to recipient organizations. Thus, this paper aims at analyzing knowledge translation and organizational performance (Lombardi, 2019; Trequattrini *et al.*, 2018) in the football industry, uncovering both the role of professional football players' skills transfer and the determinants of achieving positive performance at the organizational level. In this context, the professional football clubs are intended as cultural enterprises and KIOs (Secundo *et al.*, 2017; Trequattrini *et al.*, 2017a). Their value-creation process is based on the interaction of their knowledge assets (e.g. professional football players as human capital; club branding as image, reputation and relational capital; information and communication technology as structural capital). Thus, objectives by professional football clubs are achieved combining efficiently such resources. Football players represent the human capital in such enterprise (Tomé *et al.*, 2014) and the factor that mainly affects the final result. Interestingly, it is fundamental to investigate the knowledge translation process in the context of football industry.

The research is directed to the discovery of the factors and determinants of intra-organizational (among professional football clubs) dynamics in the knowledge translation processes. We also investigate how professional football players incorporate specialist knowledge while spending time at one club (the source organization) and consequently how this knowledge is translated to a new club (the recipient organization) when a player is transferred.

The research question is answered through a quantitative method (Anderson *et al.*, 2012; Bell *et al.*, 2018) using bivariate linear regression analysis and network analysis (Carrington *et al.*, 2005; Perry *et al.*, 2018; Trequattrini *et al.*, 2015, Trequattrini *et al.*, 2017b). Data were collected mainly from the primary professional website for player movements, Transfermarkt (www.transfermarkt.it). We gathered our sample by selecting football players listed as forwards who moved to a new club during the 2016/2017 and 2017/2018 seasons. We also identified their performance before and after the transfer, to identify intergroup similarities and differences between professional football clubs. To complete the analysis identifying factors and determinants affecting the transferability of professional

football players' capabilities and performances, we used a network analysis model to identify the main network indicators (Trequattrini *et al.*, 2015; Perry *et al.*, 2018). In the investigation of performance before and after a player's transfer, we drew on the five key aspects of KT identified in Nakauchi *et al.'s* (2017) framework.

While our study has some limitations, we identify factors, determinants and contexts that aid in the translation of knowledge and specialist knowledge and thus contribute to the successful operation of KIOs in the football industry. The research results are mainly intended to determine the factors behind team performance improvement. Our empirical analysis shows the need for the coexistence of a combination of factors to achieve the transferability of professional football players' capabilities and performances. The results of our analysis serve all economic sectors and the theoretical and practical advances can be of benefit to academics, practitioners and policymakers in addressing knowledge translation issues and supporting relevant theories.

The remainder of the paper is organized as follows: Section 2 examines the relevant literature; Section 3 presents the research methodology; Section 4 presents the findings; and Section 5 presents the discussion and conclusions of our paper and provides suggestions for future research.

2. Literature review and research question

2.1 KT and knowledge translation

Over recent decades, scholars have widely investigated KT within and between organizations (Argote and Guo, 2016; Chen *et al.*, 2014; Ingram, 2002; Gil and Carrillo, 2016; Van Wijk *et al.*, 2008) owing to its impact on organizational performance and business processes. Although some critical studies exist (Argote and Ingram, 2000), it is generally held that KT requires more complex processes between organizations than it does within organizations (Von Hippel, 1989; Zellmer-Bruhn, 2003). Argote and Ingram (2000) stated that "knowledge transfer in organizations is the process through which one unit (e.g. group, department, or division) is affected by the experience of another." Thus, KT assumes several forms in fostering replication and adaptation (Williams, 2007), becoming knowledge translation (Simeone *et al.*, 2017) and sustaining organizations' competitiveness and collaborations with the environment (Jones and Mahon, 2018).

Levitt and March (1988) explained that KT at the organizational level allows organizations to learn from direct experience and also from the indirect experience of other organizations. As well as operating between organizations (Miner and Anderson, 1999), KT also occurs across social units, such as teams (Bresman, 2010) and populations within organizations (Miner and Anderson, 1999). Several factors have been found to play significant roles in KT, such as psychological factors, social media technologies, personnel mobility and routines across groups (Savory, 2006; Argote and Fahrenkopf, 2016; Kane *et al.*, 2005).

