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The Effects of Organizational Absorptive Capacity, Professional Experience and Training over the Use of Sales Force Automation

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ABSTRACT

This research brings out the impact of training and professional experience on organizational absorptive capacity and the use of Sales Force Automation (SFA). A quantitative study was conducted on a sample of 186 medical sales representatives who work in the pharmaceutical industry. The method of structural equations based on the PLS approach and linear regression have been deployed for data analysis. The results reveal a positive impact of the training over organizational absorptive capacity (potential absorptive capacity and realized absorptive capacity) and the use of SFA as well as a positive impact of professional experience on organizational absorptive capacity. Furthermore, the organizational absorptive capacity has a positive influence on the use of the SFA. This study contributes to the literature on SFA use by examining the role of training, professional experience, realized and potential absorptive capacities in the SFA use. This research is appropriate for managers of pharmaceutical companies who constantly seek to improve the use of SFA technologies. Thus, the staff of these companies is more likely to perform their duties in a way that promotes their realized and potential absorptive capacities and the best use of SFA through continuous training for inexperienced and experienced salespeople.

Keywords: SFA use, organizational absorptive capacity, training, professional experience, potential absorptive capacity, realized absorptive capacity, North Africa

1. Introduction

In an increasingly competitive market, the introduction of information and communication technologies (ICT) into business enterprises have made Sales Force Automation (SFA) systems fatal business devices, in which organizations regularly invest despite the high cost of implementation (Román and Rodríguez, 2015 ; Sanakulov, Kalliomaa and Karjaluoto, 2018).

Sales Force Automation is part of Customer Relationship Management (CRM) systems and consists of supplying sellers with management tools to assist them in their prospecting procedures. It also helps companies to collect, manage, store and share knowledge to develop a lasting relationship with customers (Boujena and Merunka, 2008; Upadhyay et al., 2018).

Companies acquire immense human and financial resources to equip their sales forces with information technology (Román and Rodríguez, 2015). Yet, Sleep et al. (2020) and Sanakulov, Kalliomaa and Karjaluoto (2018) argue that increased use of SFA systems does not continually lead to increased productivity and work efficiency. In fact, both Gartner and Standish Group claim that 75% of SFA projects fail (Bernoux and Gagnon, 2008). According to these Groups, there are several difficulties

encountered when implementing a Sales Force Automation solution: resistance to change, the quality of use of the SFA and the difficulty in benefits provided by such a solution. As a result, the deployment of the SFA is a difficult and complex task that must be taken seriously. It is, then, necessary to understand why some organizations manage to use SFA tools and why others fail (Sanakulov, Kalliomaa and Karjaluoto, 2018).

The current hypothesis reveals that the failures of the SFA systems that endure arise from the fact that organizational changes are considered with a deterministic approach to technology. This is a recurring debate that has drawn the attention of researchers by opposing two types of determinism: technological determinism and organizational determinism. Technological determinism considers that technology has an impact on organizations insofar as it contributes to improving the efficiency of organizations and organizational mechanisms. Indeed, if the technology is properly implemented, it will impose itself intrinsically on the organization and on the stakeholders. Organizational determinism, on the other hand, stipulates that the diffusion of technologies depends on the characteristics of the organizations in which they are used and that the characteristics of the organization appear as a constraint to the introduced technologies (Leonardi and Jackson,2004).

The majority of research on SFA systems is based on the deterministic approach (technological and organizational) and focuses on three key themes: SFA adoption by the sales forces (Larpsiri and Speece, 2004;Sinisalo, Karjaluoto and Saraniemi, 2015; Sanakulov, Kalliomaa and Karjaluoto, 2018), SFA impact on the organization (Sinisalo, Karjaluoto and Saraniemi, 2015; Román and Rodríguez, 2015; Wang et al., 2017) and the determinants of adoption and use of SFA (Sinisalo, Karjaluoto and Saraniemi, 2015; Cascio, Mariadoss and Mouri, 2010 ; Upadhyay et al., 2018). These works have been based on the deterministic approach that focuses on explaining individual reactions and behaviors with the implementation of a new technology as well as its impact on the organization. On the one hand, this approach has focused on enumerating the determinants of the acceptance and adoption of the SFA among the actors of the organization, more precisely the sellers and this is according to a linear diagram which is mainly inspired by acceptance models (TAM1, TAM2) (Davis, 1989). On the other hand, it has focused on the study of the positive (productivity, creativity, efficiency) (Cascio, Mariadoss and Mouri, 2010, Wang et al., 2017) or negative implications of the SFA on employers and employees (Sinisalo, Karjaluoto and Saraniemi, 2015).

However, despite the difference in their results, these research works, which have been based on the deterministic approach, had one thing in common: the analytical approach adopted was of a causal type; that means it attempts to establish a link between the antecedents or the consequences of adopting the SFA. The technological determinism adopted by the majority of research works on SFA systems (e.g. Sinisalo, Karjaluoto and Saraniemi, 2015; Román and Rodríguez, 2015 ; Wang et al., 2017) has been well criticized for not calling into question the relevance of the factors of success.

Thereby, the understanding of the logic of using the SFA thus requires to break with the technological deterministic approach and to adopt organizational determinism which considers that human actors and the organizational context are taken into account (Barley 1990; Orlikowski, 1992) and the relational approach by integrating the Knowledge Management (KM) more particularly organizational absorptive capacity which involves the incorporation, retention and distribution of knowledge (Cohen and Levinthal, 1990).

As an alternative to this deterministic approach, the relational approach based on knowledge management aims to focus on the link rather than people and makes it possible to understand how employees interpret and share knowledge. It assumes that people act in relation to each other and that individual autonomy can only be relative. It emphasizes interaction, communication, relationships and knowledge sharing among staff members to succeed in using technologies. (Stadler, Fullagar and Reid, 2014)

In this research, we are simultaneously in the organizational determinism approach and in the relational approach based on knowledge management. In fact, organizations invest considerable sums to acquire a Sales Force Automation system, but they do not properly use their systems to gain customer knowledge. Indeed, Khodakarami and Lahouti (2013) stated that SFAs are generally underexploited, especially with regard to creating customer knowledge. External knowledge has become a primary source of competitive advantage. To ensure their sustainability, organizations must « recognize the value of new, external information, assimilate it, and apply it to commercial ends" (Cohen et Levinthal, 1990, p.128), namely the organizational absorption capacity. According to Chaudhary (2019, p.3) "An organization's absorptive capacity is not resident in any single individual, but depends on the link across a mosaic of individual capabilities", it requires organizational factors such as training and professional experience to help make individual knowledge more understandable.

The choice of this topic is primarily justified, first, despite the importance of the use of technology in sales jobs;empirical research on the use of SFA is quite limited (Sanakulov, Kalliomaa and Karjaluoto, 2018). The SFA use and organizational absorptive capacity are two considerable areas, but their links remain insufficiently dealt with at the academic level. Organizational absorptive capacity has largely fascinated knowledge management researchers (Wu et al., 2019), but not sales force automation research. Second, the majority of early research uses absorptive capacity as an unidimensional concept (e.g. Cohen and Levinthal, 1990), while recent research examines its sub-dimensions, potential and realized absorptive capacities (Ahmed et al., 2019 ; Chaudhary, 2019 ; Muraliraj et al., 2019). However, as far as it is known, there is no research that examined the relationship between organizational absorptive capacity and SFA use through potential absorptive capacity and realized absorptive capacity. Third, the results are different in the effects of training on information and communication technologies (ICT) use. In fact, in the area of SFA use, training is accepted as an important driver of successful SFA use (e.g. Singh, Manrai and Manrai, 2015; Jantan and Honeycutt, 2013 ; Kodwani and Prashar, 2019).

Other researchers such as Salopek (2009) have observed that many salespeople find training ineffective or less useful for a better use of technology. Fourth, professional experience has received little attention in ICT research specifically SFA systems. In doing so, we fill an important gap in the literature by examining the antecedents of SFA use in pharmaceutical firms which are non-R&D-intensive service firms.

Tunisia is a particularly interesting example of developing countries in North Africa. The use of SFA in developing countries is comparatively lower than in most developed countries (Román and Rodríguez, 2015). This research is particularly necessary in a context of African developing countries such as Tunisia, where companies in the pharmaceutical sector adopt less ICT than companies from developed Western countries.

This article focuses on the use of SFA to the detriment of the largely dominant concepts of adoption and acceptance in previous research works (Cascio et al., 2010, Wang et al., 2017), and its relation with the organizational absorptive capacity and its determinants such as training and professional experience. Thus, this research tries to answer this question: To what extent do training, professional experience and organizational absorptive capacity influence the use of the SFA? This study examines the role of training and professional experience on potential and realized absorptive capacity and on SFA use. In addition, this study also investigates the direct impact of each dimension of organizational absorptive capacity on SFA use.

Section 2 of this article presents a cross-referencing of previous research on the use of the SFA in light of the organizational deterministic approach and relational approach based on knowledge management. Then, it explains the hypotheses and the conceptual model. Section 3 develops the research methodology. Section 4 presents the analysis of the data while the discussion appears in sections 5. Section 6 presents the conclusion by highlighting the theoretical and managerial contributions, the limitations of the study and possible directions for future research.

2. Theoretical background

2.1 The use of the SFA in the light of the organizational deterministic approach

The concept of Sales Force Automation has been conceptualized by Lambin and De Moerloose (2012) as an effective solution to optimize salespersons' activities with their customers. It is often adopted by businesses to improve customer service, better guide salespeople, improve sales force productivity, and ensure the best sales management decisions.

Baker and Delpechitre (2013, p.278) presented SFA as “computer software and relational database technologies created to support sales activities in the field”. Sinisalo, Karjaluoto and Saraniemi (2015) state that SFA is therefore part of a company's CRM (Customer Relationship Management) and is

generally the first function (the others being marketing and customer service) that is automated using CRM technology. Jelinek (2013, p.637) has defined it as "the set of technological tools making it possible to better equip a sales and marketing organization to practice CRM". Sleep et al. (2020) have defined SFA as a technological tool that helps organizations manage the sales function by collecting and storing customer data such as demographic data, purchase history, needs and wishes, etc.

Although SFA has been defined in various ways, the common thread of all these definitions is that the application of SFA technology helps to support the sales function thus enabling better execution of sales tasks in an organization (Upadhyay et al., 2018).

Research that focuses on the use of the SFA in the light of the organizational deterministic approach, states that the SFA use depends on the characteristics of the organizations. In this context, Serdagolu (2009) shows that there are relations between the use of the SFA and its antecedents. This is inspired by the value chain and the model of acceptance of the technology (Davis, 1989). Serdaroglu (2009) identified determinants that affect the use of SFA: perceived usefulness, perceived ease of use, supervisor support, enabling conditions, computer system self-efficiency, use of the SFA team and control of SFA technology from supervisors. He presents the use of the SFA as a two-dimensional concept: the SFA is a customer relationship management tool and an internal coordination tool for teams within the organization. The first dimension includes processes such as managing business contacts as well as understanding customer needs, organizing activities such as scheduling sales' calls,preparation for the a visit, presentation of sales pitch while overcoming objections and continuing to serve the customer after the sale (Widmier et al, 2005). The second dimension allows internal coordination between the members of the company in relation to the management of information concerning the sales activities of the team and the training to be provided. In this way, the sales persons exchange information daily with each other while communicating the results of their activities to their management.

Central elements of SFA acceptance can be grouped into three categories, namely: organizational factors (training, managers' commitment), individual factors (personality traits, age, attitude and professional experience) and social factors (the role of social norms, peer usage). In this sense, Upadhyay et al. (2018) enumerated the direct and indirect influencers of use of sales technology, they claimed that attitude and peer usage have a direct effect on the use of sales technology. Pullig, Maxham and Hair (2002) showed that managers' commitment to the use of SFA tools is the key to a successful organizational change and that training helps sales persons to better understand the operation and use of SFA. Keillor, Bashaw and Pettijohn (1997) have demonstrated that age and professional experience can influence the process of accepting and using SFA tools.

2.2 The use of the SFA in the light of the relational approach based on knowledge management

Research that focuses on the use of the SFA in the light of the relational approach based on knowledge

management states that there is a close relationship between CRM and knowledge management, this relationship is materialized through the transfer of knowledge, held by sellers, to other stakeholders in the company and to customers (Boujena and Merunka, 2008). Thus, the transverse system of the CRM type is dedicated to sellers to facilitate the accumulation, processing and sharing of customer knowledge, both tacit and explicit.

Migdadi (2020) states that knowledge management enables successful CRM of which SFA is a part since CRM processes are based on large amounts of knowledge to identify and track customers and then satisfy and retain them. Thus, companies would have to develop CKM (Customer Knowledge Management) capacities to properly manage the knowledge coming from customers. Customer knowledge will be a valuable and scarce asset for these companies to adapt to rapidly changing customer needs. In the same way, Tseng (2016, p.204) asserts that "knowledge management the objective of which is the acquisition, dissemination and use of knowledge will be the cornerstone for the successful use of a CRM, since it allows the organization to have a global view of customers".

According to Chua and Banerjee (2013, p.614), the continuous evolution of customer needs and has led to a paradigm shift in knowledge management towards a dynamic customer-centered approach. He claimed that "CKM (customer Knowledge Management) enables to positively affect CRM practices by facilitating the acquisition and continuous updating of knowledge on customer needs, motivations and behavior, as well as the application of this knowledge to improve CRM practices". Tseng (2016, p.205) asserts that "companies rely on good knowledge management to improve CRM practices through a better understanding of customer needs by providing personalized information and increasing interaction between companies and their customers". Hasanian, Chong and Gan, (2015) also indicated that customer relations cannot take place without knowledge management since CRM processes are based on large amounts of knowledge. Knowledge management facilitates the sharing, creation and storage of knowledge thus it promotes the functioning of CRM.

There is very little research, as far as it is known, that addresses the relationship between SFA and KM but since SFA is part of CRM, we assume that there is a relationship between the SFA and KM. The capacities in terms of knowledge management are important pre-requisites in the implementation of an SFA. To be effective and productive, the SFA must have both explicit and tacit knowledge at the same time in order to be properly managed by the sellers. As far as it is known, only the research by Hunter and Perreault Jr. (2007) have examined the notion of using the SFA by relying on the theory of organizational learning and knowledge management. They defined the concept of using the SFA in three dimensions: access to information, its analysis and its communication. Access to information provides details on the possibility available to the sales force to obtain information related to the accomplishment of its sales work and the complaints related to it. Information analysis is translated into the ability of the sales force to synthesize information. As for the communication of information, it reflects the ability of sellers to

share information between contributors.

2.3 Research Framework and Hypotheses

2.3.1 Effects of Training and Professional Experience on Organizational Absorptive Capacity and the Use of SFA

Muraliraj et al. (2019) asserted that companies must foster organizational absorptive capacities to cope with the turbulence of the business world and to survive in dynamic environments. Cohen and Levinthal (1990, p.130) were the first authors to develop the notion of absorptive capacity. They defined it as "the aptitude of a firm to recognize the value of new information, to assimilate and to apply it for commercial purposes". Three dimensions can be retained: the valorization of external knowledge, its assimilation and its application for commercial purposes. Zahra and George (2002) used this definition to describe organizational absorptive capacity as a dynamic capacity and multidimensional construct, and they defined it as a “set of organizational routines through which firms acquire, assimilate, transform and exploit knowledge to produce a dynamic organizational capability” (Zahra and George, 2002, p. 186). They propose four dimensions that are grouped into two categories, namely the potential absorptive capacity (PACAP: the ability of the company not only to acquire external knowledge but also to assimilate it) and the realized absorptive capacity (RACAP: the organization's capacity to transform and exploit knowledge). According to Albort-Morant et al. (2018), PACAP and RACAP are distinct capabilities that need to be managed separately because they allow differential outcomes to gain competitive advantage.

Ahmed et al. (2019) state that the majority of research examining organizational absorptive capacity has taken it as an unidimensional concept, regardless of the differences between realized and potential absorptive capacity. Questioning the determinants of absorptive capacity without differentiating between its types can be risky and even misleading. In addition, research on the relationship between three concepts training, organizational absorptive capacity and SFA use is scarce.

Murovec and Prodan (2009) consider that training is a determining variable that affects the use of the SFA. Sellers' training is subject to ongoing development and learning programs that provide sellers with the skills andknowledge they need. Chen and Huang (2009) show that human resource management practices (such as training) are positively related to knowledge managment.

Kodwani and Prashar (2019) state that the existing literature on training states that it remains a major concern for managers. Singh, Manrai and Manrai (2015) advocated the need for empirical work which explores the relationship between training and SFA use given the importance of the effectiveness of sales training. Thus, training is also an important factor in the development of sales work while using information technologies according to Cron et al. (2005). Indeed, sellers attend courses to improve their skills, and this is done through online training sessions. Cron et al. (2005) show that training contributes to the improvement of the use of SFA.

Kodwani and Prashar (2019) state that effective sales training improves knowledge and skill levels of sales managers. As a result, organizations invest immensely in terms of time, resources and effort to train their sales executives for better SFA use.

Thus, the hypotheses H1, H2, H2.1 and H2.2 are presented as follows:

H1. Training has a positive influence on organizational absorptive capacity.

H2. The training positively influences the use of SFA.

H2.1. The training positively influences the use of the SFA as a customer relationship management tool.

H2.2. The training positively influences the use of the SFA as a tool for internal coordination among stakeholders.

Few researches deal with professional experience and even with the relationship between professional experience and SFA use. As far as it is known, two little bit old studies have dealt with this relationship. Keillor, Bashaw and Pettijohn (1997) examined the relationship between sellers' work experience and their perception of technology. They found that less experienced salespeople are more resistant to the use of technology. Deng, Doll and Cao (2008) state that internal factors can influence knowledge management, which are the category of study, the type of position held in the company, as well as the professional experience within the company. Thus the hypotheses H3, H4, H4.1 and H4.2 are presented:

H3. Professional experience positively influences organizational absorptive capacity.

H4. Professional experience positively influences the use of SFA.

H4.1. Professional experience positively influences the use of the SFA as a customer relationship management tool.

H4.2. Professional experience positively influences the use of the SFA as a tool for internal coordination among stakeholders.

2.3.2 Effects of Absorptive Capacity on the Use of SFA

Cohen and Levinthal (1990) suggest that a firm with a large absorptive capacity makes the use of technology more attractive through the organization's contributors. Zahra and George (2002) made a reconceptualization of the organizational absorptive capacity different from that of Cohen and Levinthal (1990) by identifying two dimensions, namely the potential absorption capacity and the realized absorption capacity.

The Potential absorptive capacity is related to exploratory learning or the acquisition of external knowledge. It is the ability to assess the interest of external knowledge (Chaudhary, 2019); it is made up of knowledge acquisition and assimilation capacities. According to Ahmed et al. (2019), knowledge acquisition is the ability of companies to recognize and obtain important information from external sources for the proper functioning of the organization. Knowledge assimilation is the company's ability to interpret and process the knowledge obtained. Chaudhary and Batra (2018) claim that once organizations acquire potential absorptive capacity, this latter positively affects the use of ICTs.

The Realized absorptive capacity is defined as the organizational capacity to transform and exploit knowledge.

Knowledge transformation is defined as "firm's ability to develop and refine routines that facilitate combining existing knowledge" (Zahra and George, 2002, p.187) with new external knowledge. According to Chaudhary (2019), transformation supports companies to combine external knowledge with existing knowledge in order to properly use technologies. Finally, the exploitation of knowledge is based on the application and implementation of acquired, assimilated and transformed knowledge (Ahmed et al., 2019), thus linking them to positive uses of technologies (Xie, Zou and Qi, 2018).

Hence, the following hypotheses: H5, H5.1 and H5.2.

H5. Organizational absorptive capacity positively influences the use of SFA.

H5.1 Organizational absorptive capacity positively influences the use of the SFA as a customer relationship management tool.

H5.2 Organizational absorptive capacity positively influences the use of the SFA as an internal coordination tool among stakeholders.

Figure 1 shows the assumptions and presents the research model.

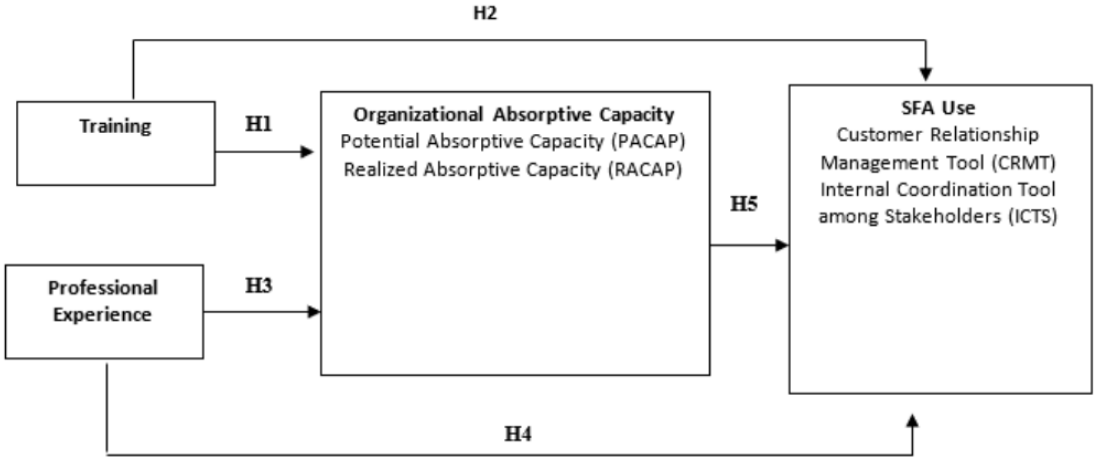

Figure 1: Research model

3. Methodology

3.1 Sample and data collection

The data collection has lasted six months during which the authors used a questionnaire handed directly to respondents or sent electronically by email. The authors chose the sample based on the "snowball" method to select medical sales representatives working in companies operating in the pharmaceutical sector and located in Tunisia. Tunisia is a country in North Africa located on the Mediterranean coast.

The choice of the pharmaceutical sector is justified by the fact that SFA system facilitates the working tasks of the medical sales representatives during their visits to pharmacies for example. This is why it is essential for the

medical sales representatives to have a simple and intuitive tool that facilitates commercial activity.

The sample is made up of 186 medical sales representatives, 84 men and 102 women, aged between 36 and 45 years old. The choice of medical sales representatives is justified by the paramount role of the medical visitor in the pharmaceutical industry, which has a primary responsibility at the level information.

We chose the snowball sampling method, because we evaluate the target population, namely medical representatives, who are a bit special and geographically dispersed over Tunisia. In addition, we believe that the number of medical representatives in Tunisia is low. Around 4000 medical representatives are available throughout the national territory in January 2019 (http://recruter.tn/delegue-medical-un-metier-difficile-mais valorisant. 2020.10.20)

3.2 Measurement instruments

All variables were measured using a Likert scale ranging from 1 (strongly disagree) to 1 (strongly agree). Table 1 shows the measurement scales.

3.3 Validation of measurement instruments

The exploratory factor analysis using the SPSS 18.0 software has allowed the refinement of the measurement scales. An exploratory factor analysis, the type of which is principal component analysis and Cronbach's alpha reliability analysis are deployed to test factor saturation. Table 1 details the principal component analysis of each dimension and presents the results of these analyses and proves that the Kaiser-Meyer-Olkin (KMO) measurements indicate the relevance of the factor solution for all the dimensions obtained. In addition, the Barlett specificity test is significant (P = 0.000) for all dimensions, which confirms the existence of a non-zero inter-item matrix. In addition, the quality of representation of the indicators is good since they have values higher than or equal to 0.5. Finally, the Alpha Index values are considered satisfactory and acceptable since they are above the minimum threshold of 0.6. These results prove that the reliability of the dimensions is checked.

Table 1 shows the results of the exploratory factor analysis.

Table 1: Results of exploratory studies

Items	Factors	Eigenvalue
The Training (Chen and Huang, 2009)(KMO=0.648; =0.768)		
TR_1: Availability of formal training activities (i.e. after a degree/ a diploma).	0.602	
TR_2: Availability of training policies and global training programs (a training program covering several aspects, e.g. pharmaceuticals, languages, negotiation techniques, etc.).	0.632	3.380
TR_3: Availability of training for newly hired personnel.	0.703	
TR_4: Availability of training for developing problem solving skills.	0.637	
The Organizational Absorptive Capacity (Flatten et al, 2011)		
Potential Absorptive Capacity (PACAP) (KMO=0.648; =0.768)		
Acquisition		
ACQU_1: To look for relevant information about our industry is an everyday matter in our business.	0.872	
ACQU_2: Our management system encourages employees to use sources of information related to our sector.	0.861	
ACQU_3: Our management system expects employees to process information that are not part of our sector (outside the sector).	0.794	2.234
Assimilation		
ASS_1: In our company, ideas and concepts are communicated in between departments.	0.658	
ASS_2: Our management system emphasizes interdepartmental support for problem solving.	0.762	
ASS_3: In our company, there is a fast information flow (that is, if aservice obtains important information, it quickly communicates it to all the other services or departments).	0.871	3.345

ASS_4:Our management system periodically requires interdepartmental meetings to exchange new developments, issues and achievements	0.734	
Realized Absorptive Capacity (RACAP) (KMO=0.516 ; =0.842)		
Transformation		
TRAN_1: Our employees are able to structure and use the collected knowledge.	0.855	
TRAN_2: Our employees are used to assimilating new acquaintances as well as preparing them for other purposes and making them available.	0.777	
TRAN_3: Our employees succeed in linking existing knowledge with new corporate inspirations.	0.803	6.634
TRAN_4: Our employees are able to apply the newly acquired knowledge in their practical work.	0.600	
Exploitation		
EXPL_1: Our management system supports the development of pharmaceutical laboratory projects.	0.807	
EXPL_2: Our laboratory takes technology into consideration and adapts it to new knowledge.	0.866	3.456
EXPL_3: Our laboratory is able to work more efficiently by adopting new technologies.	0.699	
***The use of SFA* (Serdagolu, 2009)**		
A customer relationship management tool (KMO=0.637, =0.748)		
CRMT_1: To serve customers in a more creative way (e.g. the use of computers by salespeople to improve problem-solving skills).	0.602	

CRMT_2: To improve the quality of service offered to prescribers.	0.609	6.456
CRMT_3: To identify the most profitable customers from the list of potential customers (prospects).	0.718	
CRMT_4: To plan sales activities (e.g. sales number, phone calls per day).	0.476	
An internal coordination tool among the stakeholders of the company		
(KMO=0.641, ? =0.820)		
ICTS_1:To receive information from my director (manager, supervisor)	0.637	3.345
ICTS_2: To provide information to my director (manager, supervisor)	0.74	
ICTS_3: To report travel expenses to the head office.	-	-
ICTS_4: To learn about our existing products and new products	0.582	
ICTS_5: To coordinate activities with members of my team.	0.719	

4. Results and analysis

Two statistical methods, namely the simple linear regression method and the structural equation method, were used to test the research model. On the one hand, the linear regression method aims to test the relationships between training, organizational absorptive capacity and use of the SFA. On the other hand, it aims to test the relationships between professional experience, the organizational absorptive capacity and the use of the SFA. Regarding the structural equations method, the authors chose the Partial Least Square (PLS) method to study the relationship between the organizational absorptive capacity and SFA use. This method is considered pertinent to this research since the conceptual model includes a formative construct, namely the use of the SFA.