KT has also been deeply analyzed in the context of group or team members. Interestingly, the extent of the knowledge and skills of members belonging to a group changes after training activities, which supports KT activities (Argote and Fahrenkopf, 2016; Lapré and Van Wassenhove, 2001; Paoloni *et al.*, 2019; Salas *et al.*, 2012). KT is also activated by the diversity and variety in knowledge sources among a group's members (Harrison and Klein, 2007), and by a group's members returning from outgoing experiences (Gruenfeld *et al.*, 2000). Changes in group membership have also been found to influence KT and improve the group's performance compared to groups in which there were no such changes (Choi and Thompson, 2005).

Knowledge is transferred between actors (individuals and organizations) in several ways (Nakauchi *et al.*, 2017), through social practices (Von Krogh, 2012) and via both tacit and explicit means (Nonaka and Takeuchi, 1995). Nakauchi *et al.'s* (2017) investigated factors

affecting the transferability of professional football players' capabilities and performances understanding knowledge flows through the knowledge itself, the knowledge recipient, the knowledge source, the relationship between the recipient and the source and the structure of the network. Knowledge flows are defined as the outflow and inflow of knowledge inside and outside of organizations, recognizing the power of knowledge translation (Graham *et al.*, 2006; Seaton, 2002). Simeone *et al.* (2017) claimed that knowledge translation "involves processing new knowledge, interpreting it according to the needs and interests of a specific organization and transforming it into forms that are more suitable for the specific organizational context of application," while Albino *et al.* (1998) argued that the objective of KT among individuals or organizations is the acquisition of new knowledge.

KT may be becoming more important than ever. As Lombardi *et al.* (2016) argued, "The current knowledge economy highlights the relevance of understanding if knowledge is transferable as well as which are the variables influencing organizational performance in all types of companies including start-ups companies requiring new forms of financial funds." Thus, KT into the organization and its business processes is relevant to achieving high performance, encouraging innovation processes and gaining competitive advantages. Thus, understanding the factors or variables influencing KT is now a key issue. Recently, Milagres and Burcharth (2019) analyzed KT in inter-organizational partnerships, and proposed the main factors influencing KT at the macro-environmental (e.g. industrial policy, intellectual property regime), inter-organizational (e.g. synergy-seeking motives), organizational (e.g. capabilities, intangible resources, behavioral aspects and internal processes) and individual levels (e.g. motivation, emotions, learning behavior).

2.2 KIO and knowledge workers

KIOs are now strongly attached to KT and the role of knowledge workers. In this scenario, intangible assets and intellectual capital (Bontis, 1998; Edvinsson, 1997; Guthrie *et al.*, 2012; Lombardi and Dumay, 2017; Roos, *et al.*, 2011) in several forms (human capital, relational capital, structural capital) contribute to the achievement of high performance and value creation for KIO stakeholders. Thus, KIOs (Nurmi, 1998; Secundo *et al.*, 2017) are deeply invested in their relationships with knowledge workers and their skills and competence.

KIOs represent entities "whose creation or expansion is strictly based and affected by the dynamic application, development and management of new knowledge" (Secundo *et al.*, 2017). Whether KIOs are recognized as knowledge brokers, knowledge-intensive service providers and/or specialized knowledge suppliers (Secundo *et al.*, 2017), they are characterized by both high levels of innovativeness and the strategic relevance of their intangible assets for value creation (Malerba, 2010; Nurmi, 1998). KIOs require individual and organizational capacities, competencies and attitudes to transform new ideas, technologies and inventions into economic and social value and to develop innovative business models (Byers *et al.*, 2010; Mitchelmore and Rowley, 2010; Passiante and Romano, 2016) that foster effective business processes and organizational performance.

KIO requires qualified knowledge workers characterized by autonomous and flexible styles of work (Alvesson, 2004; Brenneckea and Rankb, 2016; Robertson and Swan, 2003). Knowledge workers take on non-routine tasks and engage in high levels of cooperation and communication with other human resources in meeting their job demands (Cummings and Haas, 2012; Rulke and Galaskiewicz, 2000), which fosters specialization, innovation (Cohen and Bailey, 1997) and increases in skills and competencies over time.

In this scenario, an organization's competitiveness and productivity (Sousa and Rocha, 2019) is promoted by skills treated as resources of an individual and organizational nature. The individual characteristics of knowledge workers support the concept of skills, even if the term's meaning has changed over time (Heckman and Kautz, 2012; Heckman *et al.*, 2006; Kuhn

and Weinberger, 2005; Mulder, 2000, 2001; Trequattrini *et al.*, 2012; Weinberger, 2014) and varies from different perspectives. According to Becker (1964), a clear distinction can be made between two types of skills: general skills and firm-specific skills. General skills refer to abilities and expertise applied in widely differentiated contexts, as they are recognized as highly flexible and adaptable to the context and environment. Firm-specific skills refer to distinctive skills that have an exclusive value in the environment in which they were generated. Both types of skills and their development are perceived as a strategic management tool (Nyhan, 1998). The concept of skill has therefore been investigated to understand knowledge workers and how to produce them and support their role (Blair and Kochan, 2002; Drucker, 1998; Tapscott, 1996; Blackler, 1995; Williamson, 1979) in KIOs.

Groysberg (2012) stated that general skills can be easily transferred from one organization to another, whereas firm-specific skills are most highly productive in the environment in which they were formed. However, the notions of knowledge workers' skills adopted in organizations allow for the identification of greatly talented workers called "star workers" (Rosen, 1981; Simonton, 1999). The performance of star workers is transferable from one organization to another (Groysberg, 2012) under several conditions. However, Hamel (1994) recognized knowledge workers as:

> a source of competitive advantage in that it is competitively unique and contributes to value and or cost. But whereas all core competencies are sources of competitive advantage, not all competitive advantages are core competencies (p. 18).

Additionally, another relevant issue on knowledge workers is the talent crunch phenomenon (Bhasin and Low Kim Cheng, 2002; Pannell and Mendez, 2019; Sloan, 2000). Ferry (2018) assumed the talent crunch as "the gap between talent supply and demand at three critical milestones: 2020, 2025, and 2030". This phenomenon is investigated under "three knowledge-intensive sectors within each market that act as critical drivers of global economic growth: financial and business services; technology, media, and telecommunications (TMT); and manufacturing, and also examines the remainder of each economy" (Ferry, 2018). Thus, the potential of knowledge workers is also influenced by the talent crunch.

Interestingly, therefore, a KIO's ability to acquire a stable and sustainable competitive advantage is closely linked to opportunities to take advantage of its distinctive competencies. To safeguard competitive advantage (Almeida *et al.*, 2002; Zollo and Winter, 2002), a KIO must counter the growing dynamism characterizing the social, economic and political context in which they operate. Therefore, the development of dynamic capabilities (Teece *et al.*, 1997), or the ability to integrate, build and reconfigure internal and external resources and skills in response to rapid environmental changes, is crucial.

Highly specific resources within organizations cannot be transferred because they lose part of their value when they are used in a different context from the one in which they were created and accumulated (Dierickx and Cool, 1989). If a knowledge worker's skills and competencies are easily transferred from one organization to another organization, they are not recognized as a source of competitive advantage. In that case, individuals could easily leave their organization at any moment and deprive it of its acquired competitive advantage.

With the emergence of the "War for Talent" (Florida, 2006; Groysberg, 2012), organizations are busily attracting talented people with incentives, such as paying them very high salaries. In this scenario, KIOs (Secundo *et al.*, 2017) invest considerable effort and resources into the process of recruiting, developing and retaining the most talented workers who can contribute the most to achieving high levels of performance (Tarique and Schuler, 2010) over time.

The professional football clubs, as KIOs in the football industry (Beech and Chadwick, 2004; Sšderman and Dolles, 2013), require qualified professional football players as knowledge workers. The strategic relevance of intangible assets for value creation (Malerba,

2010; Nurmi, 1998) by professional football clubs allows us to identify their specific knowledge assets (or intellectual capital) as follows: professional football players as human capital; club branding as image, reputation and relational capital; taking part in specific competitions; and information and communication technology (Trequattrini *et al.*, 2017a). These knowledge assets held by professional football clubs help to improve their business processes and affect their performance and competitiveness.

Taking the aims of this paper together with the analysis of the previous literature, we derived the following research question (RQ): *What are the factors and determinants of knowledge translation contributing to the successful operation and performance improvement of knowledge-intensive organizations?*

3. Methodology

We adopted a quantitative methodology (Anderson *et al.*, 2012; Bell *et al.*, 2018) using both bivariate linear regression analysis and network analysis (Carrington *et al.*, 2005; Trequattrini *et al.*, 2015; Trequattrini *et al.*, (2017b); Perry *et al.*, 2018) to analyze the data in relation to our research question. The quantitative method allows researchers "to make valid and objective descriptions on phenomena. The researcher is attempting to show how phenomena can be controlled by manipulating the variables. Researchers seek to understand phenomena by isolating and examining the interrelationship among and between variables in a controlled setting" (Taylor, 2005). Thus, the choice of a quantitative method allows us to understand the relationships between several factors (positive or negative, strong or weak) to describe phenomena and achieve the research aims.