4.1 Effects of Training on the Organizational Absorptive Capacity and the Use of the SFA

To test the hypotheses H1, H2.1 and H2.2, the simple linear regression method was used by applying the two tests: the "ANOVA" test which makes it possible to test the existence or the absence of the model and the tests of Student "t" that allow the study of the significance of the coefficients of the regression equation. The results obtained are shown in Table 2. We opted for linear regression since the training variable is a qualitative variable.According to Carricano and Poujol (2008), ANOVA consists in testing the effect of a qualitative variable, it is training in our study on a quantitative variable.

Table 2: Summary of the validation of assumptions about the effects of training on the organizational absorptive capacity and the use of the SFA.

Hypotheses	Indicators	Validation
H1. Training has a positive influence on organizational absorptive capacity.	β=0.916 p=0.000 t=32.078	Supported
H2.1. The training positively influences the use of the SFA as a customer relationship management tool.	β=0.337 p=0.000 t=4.859	Supported
H2.2. The training positively influences the use of the SFA as a tool for internal coordination among stakeholders.	β=0.249 p=0.000 t=3.490	Supported

4.2 Effects of professional experience on the organizational absorptive capacity and the use of SFA

To test hypotheses H3, H4.1 and H4.2, ANOVA tests (analysis of variance) were used. The results have showed a significant difference of risk at 5% for the organizational absorptive capacity. Indeed, the organizational absorptive capacity depends on experience. In addition, the average results show that medical sales representatives with 4 to 10 years of experience contribute more to organizational absorptive capacity. This age range has the highest and least dispersed average with a standard deviation of 0.8 (see Appendix 1). Hypothesis H3 is then accepted.

The results of the ANOVA Test revealed a non-significant difference for the use of SFA as an internal coordination tool between stakeholders and the use of SFA as a CRM tool. Indeed, Fisher's test is not significant for the variable "use of SFA as an internal coordination tool among stakeholders", i.e. $p = 0.341$ superior than 5% and the variable "use of SFA as customer relationship management tool", i.e. $p = 0.143$ superior than 5%. On the other hand, the variance-based average comparison test is not significant because the probability level is higher than 0.5 for both dimensions, namely the use of the SFA as a management tool of the customer relationship and the use of the SFA as an internal coordination tool among stakeholders (see Appendix 1). The results of the hypothesis test prove that hypothesis H4 is invalid since H4.1 and H4.2 are disproved.

4.3 Effects of the organizational absorptive capacity on the use of SFA.

The approach of Hair et al. (2014) was adopted to test the predictive validity of the relationship between the organizational absorptive capacity and use of the SFA. This approach involves two steps, namely the specification and validation of the measurement model and the specification and validation of the structural model.

Therefore, the structural model has two measurement models, namely the organizational absorptive capacity measurement model (a third-order reflexive construct) and the SFA use measurement model (a second-order formative construct). In order to evaluate the measurement model, several validation criteria, derived from the PLS method, are used. These criteria differ according to the nature of the construct. In this sense, for a reflective construct, the composite reliability (CR), the convergent validity [average variance extracted AVE (Average Variance Extracted)] and the discriminant validity [cross-correlation (cross loading) (Chin, Henseler and

Wang 2010) and criterion of Fornell-larker] are studied. Concerning the formative construct, the quality of the indexes at the level of the construct (the nomological validity and the content validity) and at the level of the indicator [significance of the weights: VIF (variance inflation factor)] are checked. The results from PLS prove that the validity of first-order reflective constructs, namely acquisition, assimilation, transformation and exploitation is acceptable. Given the internal coherence of the scales, the convergent validity and the discriminant validity are satisfactory.

The organizational absorptive capacity is a reflective first-order and reflexive second-order construct. The construct of potential absorptive capacity encompasses two dimensions, acquisition and assimilation. As for the realized absorptive capacity, this one includes two dimensions: transformation and exploitation. The authors have found that the construct of the potential and realized absorptive capacity has the following loadings: acquisition (0.34), assimilation (0.983), transformation (0.306), and exploitation (0.964). The authors have retained the two dimensions of acquisition and transformation, relying on Murovec and Prodan (2009). Despite the weakness of these two dimensions, the authors find that the composite reliability (CR) of the construct "the potential absorptive capacity" is 0.722, a value exceeding the theoretical threshold of 0.7 (Gefen, Straub and Boudreau, 2000). It is the same for the realized absorptive capacity where the composite reliability CR is 0.524.

The convergent validity of the potential absorptive capacity has been considered sufficient. Indeed, the AVE is 0.505, just above the threshold of 0.500 (Fornell and Larcker, 1981). It is the same for the realized absorptive capacity where the AVE is 0.524. Regarding the discriminant validity, the square validity of the AVEs of the latent constructs, namely the potential absorptive capacity and the realized absorptive capacity have values of 0.711 and 0.724 respectively. The value of Potential Absorptive Capacity (PACAP) is higher than its correlation with other non-diagonal variables. Similarly, the latent variable "realized absorptive capacity" proves that the square root of the AVE is higher than the value of the correlation with the other constructs (VAVE = 0.724) (see Appendix 1). Similarly, the results show that organizational absorptive capacity is a third-order reflective concept. Indeed, the realized absorptive capacity has a loading of 0.852 and the potential absorptive capacity has a loading of 0.819. In addition, the loadings have values above the threshold promoted by the literature, i.e. 0.5 (Chin, Henseler and Wang, 2010). The composite reliability (CR) of the construct organizational absorptive capacity is 0.630 so it is above the threshold of 0.6. Being 0.5011, the convergent validity of the organizational absorptive capacity is sufficient for the estimation of the AVE, since it is above 0.500 (Fornell and Larker, 1981). Concerning the discriminant validity, the results prove that the square roots of the AVEs of the latent construct "the organizational absorptive capacity" have a value of 0.600. This result indicates a value higher than the correlation of the organizational absorptive capacity (CAP) with the other variables that are off diagonal (see Appendix 1). Figure 2 explains the measurement model of third-order organizational absorptive capacity.

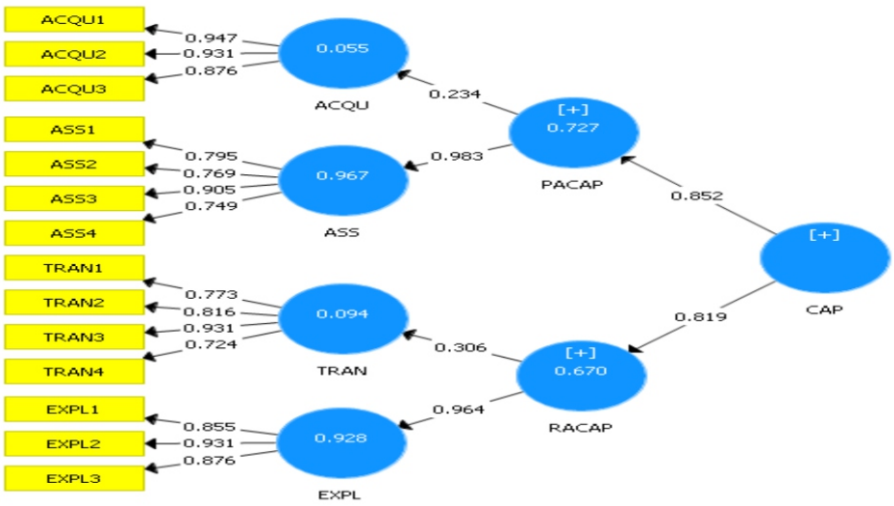

Figure 2: The measurement model of third-order organizational absorptive capacity

Concerning the concept of the use of the SFA, it is a second-order formative concept (Serdagolu, 2009). Table 3 presents the results of the first-order formative constructs, namely the use of the SFA as a customer relationship management tool and as a tool for internal coordination among stakeholders.

Table 3: Results of confirmatory analysis of first-order formative constructs: the use of SFA as a customer relationship management tool and as a tool for internal coordination among stakeholders.

latent variables	indicators	VIF	weight	t-test
Customer Relationship Management Tool (CRMT)	CRMT1	1.563	0.211	4.530
	CRMT2	1.569	0.251	4.190
	CRMT3	1.838	0.981	17.843
	CRMT4	1.516	0.300	3.427
Internal Coordination Tool among Stakeholders (ICTS)	ICTS1	1.719	0.867	10.918
	ICTS2	2.867	0.716	4.992
	ICTS4	1.682	0.499	3.700
	ICTS5	3.098	0.221	4.094

It should be noted that there is no problem of multicollinearity since the VIF values are higher than 1 and lower than 10. In addition, the results show that all weights have higher order values than 0.2 and therefore the contribution of each formative indicator in the latent variance is satisfactory. To estimate the formative construct, it is necessary to ensure the external validity of the index (Lacroux, 2011). The value of the relationship between ICTS and CRMT did not exceed 0.5, it is not very strong and it could not reach 0.6 as indicated by Roussel, Durrieu and Campoy (2002) and therefore it will be sufficient to adopt a first-order structure and the use of SFA construct as an internal coordination tool among stakeholders and as a customer relationship management tool. The study of the structural model and the hypotheses of the research were carried out by evaluating the values of the coefficient of determination R2(explained variance), the structural coefficients and the statistics t. Indeed, R2 and structural coefficients indicate the strengths and meanings of relations, while tstatistics and errors indicate the power of the influence of the variable. Following an estimation by the Boostrap procedure (Gefen, Straub, and

Boudreau, 2000), the R2 values are higher than the minimum value recommended in the literature (0.19) (Chin, Henseler and Wang, 2010). In this sense, the R2 of the global model is 0.511, that is, the structural model has a satisfactory explanatory power of 51.1%

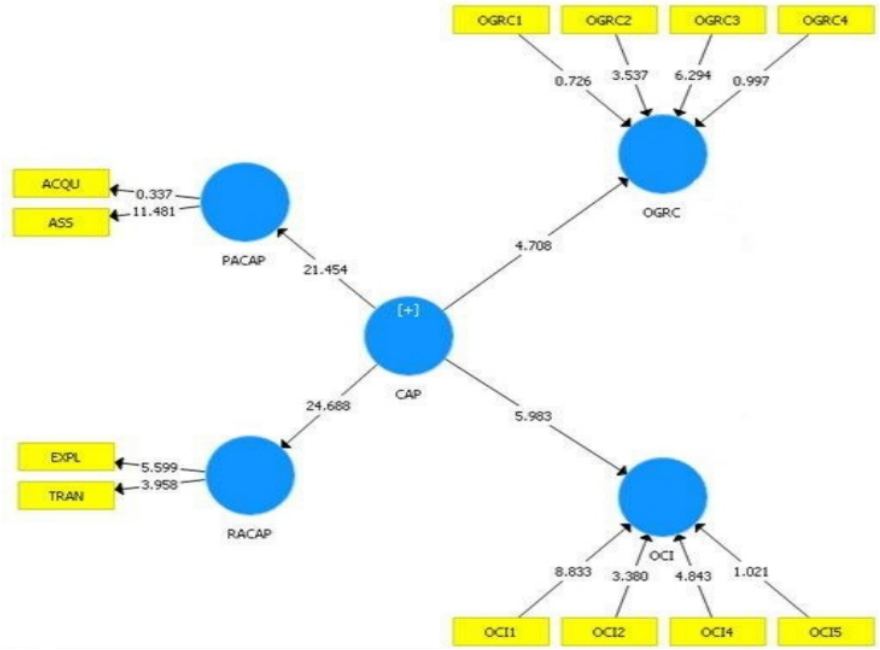

Figure 3: Structural model

Added to that, Stone-Geisser's Q2 fit index is analyzed (Geisser 1974, Stone 1974) to ensure the overall validity of the structural model. This indicator is used to assess the overall relevance of the model. The values of Q2 must be higher than or equal to zero. The Q2 indicator assesses the overall relevance of the model. Table 4presents the values of the explained variance of model of dependent variables as well as the Stone-Geisser Q2 calculation.

Table 4: The results for the explained variance R2 and Q2 of Stone-Geisser

Dimensions	R^2	sted R^2	Q^2(=1-SSE/SSO)
Customer Relationship Management Tool (CRMT)	0,417	0,416	0,130
Internal Coordination Tool among Stakeholders (ICTS)	0,352	0,351	0,048
Organizational Absorptive Capacity	0,423	0,422	-
Potential Absorptive Capacity (PACAP)	0,631	0,630	0,306
Realized Absorptive Capacity (RACAP)	0,713	0,712	0,338

On the one hand, the results of the direct relationships between, the organizational absorptive capacity, the use of the SFA as a customer relationship management tool (H5.1) and on the other hand, the organizational absorptive capacity and the use of the SFA as an internal coordination tool among stakeholders (H5.2) are shown in table 5.