Data for this study were collected mainly from the primary professional website for player movements, Transfermarkt (www.transfermarkt.it) (first accessed in November 2018). To compose our sample, we selected professional football players listed as forwards who moved to a new club in the 2016/2017 and 2017/2018 seasons. We then identified the players' performances before and after the transfer, to analyze the similarities and differences between the source and recipient organizations, in the form of professional football clubs. Using bivariate linear regression analysis to investigate the factors and determinants of the transferability of professional football players' capabilities and performance, we examined the performance before and after the transfer using the five key factors of KT defined in Nakauchi *et al.'s* (2017) framework. The main aim of the analyses performed on our sample was to pick up factors affecting the transferability of professional football players' capabilities and performance. We performed further analysis using the network analysis model, building on some network indicators such as density. The following subsections describe the research context, and the methods used for data collection and analysis.

3.1 Research context

The football industry has become a major economic sector (Beech and Chadwick, 2004; Sšderman and Dolles, 2013) all over the world. In this light, professional football is not to be considered a mere sporting competition, but rather as an environment connected to a complex system of economic, social and political structures and having a significant financial and cultural impact (Beech and Chadwick, 2004; Sšderman and Dolles, 2013). Thus, professional football has become a relevant economic growth lever influencing economic trends.

Professional football clubs are assimilated to cultural enterprises and are KIOs (Secundo *et al.*, 2017; Trequattrini *et al.*, 2017a) supported by intangible assets (e.g. football players, club branding, taking part in specific competitions, information and communication technology). This kind of organization is directed to the production of goods and services for society and their resources have to be combined efficiently to achieve their objectives. The football

industry represents the main sports sector in Europe and "the overall size of the European football market continues to increase in revenue terms, reaching €28.4bn for 2017/18" (Deloitte, 2019). The European football market is now worth some €25.5bn (£21.9bn) (Deloitte, 2019, p. 8).

The financial results of the 2016–2017 football season reflected a new era of improved profitability and financial stability for European football clubs (Deloitte, 2019). The "Big Five" Leagues (Report Calcio, 2018) in Europe are the English Premier League (English League), Serie A (Italian League), Bundesliga (German League), La Liga (Spanish League), and Ligue 1 (French League). The English League was the market leader, with record revenue, followed by the German, Spanish, Italian and French Leagues (Deloitte, 2019, p. 9).

3.2 Sample and data collection

To compose our sample we selected the population of professional football clubs participating in the "Big Five" European Leagues (https://www.statista.com/statistics/261218/big-five-european-soccer-leagues-revenue/) (first accessed in November 2018). From these leagues we selected 98 professional football clubs and identified all strikers transferred during the 2016/2017 and 2017/2018 seasons, which were the most significant seasons in terms of the economic value of transfers (Deloitte, 2019). Assuming that club performance derives from the performance of players who participate in an adequate number of matches, we selected strikers who participated in at least 50 percent of European League matches in the seasons analyzed. With these criteria, our sample comprised 62 professional football players from the following European Leagues: 13 strikers from the English League, 12 strikers from the Italian League, 11 strikers from the German League, 14 strikers from the French League and 12 strikers from the Spanish League.

To calculate each striker's performance (P_S) during each season, we collected the following data: the number of goals (G) in the 2016–2017 and 2017–2018 seasons and the number of appearances (P) in the 2016–2017 and 2017–2018 seasons. The striker's performance (P_S) for each season was then based on the following formula:

$$P_{S\,201X} = \frac{G201x}{P201x}$$

We identified the striker's performance before and after the transfer (Table I). Starting from the hypothesis that a transfer of knowledge occurs in the case of strikers' changing professional football clubs (Table I) lists the striker's performance in the 2016 and 2017 seasons and the delta performance between the two seasons.

For Players 1–33 a transfer of knowledge occurred and was highlighted by the positive difference between the performance during the 2017 season and the performance during the 2016 season. Thus, the transfer was efficient as the striker's performance was improved. For Players 34–62 a transfer of knowledge occurred but it was not as efficient as the striker's performance did not improve.

3.3 The theoretical framework

To analyze our data, we used the key aspects of KT defined in Nakauchi *et al.'s* (2017) framework to understand the factors affecting the transferability of professional football players' capabilities and performances. This framework was chosen because it specifically focuses on the understanding of knowledge flows through "five key aspects of KT within an organization: the knowledge itself, the knowledge recipient, the knowledge source, the relationship between the recipient and the source, and the structure of the network" (Nakauchi *et al.*, 2017). Thus, we made reference to the following key aspects:

Striker	Performance 2016	Performance 2017	Δ performance
1	0.433	0.950	0.517
2	0.174	0.636	0.462
3	0.484	0.889	0.405
4	0.091	0.361	0.270
5	0.167	0.406	0.240
6	0.190	0.429	0.238
7	0.160	0.395	0.235
8	0.000	0.192	0.192
9	0.190	0.370	0.180
10	0.188	0.355	0.167
11	0.160	0.310	0.150
12	0.143	0.267	0.124
13	0.200	0.323	0.123
14	0.182	0.303	0.121
15	0.000	0.107	0.107
16	0.263	0.355	0.092
17	0.360	0.450	0.090
18	0.303	0.387	0.084
19	0.000	0.067	0.067
20	0.033	0.097	0.063
21	0.074	0.136	0.062
22	0.407	0.455	0.047
23	0.161	0.208	0.047
24	0.265	0.303	0.038
25	0.190	0.227	0.037
26	0.130	0.167	0.036
27	0.100	0.130	0.030
28	0.343	0.368	0.026
29	0.406	0.429	0.022
30	0.108	0.125	0.017
31	0.088	0.100	0.012
32	0.033	0.038	0.005
33	0.077	0.077	0.000
34	0.094	0.091	−0.003
35	0.206	0.194	−0.012
36	0.278	0.257	−0.021
37	0.517	0.481	−0.036
38	0.216	0.171	−0.045
39	0.200	0.143	−0.057
40	0.160	0.091	−0.069
41	0.211	0.133	−0.077
42	0.296	0.214	−0.082
43	0.138	0.048	−0.090
44	0.257	0.147	−0.110
45	0.355	0.241	−0.113
46	0.364	0.250	−0.114
47	0.250	0.133	−0.117
48	0.310	0.192	−0.118
49	0.281	0.161	−0.120
50	0.423	0.286	−0.137
51	0.400	0.250	−0.150
52	0.357	0.194	−0.164
53	0.516	0.348	−0.168
54	0.200	0.000	−0.200

Table I.
Striker's performance

(*continued*)

Striker	Performance 2016	Performance 2017	Δ performance
55	0.676	0.471	−0.205
56	0.577	0.355	−0.222
57	0.344	0.091	−0.253
58	0.455	0.194	−0.261
59	0.333	0.071	−0.262
60	0.371	0.100	−0.271
61	0.467	0.138	−0.329
62	0.933	0.438	−0.496

Table I.

(1) *The knowledge itself.* This is composed of tacit and technical knowledge. Nakauchi *et al.* (2017) observed that

> Scholars of KT argue that some forms of knowledge are easier to express than others, using the term "tacit" to describe knowledge that is particularly difficult to express or convey . . . Most KT research concurs that the extent to which knowledge is difficult to articulate, or is tacit, impedes its transfer. While tacitness makes it difficult to transfer knowledge generally, this characteristic is likely particularly true where knowledge must cross group boundaries . . .

(2) *The knowledge recipient.* The technical knowledge is acquired by knowledge seekers. As argued by Cohen and Levinthal (quoted in Nakauchi *et al.* (2017)), "Such knowledge fosters the acquirer's absorptive capacity, enabling him to understand and make use of new information."

(3) *The knowledge source.* The source of the knowledge can affect KT. Levin and Cross (quoted in Nakauchi *et al.* (2017)) gave the example of "a knowledge seekers' lack of faith in the knowledge source's competence . . . imped[ing] knowledge flow." Nakauchi *et al.* (2017) explained that "When a knowledge seeker believes the knowledge source is highly capable and has mastery over the relevant knowledge domain, he or she is more likely to accept the information offered."

(4) *The relationship between the recipient and the source.* This is important in identifying the context for KT. The context-dependent nature of knowledge makes understanding the context crucial to KT (Nakauchi *et al.*, 2017).

(5) *The structure of the network.* The characteristics of ties are relevant factors in KT. Nakauchi *et al.* (2017) argued that

> Network density, the extent to which the social contacts of a given pair of individuals all know each other, creates multiple redundant ties, allowing information to flow from many sources to accommodate for the complexity of information and increase the likelihood that an information seeker has access to individuals in possession of useful information . . . Moreover, network density is a general indicator of social cohesion, which likely increases KT by increasing the willingness of individuals to devote time and effort to assisting others . . . If knowledge is highly technical, hard to express, or requires great investment to understand, then a highly dense network of communication should facilitate its transfer.