Table 5: The significance of the structural coefficients

Hypotheses	Path coefficient	t-statistic	P-value	Signs
CAP _ICTS	0.564	5.983	0.000	+
CAP_CRMT	0.513	4.708	0.000	+

These results prove that all the structural coefficients are significant and positively valid for the tested hypotheses, and this is applicable for all the structural relations. Hypotheses H5, H5.1 and H5.2 are accepted.

5. Discussion

The first tested hypothesis states the positive influence of training on the organizational absorptive capacity. This result converges with the work of Prodan and Ostermann (2009), Murovec and Prodan (2009) and Ahmed et al. (2019), who support the idea that the strategic practices of human resources, the training of which,positively affects the ability of the company to acquire, assimilate, transform and exploit knowledge to produce a dynamic organizational capacity. This means that a well-trained workforce facilitates the identification and the interpretation of external knowledge, the combination of existing knowledge with external knowledge and the implementation of acquired, transformed and assimilated knowledge for a best SFA use.

The test of the second hypothesis, which defends the positive effect of the training on the use of the SFA, as an internal coordination tool among stakeholders and as a customer relationship management tool has been validated. This is proved by the improvement of salespeople's skills following their participation in the training sessions offered to them. This result joins the work of Ling and Nasurdin (2010), Cron et al. (2005) and Kodwani and Prashar (2019) who highlight the existence of a significant relationship between training and the use of SFA.Thus training has become an influential factor of SFA use, it motivates staff to learn and transfer their learning for the sake of using SFA system.

The third hypothesis postulating a positive impact of professional experience on organizational absorptive capacity was, unsurprisingly, confirmed. Indeed, the most experienced players are able to detect knowledge and exploit it for commercial purposes faster than others. This result is consistent with the work of Lane, koka and Pathak, (2006), who prove that experience has a positive effect on the organizational absorptive capacity. Thus the staff with a high degree of professional experience feel a sense of being committed to recognizing and obtaining knowledge from external sources, to interpret, incorporate and personalize it in the procedures and structures of the company.

The test of the fourth hypothesis proves that professional experience, negatively rather than positively, affects the use of the SFA as a customer relationship management tool and as a tool for internal coordination among stakeholders. The rejection of hypothesis H4.1 can be explained by the fact that, there is prior research (e.g. Abdolvand and Farzaneh, 2013; Johnson, Barksdale Jr. and Boles, 2001) which reveals that professional experience of salespeople does not positively impact the use of CRM (and thus SFA) applications. The reason for this is that experienced salespeople consider their contact list a personal asset and are resistant to turn it over to the organization. Normally, one of the drivers for an organization to implement an SFA system is to convert the Human Capital of the salespeople into Structural Capital of the organization, which leads to a loss of power of the experienced salesperson (Griffiths, 2011, p.186). Similarly, the rejection of hypothesis H4.2 can be explained by the fact, there is prior research (e.g. Poujol, 2009) that seems to support that there is always a tendency to consume

more than to contribute to a knowledge repository as is the case of an SFA system for lead management and internal coordination. Young inexperienced professionals see more value in these knowledge repositories while the experienced professionals feel that they 'do not need it' because they know their business and thus find an asymmetry: they contribute to the repository more than they get out of it. In order to get them to use the system and contribute to it, there needs to be some sort of external incentive (Griffiths, 2011, p.213).

Finally, the last hypothesis, which emphasizes that organizational absorptive capacity has a positive influence on the use of the SFA as a customer relationship management tool and as a tool for internal coordination among stakeholders, has also revealed the significance of the relationship. Indeed, this result goes hand in hand with the work of Cohen and Levinthal (1990) and Noblet and Simon (2010) who prove that a high level of absorptive capacity favors, at best, the exploitation of ICT tools by companies. In this sense, these authors argue that companies that have an ability to detect external knowledge to mobilize information technology better. This mobilization of technologies facilitates the communication between the players of the enterprise and contributes to the development of a durable relation with the customers. The result of this last hypothesis is consistent with the work of Zahra and George (2002) and Wu et al. (2019) who prove that the company that develops a great capacity for assimilation, acquisition, transformation and exploitation of knowledge will have greater capacity to use technologies. This result leads to the following conclusion: firms that have a high potential absorptive capacity, i.e. the ability of the enterprise to detect and absorb external knowledge using the processes deployed by the enterprise, and a significant realized absorptive capacity, that is, the ability to combine existing knowledge and new knowledge for transformation and exploitation; all these factors have a better ability to mobilize and use technological tools of SFA type.

6. Conclusion

This research shows that training and professional experience have a positive influence on the organizational absorptive capacity and the use of the SFA and that the organizational absorptive capacity in turn positively influences the use of the SFA.

On the theoretical level, this research simultaneously links the deterministic approach and the relational approach based on knowledge management, to study in depth the determinants of the use of the SFA more precisely the training, the professional experience and the organizational absorptive capacity. The contribution of this research to the existing literature, in particular on SFA use, can be justified in two ways. First, the study empirically examines how training and professional experience influence potential and realized absorptive capacities, respectively. It provides new insight into the combined effect of absorptive capacity, training and professional experience on SFA use. Second, this research helps to develop an understanding of how salespersons acquire, assimilate, transform and exploit external knowledge for a better SFA use in a pharmaceutical context and in a country (like Tunisia, North Africa) where these potential and realized absorptive capacities are little dealt with in the previous literature.

From a managerial point of view, this research could be relevant for pharmaceutical laboratory managers, who are constantly seeking to improve the use CRM tools of SFA type through a better understanding of the determinants that may affect this use. In this sense, a pharmaceutical laboratory must have the ability to detect external knowledge and apply it for better use of SFA tools. In addition, a better understanding of how training and professional experience interact on organizational absorptive capacity and use of the SFA can help pharmaceutical companies determine what steps need to be taken to improve the use of the SFA.

This research immensely helps owners and managers of companies in the pharmaceutical industry to carry out ongoing training for new and inexperienced and experienced salespeople to improve their abilities to acquire, assimilate, transform and exploit external knowledge and consequently the use of SFA. Continuous training and professional experience are no longer considered an option but rather a requirement; therefore pharmaceutical companies must plan and / or manage strategies for the implementation of regular training for their staff in order to appropriate absorptive capacity and SFA use.

Nevertheless, the current research presents certain limits, which opens horizons, to complete it. First of all, the current research was unable to deeply and comprehensively address the interaction between CRM systems of SFA type and the three types of customer knowledge "knowledge about customer"," knowledge from customer "and "knowledge for customer". In addition, the choice of the field of the pharmaceutical industry may be simplistic in regards with the lessons and conclusions drawn in terms of inferential statistics. Other elements could be taken into account by the researchers in their subsequent research, so it would be relevant to study the consequences of the use of the SFA on the salespeople's performance and on the quality of service provided to the end customers in the industrial environment. It would also be wise to carry out comparative studies between companies in various sectors in the use of SFA tools.

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Appendix 1: "SMART PLS Version 3" outputs

Table 1: Correlation matrix of first-order reflexive variables

	ACQUI	ASS	EXPL	TRANS
ACQUI	**0.918**			
ASS	0.055	**0.807**		
EXPL	-0.105	0.375	**0.888**	
TRANS	0.056	0.198	0.041	**0.815**

Table 2: Correlation of second-order constructs (potential organizational absorptive capacity and realized absorptive capacity) with the use of SFA

	PACAP	RACAP	ICTS	CRMT
PACAP	0.711		0.400	0.492
RACAP	0,408	0,724	0.528	0.353
ICTS	0,831	0,844	0.600	
CRMT			0.476	

Table 3: Correlation of third-order construct with the use of the SFA as a CRM tool and internal coordination tool among members

	CAP	ICTS	CRMT
CAP	0.600	-	-
ICTS	0.564	-	-
CRMT	0.513	0.467	-

Table 4: Correlation matrix of the use of the SFA as a CRM tool and as a tool for internal coordination among stakeholders

	CAP	ICTS	CRMT	PACAP	RACAP
CAP	1,000				
ICTS	0,564	1,000			
CRMT	0,513	**0,467**	1,000		
PACAP	0,831	0,400	0,492	1,000	
RACAP	0,844	0,528	0,353	0,408	1,000

Antecedents of Knowledge Sharing Behaviour in the Public Sector

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ABSTRACT

This qualitative study investigated antecedents of knowledge sharing in the public sector. Basing on the theory of planned behaviour and literature review, three antecedents guided the conceptualization of the study namely; employee attitudes, subjective or social norms and perceived behaviour control. Data from the 19 in-depth interviews were thematically analyzed. Findings revealed that employee attitudes towards knowledge sharing in the public sector were both positive and negative. While the theory of planned behaviour focuses on the attitudes of knowledge givers, it emerged that the knowledge seekers' attitudes mattered as well. Subjective norms were prevalent in meetings, teams, job rotation as well as in the Communities of Practice (CoP). The finding that Communities of Practice were disconnected in terms of knowledge sharing emerged surprising because we had not envisaged it since previous studies have not investigated it. Perceived behaviour control was modified by scanty organizational resources as well as incentives and policies. The study proposes knowledge sharing model for both practitioners and researchers.

Keywords: Knowledge sharing, attitudes, subjective norms, perceived behaviour control, Community of Practic

1. Introduction

Knowledge sharing is conceptualised as the process of accessing knowledge for application in solving work related problems (Christensen, 2007). Knowledge sharing relates to the provision of task related skills, experiences, abilities and expertise to help workers solve problems, develop new ideas, or implement policies or procedures (Wang and Noe, 2010; OECD, 2015).

Although the public sector is endowed with the knowledge resource (Cong and Pandya, 2003; Turyahikayo, 2018; Davenport and Prusak, 1998), evidence shows that such knowledge is not adequately shared to enhance decision making, solving of task related problems and improved service delivery (Caruso, 2017; Wamitu, 2016; Furlich, 2016). While we acknowledge the fact that knowledge should be shared so as to be meaningful (Oghavvemi, Sharabati, Paramanathan and Rahin, 2017; Kalani and Kamrani, 2017) it is noted that previous studies have not investigated fully the antecedents of knowledge sharing behaviour in the public sector. There are limited studies regarding the antecedents of knowledge sharing behaviour within the sector. A few quantitative studies have focused on knowledge sharing practices in the public sector organisations (Amayah 2013; Parka, et al, 2014; Sensuse, Cahyaningsih and Wibowo, 2015; Aerts and Haezendonck, 2017). There are a few, if any, qualitative studies focusing on the antecedents of knowledge sharing behaviour in the public sector. Consequently,

the absence of qualitative studies has, to some extent, hindered the emergence of new knowledge regarding the factors that drive knowledge sharing behaviour in the sector. Yet, without understanding the antecedents of knowledge sharing behaviour in the public sector, we cannot satisfactorily propose appropriate knowledge sharing strategies for the sector. The current qualitative study addresses this gap by examining antecedents of knowledge sharing behaviour in the public sector using the theory of planned behaviour. The research question addressed in this study is; What are the antecedents of knowledge sharing behaviour in the public sector? The purpose of this qualitative study is to attempt to seek answers to the research question.

2. Theoretical framework and Literature Review

Previous studies have indicated that knowledge sharing largely depends on individual behaviour (Kuo and Young, 2008) driven by attitudes towards behaviour, subjective norms, perceived behavioral control (Punniyamoorthy and Asumptha, 2019) and intentions (Wang and Noe, 2010). These antecedents of knowledge sharing behaviour are conceptualized in Ajzen's (1985) theory of planned behaviour.

The Theory of Planned Behaviour (TPB) was propounded by Ajzen, (1985) who assumed that the intention to behave in a certain manner results from; a) an individuals' attitude towards the behaviour, b) their subjective norms, c) and perceived behavioural control over the outcome. Attitudes defined as the disposition to respond favourably or unfavourably to the self, others, and environment in relation to their intentions (Hwang, 2012; Yean, Johari and Sukery, 2015) can be strong or weak depending on the degree of importance attached to it (Howe and Krosnick, 2017). Such a degree of importance is influenced by personal values, interests and beliefs (Safa and Solms, 2016). Subjective norms are postulated as the outcome of cognitive structures such as perceived consequences of the behaviour and normative structures, like perceived approval by others (Hwang, 2012). Perceived Behaviour Control (PBC) is the individuals' belief about their ability to exhibit certain behaviours (Kuo and Young, 2008; Yean, Johari and Sukery, 2015). While the TPB focuses on nature rather than nurture driven factors, its wide usage in related studies make it suitable for this study.

2.1 Literature Review

In this section, we thematically discuss previous studies relating to antecedents of knowledge sharing behaviour in the public sector. The discussion is hinged on the theory of planned behaviour examined in the previous section.

2.1.1 Attitudes Towards Knowledge Sharing Behaviour in the Public Sector

Previous researchers have defined 'attitude' as a disposition to respond favorably or unfavorably to the

self, others, and environment in relation to their intentions (Hwang, 2012; Yean, Johari and Sukery, 2015). Such a disposition towards behaviour can be strong or weak depending on the degree of importance attached to it (Howe and Krosnick, 2017). Such a degree of importance is influenced by personal values, interests and beliefs (Safa and Solms, 2016). An individual's attitude towards knowledge sharing will influence the behaviour to share. If one derives happiness in sharing his expertise, skills and know-how, he/she will share and it would appear, the reverse is true (Punniyamoorthy and Asumptha, 2019). Public sector employees who value their contribution to the organization or who feel that their contribution is valued by others are likely to develop strong attitudes to share their knowledge (Safa and Solms, 2016).

Scholars have further revealed more factors that shape employees' attitude towards knowledge sharing behaviour in the public sector. According to Wang and Noe (2010), if public sector employees have high capacity to absorb the knowledge that has been shared, people feel motivated to share more knowledge with them. Yet in some situations, public sector employees may have negative attitudes to share knowledge if they are worried of being misunderstood, or if they feel that their knowledge will not be used adequately (Zhang and Fai Ng, 2012). Literature does not examine the circumstances under what the shared knowledge is likely to be taken out of context. It is also not clear when misunderstandings relating to the knowledge shared are likely to arise. Some scholars have indicated that even when there is enough absorptive capacity, seekers and givers of knowledge may have arrogant behaviours which hinder inter-personal collaborations for knowledge sharing (Hew and Hara, 2007). Hence, managers should facilitate employees to share knowledge (Yang, 2008).

2.1.2 Subjective Norms and Knowledge Sharing Behaviour in the Public Sector

The TPB conceptualizes subjective norms as perceptions of social pressures relating to performing behaviour (Ajzen, 1991). Subjective norms relate to an employee's perception of colleagues' views about the suggested behaviour (Yean, Johari and Sukery, 2015). These norms are reflected in the expectations of managers regarding an individual's sharing behaviour, proceeded by intentions (Hwang, 2012). If a public sector employee believes that fellow workers approve or disapprove sharing certain type of knowledge, he/she is likely to decide whether to share or not. Yet, the extent to which social norms prevail in the public sector and how this prevalence relates to knowledge sharing behaviour is not clearly articulated in the previous studies. Although Yean, Johari andSukery (2015) contend that such norms put pressure on an individual to perform a particular behaviour, the same norms may force an employee to consider abandoning the planned behaviour (Safa and Solms, 2016). In the public sector, it is assumed that social norms are entrenched in the hierarchical ladders of seniority. Yet, we cannot tell from the literature which source of social norms impose pressure on employees to share or not to share knowledge. Do social norms from below pressurise top managers to share knowledge? Is the reverse

true?

Previous research has further indicated that public sector employees have a role to manage subjective norms. Much as the norms held in groups impose pressure on an individual's sharing behaviour, personal preferences play a role in deciding whether to share or not. The choice still lies in hands of the knowledge giver (Nguyen, Nham and Hoang, 2019). Public sector employees are likely to share knowledge with colleagues who will reciprocate (Wang and Noe, 2010), a situation of 'I scratch your back, and you scratch mine too'. This is the case regardless of the prevailing subjective norms. Moreover, as employees interact more often so do the chains of subjective norms tend to weaken (Amayah, 2013). In this case, reciprocity is seen as the only way employees who share knowledge will cause others to share. Yet, reciprocity may not be sufficient without the backup of a knowledge sharing culture.

2.1.3 Perceived Behaviour Control and Knowledge Sharing in the Public Sector

Perceived Behaviour Control (PBC) has been conceptualized as the individuals' belief about their ability to exhibit certain behaviours (Kuo and Young, 2008; Yean, Johari and Sukery, 2015). If public sector employees believe that they have sufficient ability and resources, they will likely share their knowledge. If they feel resources for knowledge sharing are unavailable, the sharing behaviour will diminish (Chen, Chen and Kinshuk, 2009;

Punniyamoorthy and Asumptha, 2019). Under the PBC, public sector employees make judgements regarding their ability to predict the planned behaviour. If workers believe their PBC over knowledge sharing is high compared to risks involved, the intention to share increases (Hajli and Lin, 2016).

Previous studies have indicated that a number of factors transcend resources in the control of behaviour for knowledge sharing. Scholars such as Wang and Noe (2010) have indicated that supervisor's control over employee behaviour was a significant predictor of an employee effort towards knowledge sharing. Yet, there is another body of literature painting a different picture. Scholars such as Liu and DeFrank (2013) demonstrated that self-interest, power and status affected knowledge sharing intentions even when the resources and incentives were in place. In other words, PBC on its own could not determine knowledge sharing intentions. From the foregoing, we can infer that previous studies have not adequately examined antecedents of knowledge sharing behaviour in the public sector. The current study attempts to address the existing knowledge gap.

3. Research Methodology and Design

In this exploratory study, three public sector institutions were requested in writing to participate in the study which request was granted. The three institutions were; Ministry of Public Service, Ministry of Education and Sports and Ministry of Justice and Constitutional Affairs in Uganda. The selected

ministries were knowledge intensive with interconnected functions. The Ministry of Public Service had an overall mandate to guide performance management practices in the other two ministries. Yet, the laws enacted by parliament with guidance of the Ministry of Justice impacted on the ministries of Public Service and Education. While the three ministries were not the only knowledge intensive ones, with interconnected functions, their selection made the study feasible within the resource constraints. The individual worker was treated as the unit of analysis since subjective and personal insights were key for this study rather than group perspectives. Purposive sampling was used to identify and select 19 key informants (Creswell, 2014) in line with a similar design by Petty, Jarvis and Thomas (2018). The informants had rich information regarding the antecedents of knowledge sharing in the public sector. The key informants who were senior managers at the level of Heads of department were requested to give informed consent prior to the study. Semi-structured interviews were conducted in the informants' offices in order to elicit their perceptions in a natural setting (Hew and Hara, 2007; Yin, 2011). Perceptions were captured using field notes technique because it is more superior to any other technique (Halcomb and Davidson, 2006) in generating qualitative data (Castleberry and Nolen, 2018). The interview process ended after saturation in which case no new additional useful data emerged to constitute a conceptual category (Francis, et al, 2010). In order to enhance conformability and credibility three more interviews in addition to the 19 were conducted. In addition, three key informants were interviewed twice so as to guarantee response consistencies as advised by Aldiabat and Navenec (2018).

We applied thematic analysis technique in order to reduce data into workable themes and the emerging conclusions (Halcomb and Davidson, 2006). We took the advice from Halcomb and Davidson (2006) to the effect that researchers should code their own data since they are much more involved in the interview process. Mindful of the fact that text as data is often difficult to break into categories and themes (Castleberry and Nolen, 2018), we kept coding and re-coding as we identified codes, categories and themes in moving back and forth fashion (Erlingsson and Brysiewicz, 2017). We discarded codes reported by one informant purposely to avoid occasional incidence (Zhang and Fai Ng, 2012). We identified a number of inductive themes emerging a posteriori. Such themes included, employee attitudes; subjective norms and perceived behaviour control. The themes relatedclosely to the constructs discussed in the theoretical framework and in the literature review. We interpreted and discussed the findings basing on the emerging themes as guided by Clarke (2009). An attempt was made to dig deep into the lived experiences of interviewees to understand the real meaning attached to the antecedents of knowledge sharing behaviour in the public sector.

4. Findings relating to Antecedents of Knowledge Sharing in the Public Sector

The discussion below highlights key findings from the study relating to the antecedents of knowledge

sharing behaviour in the public sector. The discussion is organised around three themes that emerged during the coding process. To recapitulate, the themes are; employee attitude to share knowledge, subjective norms and perceived behavioural control.

4.1 Attitude towards Knowledge Sharing Behaviour in the Public Sector

Informants were asked to indicate their attitude towards knowledge with colleagues; and whether colleagues shared knowledge with them. The study revealed a number of positive attitudes towards knowledge sharing behaviour. More than half the number of interviewees indicated that they willingly shared knowledge. "I share my knowledge with colleagues during formal and informal meetings". When asked when they shared their knowledge, they further stated; "I share knowledge during departmental planning, and when undertaking task accomplishments". Knowledge sharing behaviour was triggered by knowledge seekers. Some informants reported that quite often they sought knowledge from their peers and supervisors before, during and after task performance. There were also instances when workers had to seek clarifications on why certain activities had to be performed. While most informants reported good reception from colleagues they contacted for knowledge, there were some employees who harboured negative attitudes towards knowledge sharing. In support of this, four of the nineteen interviewees reported knowledge hoarding behaviour. "Some employees are not willing to share their knowledge. They think that hoarding knowledge makes them powerful and gives them a comparative advantage over their colleagues". This could testify to the prevalence of negative attitude towards knowledge sharing behaviour. Two informants revealed some occasional rudeness and hostility from colleagues during seeking knowledge.

It was also revealed that attitude to knowledge sharing was hindered by misperceptions. The misperception that knowledge sharing was a one man's activity rather than being perceived as everybody's responsibility seemed apparent. Some interviewees remarked, "we don't have a Public Relations Officer (PRO) to disseminate knowledge'. There is need for Monitoring and Evaluation Officer (M&E) to help in knowledge sharing". With this misperception, some employees did not believe it was their responsibility to share knowledge. One would therefore infer that the positive attitude to share knowledge is shaped by the right perception of both the giver and receiver of knowledge.

4.2 Subjective Norms and Knowledge Sharing in the Public Sector

In this section, we examine findings relating to how subjective norms shaped knowledge sharing behaviour in the public sector. The findings are organised around norms that shaped knowledge sharing.

The public sector ministries studied nurtured norms which were not aimed at knowledge sharing, though they made the sharing inevitable. One of such norms was frequent formal meetings. All interviewees indicated that weekly and monthly meetings imposed on them an obligation to attend and

exchange ideas. “we meet weekly to review the previous week’s performance. My colleagues meet monthly for strategic planning and consideration of field reports”. While frequent meetings were not deliberately intended to facilitate knowledge sharing, they formed part of the public sector norms in which knowledge sharing behaviour was reflected.

Informants revealed that there was active participation in the meetings. Half of the interviewees revealed that they shared their views freely in these meetings. Yet, they could not ascertain why they shared and whether their shared knowledge was put to the right purpose.The other well pronounced subjective norm related to job rotation in which some workers in the studied ministries were often transferred to departments within the same ministry, or to other ministries. An informant indicated, “I joined the public sector as a junior officer in the ministry of public sector. I have been transferred recently to the ministry of Justice”. Rotated workers encountered new experiences; knowledge networks useful for knowledge sharing. While job rotation stimulated knowledge sharing behaviour it was undertaken for other reasons. Managers in the departments responsible for job rotations indicated that rotations targeted some employees who had been promoted to fill vacancies in other departments. Informants revealed other reasons such as transfer of a problematic employee to a remote department or ministry, or transfer of a worker to a ministry perceived as ‘lucrative’. Moreover, job rotation targeted employees below Heads of units that performed similar jobs. In this regard, some interviewees remarked, “I have worked in this department for ten years now. If am transferred to another department it may take me a year to learn”. Two other interviewees indicated that they had worked at the department for over 20 years and had never been rotated. So, the likelihood that employee rotation imposed social pressures to share knowledge is debatable.

4.3 Perceived Behaviour Control and Knowledge Sharing in the Public Sector

Employees in the public sector studied had control over their knowledge. Even when they were sponsored for training, they still had power to decide whether or not to share their knowledge. For example, two informants indicated that, “we encourage people to make presentations after the training but most of them don’t want to share. We have arranged meetings for people to share their knowledge but they don’t turn up”. This perceived behaviour stems from the fact that training guidelines as enshrined in the standing orders did not spell out clear and enforceable procedures relating to knowledge sharing.

To some extent, however, formalization of systems and procedures weakened individual perceived behaviour control. Employees who participated in those tasks were required to share knowledge with team members. It was reported that employees who participated in special projects, assignments and field activities submitted reports to their supervisors in the department. The senior management teams discussed policy issues before forwarding such matters to the top. Such highly formalised environment

imposed an obligation on the participating employees to share knowledge and so their behaviour control was to some extent limited.

Much as employees had the ability for behaviour control over knowledge sharing, the resources and incentives for sharing were inadequate. A number of interviewees indicated that the working environment did not motivate them to share knowledge. One informant revealed, "there is no designated place for break tea or lunch. We sit in our offices from morning to evening with only one-hour lunch break. We need staff rooms for health break and informal discussions". Moreover, the ICT infrastructure was not adequate as reported by a number of informants. An informant remarked, "We have always requested for an intranet as a ministry to share information. We need an organizational portal for knowledge sharing". Without this environment, it meant that employees had to physically meet for knowledge sharing instead of using online platforms.

The findings have revealed a number of insights relating to employee attitude towards knowledge sharing, subjective norms that impact on knowledge sharing behaviour, and the perceived behavioural control. The next section is about the discussion of the findings. We attempt to shed light on the practical implications of the findings.