3.4 Data analysis

We used bivariate linear regression analysis and network analysis in our sample to investigate the knowledge translation phenomenon. To verify if KT exists, we correlated the

strikers' performances before and after the transfer to analyze the intergroup similarities and differences in performance. Using the bivariate linear regression method, we investigated which variables could affect the KT process of professional football players and the conditions for an increase in the transferability of skills.

We filtered the sample through the factors identified above from the framework of Nakauchi *et al.* (2017). Five variables were derived, as presented in Table II, and mapped to the five factors as follows: (1) the striker's economic value; (2) the economic value of the recipient professional football club (season 2017/2018); (3) the economic value of the source professional football club (season 2016/2017); (4) the number of transfers made between the two clubs (source and recipient organizations); and (5) the environmental analysis.

In developing our analysis, we used the median value of each variable to equally divide our sample into two groups (see Table III). The division of the sample into sub-groups was performed to make the groups more homogeneous for linear regression.

The research sources used for the analysis were documents, webpages, reports, journal articles in open sources, papers and scientific books and databases. The empirical analysis was carried out using SPSS software. Additionally, to carry out an environmental analysis of the context in which the professional football players transfer processes were undertaken, we used network analysis identifying the network graph and main key indicators using the UCINET software application. Data entered into the network analysis were built up from professional football players' transfers among leagues. Section 4 presents the results of the analysis.

4. Research findings

This section presents an analysis of the results in relation to our research question: *What are the factors and determinants of knowledge translation contributing to the successful*

Nakauchi *et al.* (2017) variables	Original variables	Variables' meaning
(1) The knowledge itself	(1) Striker's economic value	The striker's economic value approximates the value of the tacit and explicit knowledge that itself incorporates. Thus, a club that purchases a player acquires above all his technical and tactical knowledge, his relational skills and his ability to adapt to the context, etc.
(2) The knowledge recipient	(2) The economic value of the recipient professional football club	One of the factors that give economic value to a football club is the economic value of its first-team players; it can be considered as the set of individual knowledge that a club held, to be transformed into collective knowledge through training activities
(3) The knowledge source	(3) The economic value of the source professional football club	
(4) The relationship between the recipient and the source	(4) Number of transfers made between the two clubs	The number of transfers is an indicator of the interaction' frequency between source and recipient clubs
(5) The structure of the network	(5) Environmental analysis in which the transfer is made (the League) using the network analysis	A context in which occurred many transfers is inclined to the knowledge transfer. Thus, the morphology of the network influences the effectiveness of the transfer

Table II.
KT Variables transposed by Nakauchi *et al.* (2017)

operation and performance improvement of knowledge-intensive organizations? Collected data were analyzed using bivariate linear regression analysis, adopted for studying cause and effect relationships between variables. Additionally, we employed network analysis to investigate the structure of the network.

4.1 The empirical analysis of the four primary variables transposed on Nakauchi et al.'s framework

The results of the first step of our analysis provided some interesting results (see Table IV). We correlated the striker's performance before and after the transfer process, filtering the sample through the factors identified through the framework of Nakauchi *et al.* (2017).

Analyzing the value of Pearson's coefficient (r), we found that skill transferability increased when a striker's economic value was high. The economic value of a player can serve as an estimate of his characteristics and skills. Players with a higher value are those who have demonstrated better performances in their careers. Additionally, skill transferability increased when the striker's transfer took place between clubs with high economic values. This means that both the recipient and source clubs can invest greater economic resources into the development of skills. In the light of the previous results, skill transferability increased when the transfer took place between clubs that had stable and continuous links. However, this aspect was better explored in the environmental analysis, using Nakauchi *et al.'s* (2017) fifth factor.