5. Discussion and Practical Implications

While workers' attitude to share knowledge in the public sector existed, we notice that the highly formalised environment shaped such attitudes. Knowledge sharing occurred during formal meetings, planning sessions and task related discussions. Yet, even in such a formalised environment, some workers harboured negative attitude to knowledge sharing. Some public sector workers justified knowledge hoarding as a tool to gain and maintain competitive advantage. Previous studies have indicated that employees often feel they are giving away power if they share knowledge (Caruso, 2017) especially in the absence of knowledge sharing incentives (Wang and Noe, 2010). Previous studies especially by Heo and Toomey (2016) also revealed that persuading employees to share their knowledge was challenging because their inherent interests differed. In the same vein, Shanab and Shehabat (2018) studied the perceived behaviour control of public sector employees towards knowledge sharing behaviour and concluded that in the absence of relevant policies and incentives, employees resisted knowledge sharing based on their interest. While we do not subscribe to this practice of knowledge hoarding, bearing in mind that knowledge gains value when it is shared and applied, we are concerned about this negative attitude towards knowledge sharing. However, we are mindful of the fact that asking employees to simply share their knowledge without giving them some incentives is counter-productive. Even when such knowledge has been acquired using organizational resources, it is important that employees are given monetary and non-monetary incentives to share knowledge.

The findings in respect of attitude to knowledge sharing reveal instances when knowledge sharing

reveal instances when knowledge sharing behaviour was triggered by knowledge seekers. Quite often employees contacted their peers and supervisors on how they were required to undertake certain activities. The theory of planned behaviour has unfortunately focused on attitude of knowledge givers and disregarded the attitude of knowledge seekers. Previous studies have also ignored knowledge seekers' attitudes (Yang, 2008, Safa and Solms, 2016; Howe and Krosnick, 2017). To the best of our knowledge, available studies on the subject focused on knowledge seeking in information systems research projects (Sutanto and Jiang, 2013), which is outside the scope of the current study.

The Findings have indicated that employees' behaviour to share knowledge was shaped by the perceived approval by colleagues. Such approval was received during weekly and monthly meetings. There were also some practices such as job rotation which impacted on subjective norms. Job rotation was conducted for reasons beyond knowledge sharing enhancement. Thus, employee rotation was reported as being of little significance in imposing social pressures on the public sector workers to share knowledge. This finding is consistent with previous studies which reflect authors' mixed feelings about job rotation. While such rotation is common among the less performing employees, it can lead to rotated employees gaining more knowledge at their new organisation than actually sharing what they have (Kampkötter, Harbring and Sliwka, 2018). Moreover, when employees are assigned new tasks, their previous knowledge may not be relevant to the current job needs which affects sharing behaviour (Hakenes and Katolnik, 2017). Although the findings of the current and previous studies tend to agree that job rotation does not drive knowledge sharing behaviour, we believe that the rotated employee moves to the new work environment with both tacit and explicit knowledge. On the basis of our findings and previous research, we strongly believe that job rotation may not be a useful component of social norms to drive knowledge sharing intentions. Moreover, some highly specialized jobs such as Legal practice, auditing, Information and Communication Technology (ICT), records and archives management were not rotated.

Although formal meetings were regular and participatory, such meetings imposed an obligation on employees to attend and exchange ideas as part of the organizational norms. Much as these norms were not deliberately nurtured to enhance knowledge sharing, we believe they facilitated knowledge transfer during meetings. Moreover, knowledge sharing activities in government institutions include workshops and meetings (Sensuse, Cahyaningsih and Wibowo, 2015), and brainstorming sessions, using policy documents and reports (Aerts and Haezendonck, 2017; Shanab and Shehabat, 2018). However, we did not find evidence of visible informal meetings which have been found to enhance socialization and fusion of tacit knowledge. Formal meetings should be maintained in governments to facilitate group discussions, brainstorming and exchange of tacit and explicit knowledge. Informal gatherings should be promoted to enhance sharing of tacit knowledge.

Findings revealed that formal work teams imposed social pressures to share knowledge. All

interviewees revealed that they often worked in teams. Unfortunately, senior members in such teams dominated discussions. This finding is consistent with previous research by Rushmer, Hunter and Steven (2014) who investigated knowledge sharing in teams and concluded that workshop discussions did not work when dominated by particular individuals and groups. However, earlier researchers (Zhang and Fai Ng, 2012) studied knowledge sharing behaviour among construction teams in Hong Kong and concluded that work teams caused pressure on team members to share knowledge. They, however, noted that such knowledge sharing behaviour depended on antecedents such as provision of rules of the game, error tolerance and provision of team incentives all of which apply in the current study.

The study reveals that some social pressures emanated from Communities of Practice (CoP). The common CoP were among lawyers, management specialists and professional teachers. Some minority CoP such as accountants, engineers, ICT specialists also existed. Previous research has indicated that knowledge sharing behaviour was enhanced in CoP amidst strong support systems from management (Jeon, Kim and Koh, 2011). Other scholars such as Schofield, et al (2018) revealed that some members of CoP sought to enhance their own knowledge as well as strengthen relationships among professional colleagues through the knowledge sharing behaviour. The knowledge sharing behaviour manifested itself during and after the meetings, by use of phone numbers and e-mail. These studies focused on knowledge sharing among CoP. The surprising finding however is that minority CoP in the current study felt that they did not benefit from the knowledge of dominant large CoP such as lawyers and teachers. Inter-CoP collaboration was missing across the three cases. We did not venture deep into this missing link as it was outside the scope of the study. But we believe that future scholars may pick interest in this aspect.

The study has demonstrated that employees' ability and control over knowledge sharing was affected by inadequate organisational resources and incentives. Organizational resources are usually provided through support from management. Previous studies by Wang and Noe (2010) indicated that management support enhanced employee knowledge sharing, the absence of which affected the sharing behaviour. Other studies have identified factors such as steep structure and leadership that pose threats to knowledge sharing, compensation and culture (Amayah, 2013; Henttonen, Kianto and Ritala, 2016). A common denominator in all these studies is the key role of management in removing negative perceived behavioural controls to enhance knowledge sharing in the public sector. Our findings in this case agree with previous research that perceived behavioural control can diminish if management creates a flexible environment for knowledge sharing behaviour.

In light of the findings and the preceding discussion, we propose a knowledge sharing model for the public sector. The model attempts to highlight key constructs and dimensions critical to knowledge sharing behaviour in the public sector.

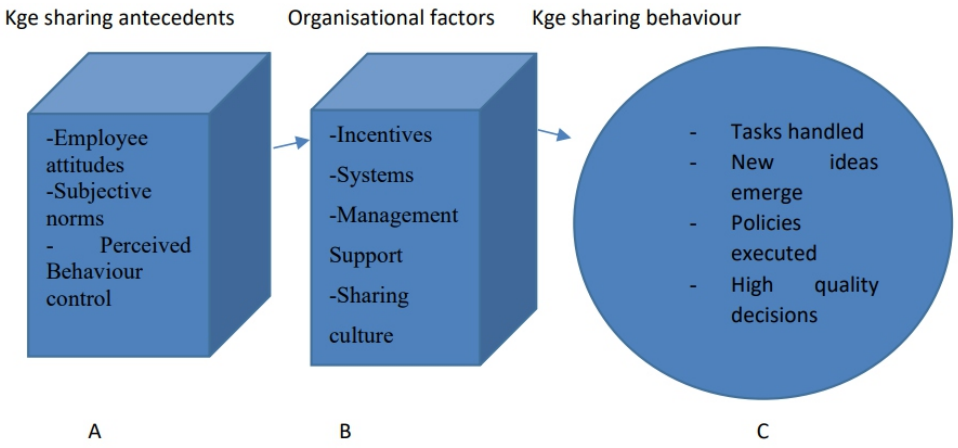

Figure 1: Knowledge Sharing Model

The discussion has been guided by the three antecedents of knowledge sharing behaviour reflected in box A. These are; employee attitudes to share; subjective norms and perceived approval by others to share knowledge; and lastly, perceived behavioural control. While these antecedents shape the knowledge sharing behaviour in the public sector, they are not self-sufficient. The need for incentives, appropriate systems, management support and sharing culture is critical as indicated in box B. Incentives refer to the combination of various inducements offered to the public sector workers as motivation for them to share knowledge. Such inducements can be monetary or non-monetary. Systems refer to structured practices that position workers to share knowledge with ease. Such systems include formal and informal meetings, teamwork, and staff baraza. Management support relates to any action taken by top management to facilitate knowledge sharing. Such actions include establishment of knowledge sharing policies and creation of knowledge sharing platforms such as social media. In order for knowledge sharing to be effective, antecedents of knowledge sharing and organisational factors should act in concert so as to facilitate solving of task related problems, generating new ideas, designing and executing good policies, as well as making high quality decisions.

6. Conclusion

This study was undertaken to examine the antecedents of knowledge sharing behaviour in the public sector. The study has revealed three key antecedents namely; employee attitude to share knowledge, subjective norms, and perceived behavioural control. The study further reveals two surprising findings namely; the recognition of the attitudes of knowledge seekers which have been ignored by previous researchers and collaborations among communities of practice. In the former, the study showed that the knowledge giver's belief that employees seeking knowledge will put it to good use motivated knowledge sharing. Additionally, the knowledge giver's attitude to share was also shaped by how they were approached and respected by the knowledge seekers. In the latter, minority CoP felt sidelined by

the large and influential communities of practice thereby limiting knowledge sharing among inter-communities of practice. In light of the revealed antecedents and other key findings, we strongly believe that the research question was answered.

6.1 Recommendations and Areas for Future Research

The study revealed that most employees have negative attitude towards knowledge sharing behaviour. Moreover, it was alleged that some knowledge givers in the public sector were rude to colleagues who sought knowledge from them. While we recommend that employees are given monetary and non-monetary incentives to share knowledge, future researchers should investigate further the kind of incentives likely to enhance knowledge sharing attitudes in the public sector.

Much as the study focused on attitudes towards knowledge sharing behaviour of knowledge givers in the sector, it was discovered that the attitude of knowledge seekers played a role in knowledge sharing. Future studies should investigate how the knowledge seeker behaviour affects the givers attitude to share knowledge.

While we thought that job rotation was useful in enabling knowledge sharing in the public sector, findings and previous studies proved the contrary. It is recommended that the public sector conducts regular job rotations purposely to enhance knowledge sharing.

Highly formalised structures stifled knowledge sharing behaviour. The study recommends establishment of an environment to support informal interactions. Such environment would create employee hubs, online platforms such as social media and knowledge bases, as well as knowledge directories, expert locators and repositories. While Communities of Practice (CoP) in teams played a key role in knowledge sharing behaviour, the study did not venture deep into inter-CoP collaboration. Future scholars may pick interest in it this aspect to ascertain how collaborations between communities of practice in a single organizational setting affected knowledge sharing behaviour.

The importance of management support stood out as one of the organisational factors shaping knowledge sharing behaviour. The current study did not venture into the nature of support required as this was outside the scope of the study. We recommend that future researchers should investigate the nature of management support required to enhance knowledge sharing behaviour.

The proposed knowledge sharing model can be tested in studies from different contexts to ascertain its efficacy in settings beyond the public sector.

6.2 Limitations of the study

Limitations of this study are two-fold and relate to sample size and design. The public sector in Uganda is bigger than three ministries we studied. The 19 interviewees conducted might be perceived as small. However, we carefully and purposively selected informants on the basis of their wealth experience.

Moreover, the purpose of this exploratory study was to help generate deeper insights relating to antecedents of knowledge sharing behaviour in the public sector within a natural setting (Yin, 2011). We relied on the qualitative design well knowing that the purpose of this study was not to generalize the findings (Creswell, 2014) but to reveal a contextualized detail of the phenomenon.

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Misled by Data? Review of Data Sources in National Intellectual Capital Research

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ABSTRACT

This paper is a review of National Intellectual Capital (NIC) literature that focuses on the documented use of data and the data sources used in the NIC literature. The topic is important as the NIC research is largely based on data analysis and thus the use of data and the data sources used ultimately shape the reality around what is the big picture of national intellectual capital, as it is understood today. While this is the case, questions about use of data and the data sources used have not been in the core of the research tradition. The review focuses on 57 systematically collected NIC articles with a documented data source, published between the years 1991 and 2018. The results show that the majority of data-based NIC research is concentrated around a set of often-used data sources, while the rest of the data-based NIC literature uses a fragmented set of data sources. New data sources are rarely utilized. The documentation of data and data source use in the literature leaves room for criticism. Researchers and the users of NIC analyses benefit, if they are able to evaluate the quality, the coverage, and the relevance of the data sources used as a basis of NIC analyses. To the best of our knowledge, this is the first time that data sources used in the NIC literature are the main focus of a literature review.

Keywords: National Intellectual Capital, data use, data sources, literature review, data bias, data quality

1. Introduction

Over the past two decades, research on national intellectual capital (NIC) has received a lot of attention within the community around intellectual capital (IC) research. NIC research has highlighted the importance of information in the societal level of value creation that is, when nations target competitiveness, wealth, wellbeing, and performance gains on the aggregate level. Among other things NIC-research has created a conceptual platform and methodologies to improve and to benchmark the progress of nations. Importantly, NIC-research has widened the understanding of the dynamics behind aggregate performance (of nations) and lifted the status of researching the effects brought about by changes in the structures of the societies, such as the effects of globalization and of technological development.

As the review does not take a position or exclude articles based on the definition of NIC used in the studied articles, a strict definition of national intellectual capital is not necessary for this review. However, for the purposes of this review an in vein with Pedro, Leitão and Alves (2018b) NIC is understood as the variety of intangible assets that give long-term advantages to a nation and interact with organizations, regions, or globally and that are able to produce future and equal benefits measured at all levels. Importantly, NIC is understood as research that focuses on the national level.

Advanced national data-ecosystems and data-management (institutions) are key elements of modern

data driven societies and as such create the physical bedrock of NIC - they enable high-level value creation and ensure and enable fact-based decision-making for all sectors of the society at organizational, industrial, regional, national, and global levels. They also function as a mirror of successful value creation, when measures and indicators based on information gathered are used in this context.

The aim of this paper is to study and answer to the question "what data sources (data ecosystems) have been used as the basis for the academic literature on National Intellectual Capital during the period between 1991 and 2018?" and to discuss the use of data and the sources in connection with national intellectual capital research. In order to reach this aim, this work presents a review of the academic NIC-literature from the perspective of data sources by first identifying 111 articles published on NIC and selecting the 57 articles, where the data source used is documented and reviewing them in detail. While data is widely utilized as the basis of analysis in the majority of NIC articles and while the use of data has previously been the subject of some criticism (see, e.g. Alfaro, López and Nevado, 2011; Chew, Sharma and Bontis, 2014; Käpylä, Kujansivu and Lönnqvist, 2012; Lee, Lin and Lin, 2017), studies focusing on the use of data and data sources used in the NIC research are non-existent. While meritorious literature reviews on NIC exist (see, e.g. Dumay, Guthrie and Puntillo, 2015; Labra and Sánchez, 2013; Pedro, Leitão and Alves, 2018a and 2018b; Petty and Guthrie, 2000), these reviews do not specifically concentrate on the use of data or the data sources used in the literature. To the best of our knowledge, this is the first time that data sources used in the NIC literature are the main focus of a literature review.

The approach taken here highlights the importance of the use of data and the data sources used as a part of the national intellectual capital discussion. The question of the effective utilization of data and the indicators used in the research- and policy-making levels is discussed together with a discussion around the challenges with access to data. As such, this review is relevant to the stakeholders in national intellectual capital questions that deal with data- and indicator-related questions. For researchers this review identifies potential problems with the use of data sources and the effects of these potential problems on research outcomes. Researchers and the users of NIC analyses benefit, if they are able to evaluate the quality, the coverage, and the relevance of the data sources used as a basis of NIC analyses. For the data ecosystem actors, at national, private, and global levels,such as national statistical institutes this review highlights their role in ensuring the operational conditions of scholars and the NIC research community, not to mention public data-based decision-making. Furthermore, this article highlights the importance of the dialogue between data ecosystem actors and policymakers in securing the availability and quality of data for research and offers support for evidence-based decisions concerning data management questions for policy-makers.

We present a discussion about the possible and apparent problems with regards to data source and content documentation in the NIC literature and shortly discuss the risks and weaknesses associated

with opaque data handling and other data related "less than perfect" modes of operation in research.

The rest of this article is structured as follows: first we shortly present the methodology used in the literature review and then we present the review-results. Then follows a literature-based discussion on the use of datasources in the NIC literature and on observed problems connected to data-use. The paper is closed with a section that offers a short summary, presentation of conclusions, and some future directions for research.

2. Methodology

This literature review follows the state-of-the-art practice proposed by Webster and Watson (2002) and uses a paper selection process to gather relevant literature. Four article databases were utilized in collecting the articles written in English used: Emerald Journals, EBSCO (all databases), Scopus Elsevier, and Science Direct. Depending on the database filters "article", "peer-reviewed", "scholarly" were used, where available. Articles related to Intellectual Capital at macro, or national levels were included. The review covered years 1991 – 2018 (until the month of September).

Articles were searched based on their abstract with a number of variants of the key phrase "National Intellectual Capital" that included strings such as: "national intellectual capital", "national" and "intellectual capital", "nation" and "intellectual capital" and "country" and "intellectual capital", also the abbreviation "IC" was used.

In summary, the search was narrowed down by:

1. Including only select subject areas: Scopus (Business, Management and Accounting, Social Sciences, Economics, Econometrics and Finance, Decision Sciences); Ebscohost (IC, human capital, knowledge management, economic development and competition, globalization, international trade, intellectual property, industrialization, information economy and technology, management, strategic planning and assets), for other sources the original search words were used without further filtering.
2. Including only English language articles
3. Including scholarly articles (articles, peer-reviewed, scholarly; depending on the archive)
4. Searching keywords (combinations) only from the document abstracts

The result of the initial abstract-level search was 848 articles – all these articles were scanned and exclusions were made, based on the article title pointing directly to exclusion criteria with relation to the focus of the level of analysis (firm, organization, region, university, research institute) that is, non NIC research focus. The included set contains one article with multiple-level analysis, where, based on author judgment the focus was strongly on NIC. Also, some purely technology-oriented papers and articles that concentrate on ethical issues were excluded.

PROCESS	SOURCES / NUMBER OF ARTICLES			
Intellectual capital search	EMERALD Journals 1 033 articles	EBSCOhost 2 606 articles	SCOPUS, Elsevier 3 885 articles	ScienceDirect 2 654 articles
Criteria 1-4	189 articles	238 articles	137 articles	340 articles
Merging results	848 articles			
Exclusion of non-NIC articles	213 articles			
Exclusion by abstract and full paper scanning	111 articles			
Articles with documented data source	57 articles			

Figure 1: Selection process used with the quantity of remaining articles after each step

The remaining 213 articles were again manually scanned by reading the abstracts, which resulted in a final total of 111 articles on NIC of which 101 we had access to in full text. The 111 articles were published in 63 different journals, Journal of Intellectual Capital (JIC) being the single most important source with a 25 % share of the NIC articles. All the articles selected were cross-checked with the Finnish Publication Forum (www.julkaisufoorumi.fi/en) listing of high quality academic publications and 91 of the articles are rated at least level 1 (basic academic). The rest of the articles were either journals under the level 1 or conference articles.

Of the 111 articles in 57 the data-source used is documented. This set of 57 articles is the main focus of this review. Of these 57 data-based NIC articles 80% were rated at least level 1 in the Finnish Publication Forum classification. Figure 1 visualizes the selection process used.

For each article the following information was extracted:

1. Database where the article is stored (one of the four databases searched)
2. Year of publication (1991 – 2018)
3. Main focus / research question (shortly)
4. Article type ("general NIC", "country comparison", "country analysis" or "special NIC focus") done after a holistic overview of the articles and based on that the creation of the four classes
5. Data source(s) used in the article (the sources)
6. Number of citations the article had received by early 2019
7. Relation to public sector data (if and how public sector data is used)
8. Presence of public sector data providers (if and when data is used)
9. Geographical coverage (# of countries in the analysis)

10. Country of the university of the main writer of the article

A synthesis and an analysis of the information collected from the selected papers gives a holistic picture of the data-use and the data sources used in the NIC literature and reveals the what are the most often used data sources. The collected information (points 1-10 above) for the 57 studied articles is available as a table in Appendix 1.

3. Results

This section presents the results from the review. We look at the set of 111 identified NIC articles and observe that fifty-four of the total 111 NIC articles do not document the data source used, the data source is unknown, or no data is used, which leaves fifty-seven (57) articles that disclose the source of data used and of which, fortyseven specifically describe the data set used (in addition to mentioning the source). In other words, roughly half (51,4%) of the selected NIC articles fall under the focus of this review.

We start by taking a look at how the used data sources are indicated in the reviewed articles – we do this by article type for which purpose, we create a taxonomy of four different article types (or classes), according to the main focus of the article identified during review of all the articles. The four classes are: "General NIC", "Country comparison", "Country analysis", and "Special NIC focus" (articles with focus in a specific topic, e.g., environment, culture, crises).

Forty (40) of the reviewed 57 articles are comparative or country specific analyses, seven special NIC focus, and ten general NIC articles. See Table 1 for detailed information.

Table 1: Information of the data sources used according to the main focus of the article

	# articles	A (General NIC)	B (Country comparision)	C (Country analysis)	D (Special NIC focus)
Data source info available	57	10	26	14	7
- information on data sets used	47	7	26	7	7

In many of the reviewed articles the way the used data sources are identified and described is imprecise, e.g., detailed information about the reference year(s) in the data is not often available. A data source can have a wide range of designations that changes from article to article and the databases used are typically unclearly and vaguely specified. What is typically identified is the "department" or "division" from which the data comes from, within a larger data-providing organization. Referencing and listing of data sources as references is typically nontransparent or incomplete.

The above-mentioned problems with documenting data sources used are prevalent for all types of data sources, while some commonly used sources can be specifically identified with a less precise referencing, most often missing and imprecise documentation of data sources does not allow a complete understanding of what the actual source used had been. In the studied 57 articles, where information

about the data source used was available, in 35% information detailed enough to allow the identification of the specific data source (within, e.g., a larger source organization) and the data-sets used was missing. Replication of previous research results and validation of results becomes remarkably easier, when the data sources used are documented properly and transparently. The lack of specificity in the information about the used data sources information may be an indication of a low attention paid to the impact of data on the research results in this field.

The typically and most often used data sources in the studied articles that indicate the data source used, include the various data bases housed within The World Bank organization. Other often used sources include The World Economic Forum with reports and indexes, and the United Nations with its various data providing organizations.More than half of the 57 articles use at least one of the above three as a data source. The three main data sources are often complemented with other data providers with index data. It can be observed that the most commonly used sources are also well-known by policy-makers (Salonius and Lönnqvist, 2012). Table 2 lists some of the organizations often used in the NIC literature as data sources and Appendix 1 offers a more complete listing of the used data sources with an article by article documentation.

Table 2: The most often used data sources

Organization	Examples of data sources and indicators / indexes published
The World Bank (WB)	World Bank (WB), World Bank group (WBG), WB's World development indicators (WDI), World Bank database (WB DB), Knowledge economy Index (WBG KEI), World Bank's Knowledge Assessment Method database (WB KAMD)
The World Economic Forum (WEF)	World Economic Forum (WEF), Global Competitiveness Report/WEF (GCR), Global competitiveness index (GCI), Network Readiness Index (NRI)
The United Nations (UN)	United Nations (UN), UN development Programme (UNDP), Human development index (HDI), Human development Report (UNHDR), UN Public Administration Country Studies (UN/PA), Millennium Development Goals (UN MDG), United Nations Educational, Scientific and Cultural Organization (UNESCO), World Health Organization (WHO), ILO survey data, International Labour Organisation (ILO)

Further statistics about the data sources used in the 57 articles are shown in Table 3, where one can see that the aforementioned three sources are the most frequently used data sources, while international and national statistics organizations form the group of the second most used data sources. We note that the percentages in Table 3 do not add to one hundred as many articles use several data sources.

Table 3: Data sources used in National Intellectual Capital measurement

Main data sources in the articles; classification used in the Appendix 1 indicated in (•)	articles n=57	%
The World Bank (a)	24	42
The World Economic Forum (b)	21	37
The United Nation (c)	21	37
International Statistical offices (OECD and Eurostat) (e)	17	30
International Institute for Management Development (d)	15	26
National Statistical Offices (f)	14	25
European Commission and other European bodies (g)	6	11
Other banks and financial institutions (h)	5	9
Interview (j)	4	7
New data sources (i)	1	2
Other index and other sources (k, l)	18	32

It is common that multiple or combined data sources are used and information is collected from a number of sources – in the 57 articles reviewed the number of different data sources mentioned was 74. Table 4 shows statistics about the number of sources used per article in the studied population. Article specific information and classification can be found from Appendix 1.

Table 4: Number data sources used per an article

Number of data sources used	Number of articles (sample 57)	Percent of articles, %
1	13	22.8
2	13	22.8
3	13	22.8
4	5	8.8
5	5	8.8
6+	8	14.0
Total	57	100

It can be seen that 23% of articles used one, two, or three data sources – this already constitutes more than two thirds of all articles studied and means that about thirty percent of the articles used four or more data sources. Fourteen percent of the reviewed articles (8) used six or more data sources. It is common that the top data sources are used simultaneously, all three were used in eight articles and World Economic Forum and World Bank together in twelve articles.

The countries studied and the number of countries simultaneously studied varies between articles. The most common area studied in the reviewed articles is the European Union, which accounts for over one fourth of research, with 16% of the articles looking at all EU countries. Eleven percent of the articles studied a smaller group of EU countries, or one EU country alone. Fifty-six percent (56.1%) of the articles had more than 20 countries in their sample, while the largest number of countries simultaneously studied was 148 (Seleim and Bontis, 2013). Under ten countries were focused on in ca. thirty-seven percent (36.9%) of the studies. Table 5 shows statistics of the geographical coverage of the reviewed articles.

Roughly a quarter (24.5%) of the studied articles utilized data from more than 50 countries in their research. These studies were from nine different main authors with altogether fourteen co-authors, with López Ruiz being the most prolific single author of high-number multi-country analyses. According to a count based on first author affiliation, documented data-based NIC research is most active in Spain (10 articles) followed by Taiwan and by Finland (7 articles). It is somewhat interesting to note that USA, Australia, and the UK are not among the top countries.

Table 5: Geographical coverage of reviewed articles

Number of countries in the studies	Number of studies	Percentage of all
>100	4	7.0%
50-99	10	17.5%
20-49	18	31.6%
10-19	4	7.0%
3-9	5	8.8%
1-2	14	24.6%
unknown/none	2	3.5%
Total	57	100%

One area of interest to this research is to find out to what extent the studied literature uses public sector data and the (national) public sector data providers as data sources. Table 6 shows the public sector data use in the studied literature. It can be seen that the use of public sector data is prevalent in all types of articles and acts as the base of analysis in over two thirds of the articles overall. Use of public sector data is most pronounced in country specific and country comparison focused articles.