4.2 The environmental analysis using the structure of the network

To carry out an analysis of the environment in which the professional football players' transfers were made, we applied a network analysis aligning the results to the fifth factor

Originals variables	Median value
1. Striker's economic value	8.000.000 €
2. The economic value of the recipient professional football club	4.195.000 €
3. The economic value of the source professional football club	2.405.000 €
4. The number of transfers made between the two clubs	2 transfers

Table III.
KT Variables' Median value

	R	R^2	SD
Striker's economic value			
less than 8,000,000 euro	0.229	0.063	0.135
greater than 8,000,000 euro	0.437	0.251	0.197
The economic value of the recipient professional football club			
less than 4,195,000 euro	0.116	0.017	0.130
greater than 4,195,000 euro	0.548	0.338	0.213
The economic value of the source professional football club			
less than 2,405,000 euro	0.129	0.020	0.124
greater than 2,405,000 euro	0.539	0.306	0.215
The number of transfers made between the two clubs			
less than 2	0.426	0.266	0.194
greater than 2	0.511	0.140	0.150

Table IV.
Bivariate linear regression analysis result

identified in Nakauchi *et al.*'s (2017) framework: the structure of the network. This step is essential to complete the previous empirical analysis proposing strong evidence to support certain factors and determinants of knowledge translation contributing to the successful operation and performance improvement of KIOs. Thus, we examined the main indicators of a network analysis derived in the UCINET software package, beginning with the construction of a dichotomized matrix (see Table V) with a cut-off value of ≤1. We took the overlaps in professional football players' transfers among clubs as data to show if KT and KT factors were confirmed.

To discover the characteristics of the network as stated by Nakauchi *et al.* (2017) in our sample and field of application (the football industry), we firstly built a network graph (Figure 1) of relations among professional football players' transfers among the "Big Five" leagues illustrated with a matrix and network graph with the name of the country in which the league is run.

Following Nakauchi *et al.*'s (2017) framework, we defined the characteristics of our network and identified a high degree of density in relations supporting the analysis (Density = 0.90). The high network density as an indicator of social cohesion allows us to recognize that the highly technical knowledge owned by professional football players determines a highly dense network of communication facilitating knowledge translation. Thus, we confirmed the nature of the knowledge translation and knowledge flow from source organizations to recipient organizations using the structure of the network analysis. Additionally, a summary of main network indicators (i.e. average degree, fragmentation, breadth, compactness), given in Table VI, showed a deep alignment with the density indicator and confirmed the high level of network cohesion (compactness = 0.950, fragmentation = 0.000, breadth = 0.050).

5. Discussion

Our research showed Nakauchi *et al.*'s (2017) framework to be valid in its application to the transfer market for professional football players. Professional football clubs acquire players on the market and at the same time acquire their specialist knowledge. From this perspective, our empirical evidence demonstrated that the quality of KT (i.e. a positive variation in a player's performance) was directly connected to the following factors and determinants: (1) the knowledge transferred in terms of quality (measured by the economic value of professional football players); (2) the recipient organization's quality (measured by the economic value of the recipient club); (3) the source organizations' quality (measured by the economic value of the source club); (4) the quality of the relationship between the source and recipient organizations (the number of connections between the source and recipient clubs); and (5) the quality of the environmental context (the density of the relationships among the big five leagues).

Additionally, our analysis demonstrates the translation of the qualitative factors given by Nakauchi *et al.* (2017) into quantitative variables using metrics and statistics models and thereby contributing to the existing literature on KT (Argote and Fahrenkopf, 2016; Graham

Table V.
Entering dichotomized matrix

	Italy	France	Spain	England	Germany
Italy	0	1	1	1	0
France	1	0	1	1	1
Spain	1	1	0	1	1
England	1	1	1	0	1
Germany	0	1	1	1	0

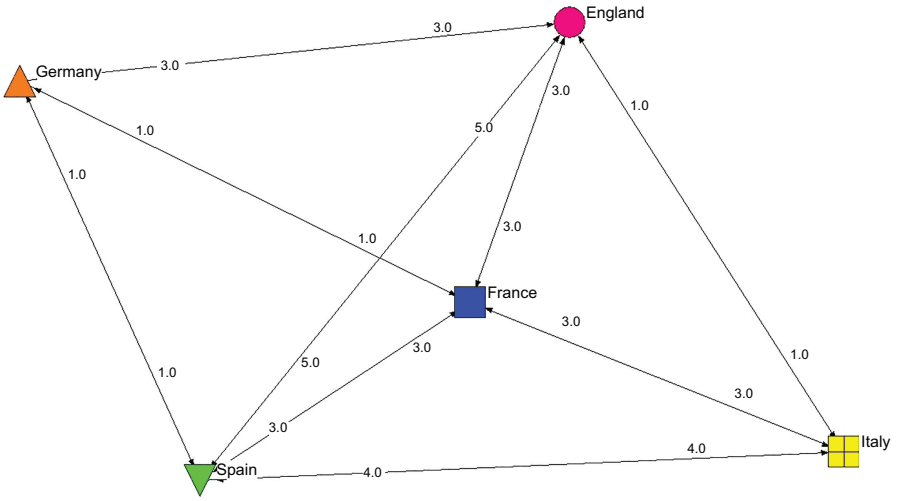


Figure 1.
Netgraph of our sample

Indicators	Values
Average Degree	3.600
H-Index	3.000
Average Distance	1.100
Connectedness	1.000
Fragmentation	0.000
Closure	0.875
Diameter	2.000
Breadth	0.050
Compactness	0.950

Table VI.
Main network indicators

et al., 2006; Seaton, 2002). Our original factors, confirmed through our analyses, will be of use to future researchers seeking to identify new factors of KT. To our knowledge, this study is the first time in the KT field that the qualitative definition of the object (e.g. knowledge itself) and subjects (e.g. recipient and source organizations) has been measured with economic value (EV) determinations following the chain of knowledge translation. This indicates that the framework of Nakauchi *et al.* (2017) could be applied to other contexts in which it is possible to determine the EV of the transferred knowledge and of the individuals or organizations fostering the transfer of knowledge. We also used a network analysis to investigate the context in which knowledge is transferred.

Our results indicate that some factors were more relevant than others in the transfer of knowledge involved in the professional football players' transfer market. We found that factors (2) recipient quality, (3) source quality and (4) their relationship were more relevant than (1) the knowledge being transferred. This result seems to oppose the intuition that the success of professional football players' transfers highly depend on their quality. Using the revised factors from Nakauchi *et al.*'s (2017) framework, we justified previous assumptions. If knowledge translation is taken as the performance variation before and after the worker transfers, our study indicates that its performance is influenced by the quality of the recipient organization (the impact on performance after transfer), the source organization (the impact on performance before transfer) and their relationship.

6. Conclusions and future research

This paper presents a quantitative analysis analyzed using Nakauchi *et al.'s* (2017) framework to understand the factors affecting the transferability of professional football players' capabilities and performance. We answer this question: *What are the factors and determinants of knowledge translation contributing to the successful operation and performance improvement of knowledge-intensive organizations?* The results of the analysis provide theoretical and practical contributions to scholars and practitioners.

Interestingly, it is fundamental to investigate the knowledge translation process in the context of football industry. The professional football clubs are cultural enterprises and KIOs (Secundo *et al.*, 2017a; Trequattrini *et al.*, 2017a). Their value-creation process is based on the interaction of their knowledge assets (e.g. professional football players as human capital; club branding as image, reputation, and relational capital; information and communication technology as structural capital). In this way, objectives by professional football clubs are achieved combining efficiently such resources. Football players represent the human capital in such enterprise (Tomé *et al.*, 2014) and the factor that mainly affects the final result.

The academic community, practitioners and policymakers will be interested in our results as practical advances supporting KT (Argote and Guo, 2016; Chen *et al.*, 2014; Ingram, 2002; Gil and Carrillo, 2016; Van Wijk *et al.*, 2008) and knowledge translation issues and theories. Particularly, we showed that knowledge translation by a particular kind of knowledge worker (professional football players) from source organizations to recipient organizations was assured by the following factors and determinants, thus contributing to the extension of existing theories (Simeone *et al.*, 2017; Trequattrini *et al.*, 2017a): (1) the knowledge workers' economic value; (2) the economic value of the recipient organization; (3) the economic value of the source organization; and (4) the number of transfers made between the source and recipient organizations.

Previous factors were confirmed by our analysis under the condition of a higher than median value. Additionally, the structure of the network (5) was confirmed as a further factor supporting KT and knowledge translation, showing that the technical knowledge owned by knowledge workers reflected a dense network of communication that facilitated KT (Nakauchi *et al.*, 2017). Thus, we confirmed previous factors supporting the KT in KIOs.

We confirm the assumptions that the process of creating new knowledge in specific organizational contexts relates to sustaining organizations' competitiveness and collaborations with the wider environment (Jones and Mahon, 2018), especially for KIOs (Krylova *et al.*, 2016; Lönnqvist and Laihonen, 2017; Nurmi, 1998). While our study highlights the need for the coexistence of combinations of factors to achieve the transferability of professional football players' capabilities and performances, a limitation of the paper is the data being limited to two seasons of European competitions and to players listed as playing in forward roles. Future research is recommended to analyze and compare additional football seasons in different leagues and to examine players with different on-field roles.

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