Table 6: Public sector data use in the surveyed NIC literature

	No public sector data used	Some public sector data used	Public sector data used as the base	Total
A (General NIC)	18.2% (2)	27.3% (3)	54.5% (6)	100% (11)
B (Country comparison)	7.7% (2)	15.4% (4)	76.9% (20)	100% (26)
C (Country analysis)	7.1% (1)	21.4% (3)	71.4% (10)	100% (14)
D (Special NIC Focus)	0% (0)	50.0% (3)	50.0% (3)	100% (6)
Total	8.8% (5)	22.8% (13)	68.4% (39)	100% (57)

The role of public sector data providers in the studied literature, in the light of the prevalent use of public sector data, can be expected to be important. All in all, this expectation is not fully met, as the public sector data providers have a strong visible role in less than half (45.6%) of the studied articles overall. Table 7 shows the role that public sector data providers have in the studied articles. It can be seen that one fifth (21.1%) of the articles do not mention public sector data providers at all and that they are given a strong visible role typically only in approximately half of the country specific and country comparison focused articles. Interestingly more than one third (35.7%) of the country comparison focused articles omit mentioning public sector data providers.

Table 7: Presence of public sector data providers in data-based NIC literature

	No role / not mentioned	Minor role / recognized	Strong visible role in an article	Total
A (General NIC)	27.3% (3)	45.5% (5)	27.3% (3)	100% (11)
B (Country comparison)	12.0% (3)	36.0% (9)	52.0% (13)	100% (25)
C (Country analysis)	35.7% (5)	7.1% (1)	57.1% (8)	100% (14)
D (Special NIC Focus)	14.3% (1)	71.4% (5)	14.3% (1)	100% (7)
Total	21.1% (12)	33.3% (19)	45.6% (26)	100% (57)

It seems that even if public sector data is often used in the literature, public sector data providers do not commonly have an important role outside providing the data. That is, there seems to be a low "state of interaction" between the NIC research community and the public sector data providers, which may be a tell-tale sign of weak collaboration between these "two camps" in terms of developing the public sector data collection and indicators that are important for research purposes.

The utilization of main data sources seems to of have been similar throughout the studied period in all types of articles with the exception of some special aspect focused articles that typically used indexes and special data sources, even new big data sources related to the chosen specific topic. Only 0.9 % of the articles recognize the options to renew also the data sources with big data/smart data (see Vahanyan, Vahanyan and Ghazaryan, 2018). Another "casual" observation about the Intellectual Capital literature is that what one can see is that the majority of recent studies on intellectual capital (IC) concentrate on other areas than national, or macro level intellectual capital. The NIC proportion of all IC studies was only 1.1 % according to our search. Pedro and others estimate that the proportion of studies with an organizational focus is as high as 92.7% of the IC literature and that the proportion of NIC studies is only 4% and that the rest of the studies (3.3%) concentrated on a regional level (Pedro, Leitão and Alves, 2018a, 2018b). The difference between the findings can be attributed to differences in the way the searches were conducted. NIC literature is a niche of less than five percent of the overall IC literature.

While the overall weight of the NIC is not great, the selection and use of data sources is an important issue for NIC research as NIC research is often data-based and the NIC research has a strong history of using data. The theoretical formation of NIC is also largely based on data analysis, which makes the clarity and transparency of the sources used important.

4. Discussion about the data-related problems and relevance-issues observed in the literature

In this section, we discuss problematic issues connected to data that underlie the data-based research on national intellectual capital. As observed above, there are critical voices in the NIC research community that point to problems with data – main problematic issues identified in literature are the ill-availability of (relevant) data and data quality issues. Observed are also inconsistencies and biases in the use of data. The observed problems with data and the use of data have consequences with regards to the credibility

and replicability of the results obtained. The real-world relevance of, e.g., indicators used in describing the state of and the progress (of NIC) in a specific nation and comparatively is also an issue of importance.

4.1 Observed data-related problems and consequences

One of the most pronounced observed shortcomings and limitations to NIC research (and reporting) with regards to data is the lack of availability of data for a number of nations (Alfaro, López and Nevado, 2011; Bounfour, 2003; Chew, Sharma and Bontis, 2014; Frederick and Mcllroy, 1999; Jednak, Dmitrović, and Damnjanović, 2017; Käpylä, Kujansivu and Lönnqvist, 2012; Lin and Edvinsson, 2008; Lin and Lin, 2008; Lin and Edvinsson, 2012; López et al., 2011; Park and Oh., 2018; Piekkola, 2018; Stachowicz-Stanusch, 2013). The lack of availability of data has had serious consequences for NIC research in that it creates a country bias and affectsthe research designs used.

Country bias in this context means that the available data has guided data-based research to take mostly and even only on countries for which there is ample data available and consolidated the use of data from the incumbent data providers (see Herciu and Ogrean, 2015; Stachowicz-Stanusch, 2013). Research designs used have been such that they are not necessarily optimal from the point of view of NIC research and reporting, but such that are able to utilize the data that is available for the purposes of NIC research and reporting (Käpylä, Kujansivu and Lönnqvist, 2012; Stachowicz-Stanusch, 2013). In other words, the availability of data and the type of data that is available may have (remarkably) limited the universe of usable methods (López et al., 2011) and in effect steered the type of NIC research that has been conducted. It has been observed that the relatively small number of countries for which data is available often makes it difficult to apply advanced comparative statistical analysis methods to test data-based hypotheses (Lee, Lin and Lin, 2017). The statement has been made that "the available data apparently determines the understanding of NIC" (Käpylä, Kujansivu and Lönnqvist, 2012).

In situations, where data is available, there are often limitations to it, such as the lack of longitudinal data (Chew, Sharma and Bontis, 2014; Seleim and Bontis, 2013), or there might be significant year to year changes with regards to the data sources and in the available statistical data (Tomé, 2011) – both are issues that typically create problems in time series- and comparative analyses. It is typical that data sets reflect the past national IC performance, rather than the current or the future status of a nation (Chew, Sharma and Bontis, 2014; Lin and Edvinsson, 2008; Lin and Lin, 2008; Lin and Edvinsson, 2012; Pedro, Leitão and Alves, 2018a). Data limitations can also affect the reliability of any analyses that attempt to establish causal relationships (see, e.g. Lee, Lin and Lin, 2017; Seleim and Bontis, 2013). Similarly, the credibility of comparative analyses based on (single) country indicators that are composed of numbers that do not consistently (year to year) come from the same sources and that are not constructed in an identical way is suspect (Radjenovic and Krstic, 2017). This problem is similar to the

common problem with the lack of consistency between quality criteria, accuracy requirements, and contents of data that different (national and regional) statistical systems require from the collected data (Lin and Edvinsson, 2012). Because the manner in which (certain indicator) data is gathered varies from country to country, as a result there are typically inconsistencies and inaccuracies in comparisons and in analyses (Hervas Oliver and Dalmau-Porta, 2007; Lin and Edvinsson, 2008; Lin and Lin, 2008) sometimes the differences can render comparisons pointless (Łukasiewicz, 2013; Navarro, Lópes and Nevada, 2011). Typically the institutions in each country can determine the set of (most suitable) indicators for which data is collected and the way in which the data is collected – although this practice may capture the unique traits of each country, it efficiently prevents (relevant) cross-country comparisons (see Käpylä, 2012).

Generally, it is noticed that it is difficult to find the correct composition of variables to address and measure specific phenomena (Lin and Edvinsson, 2008; Tomé, 2011). The selection of indicators used in indexes that try to capture the development of different phenomena most often also depend on data availability, rather than on (maximizing the) substantive content of the given index (Łukasiewicz, 2013). An easily measurable and definable format of knowledge is appreciated, as the dominant NIC discourse relies on measurement, numbers, indices, and quantitative comparisons and not on qualitative descriptions, hermeneutic understanding, or in-depth and detailed case-studies (Käpylä, 2012) and again, the typical source of information for different indexes are the few well-established and well-known sources.

It has been observed that in some cases the proposed composite-indexes may contain elements based oninherently subjective judgment that may create biases such as over- or underestimation of the results due to, e.g., the use of difficult to justify weights for variables (see Önsel et al., 2008). Also the use of proxy variables in indexes is common (López et al., 2011; Edvinsson and Bounfour, 2004; Bounfour, 2003); it is well known that proxies are not completely representative of the variables for which they are proxies, therefore, if a composite index is composed of a large number of proxies, the results may become inaccurate. Proxies are likely under- or overestimating the phenomenon they are used to measure (Ståhle and Ståhle, 2012).

Generally, the use of data in form of measurements, indicators, indices, and international comparisons easily creates an illusion of objectivity and universal applicability (Käpylä, 2012; Käpylä, Kujansivu and Lönnqvist, 2012). If this is put in the light of data-related problems that NIC research and reporting is observed to have, it can be observed that completely trusting the reported results may lead to imperfect decisions.

Pedro and others (Pedro, Leitão and Alves, 2018a) estimate that due to the difficulty in obtaining suitable data, the growth in the number of empirical studies related to NIC is not as rapid as it would be under better circumstances. They further estimate that the lack of uniformity in indicators and data

collection practices in different levels of IC is the reason for the relatively low number of empirical studies on NIC (Pedro, Leitão and Alves, 2018a). Ståhle and Pöyhönen state that the "consequences of the data and statistical indicators formation is seen as a drawback for the IC research tradition" (Ståhle and Pöyhönen, 2005).

4.2 Relevance issues related to data in NIC

The explanatory power of NIC indicators varies with time as a function of the developmental stage of the society that is being measured. For this reason it is important to review and update the NIC measures used for a given society regularly, or to perform measurement with a wide-enough selection of measures, in a way that guarantees that changes are captured, even if the structure and the drivers that drive a society forward change. Typically, the more mature an indicator is, the less explanatory power it has with regards to the development of NIC – this saturation is a testament to the constant development that takes place in what is considered to be a part of NIC and an indicator that is considered to be a growth driver at one point of time may "dry out" and outlive its usefulness as a measure of development (Salonius and Lönnqvist, 2012; Ståhle and Bounfour, 2008). When, for example, the penetration of mobile devices rises high enough, it no longer serves as an indicator ofeconomic growth or performance, similarly circulation per capita of newspapers has lost its measurement valuedue to the media revolution.

Intangible goods are most likely the main type of IC that is making a large difference in the development gapbetween developed and developing countries. The impact of intangible goods on NIC is hard to measure, because a large part of that impact is in terms of hidden wealth (López et al., 2011). This also means that if we are unable to measure the impact intangibles have on NIC we most likely are not very good in measuring the NIC gap between countries either. The same kind of problem is associated more generally with all indicators that are only poorly able to capture the whole picture of what they endeavor to measure.

This boils down to noting that when societies change, the way the development in the societies is measured must change with it. That is, the way change takes place changes and the measuring instruments designed for the past ways change takes place may become irrelevant in measuring the new ways change takes place. This means that the way measurement is made should be reviewed and updated regularly to ensure the relevance of the measures. Changing the way measurements are made may cause problems of comparability of the gathered data over time, exactly as was observed above, within the discussion of the data-related problems and their consequences. It becomes increasingly important to understand that if there is an evolution in how change takes place and in the measures used to capture the qualities and size of the change, then documenting the measures and designing "backwards compatibility" becomes very important for the sake of allowing at least some credible

longitudinal data to be collected. Put in another way, it is important to conserve core measures that are kept unchanged in how they are measured and reported throughout the changing forms of development. One must also note that intellectual capital is contextual and when the context changes the form and format of intellectual capital also and naturally changes (Ståhle and Bounfour, 2008).

What can be said is that the relevance of the measures used in understanding the state of NIC depends to a large extent to the fit of the NIC measures to the actual status quo in the country in which the measurement is made. It makes no sense to use the same measures in countries with vastly different developmental stage – where it makes sense to measure "literacy" in developing countries it makes sense to measure both "literacy" and "media- or data-literacy" in highly developed countries, because "literacy" is a saturated NIC measure for highly developed countries. To retain the relevance of NIC reporting and research there must be an evolution of measures and a backwards compatibility in the sense that also transitions from one developmental stage to another in a country could be observed also through the data collected. This also means that in designing measurement, the values of the future must be allowed to be different from the values that are accepted now (Käpylä, 2012), one can refer to the change of view with regards to strict environmental policies and how they today are considered to be indicators of positive development, where they were first considered to hinder economic development (Stavropoulos, Wall and Xu, 2018).

Maintaining NIC relevance most likely requires tools for making sure that relevant and "correct" indicators are used, there is however no consensus on evaluation models for NIC indicators (Radjenovic and Krstic, 2017). This is a clear path for further research and action in the NIC community and a challenge to the national and international data providers.

5. Summary, Conclusions, and Future Directions

This article presents a review of the academic National Intellectual Capital literature that focuses on the use of data and on the data-sources used. The review consists of presenting data collected from fifty-seven (57) articles from between the years 1991 and 2018 that have documented their data sources and discussion about the datarelated problems observed in the reviewed literature.

The results show that number of different data sources used is rather high as a whole, but a small number of commonly used "preferred" data sources dominate in the literature. More than half of the studied articles use three or less data sources simultaneously, while only fourteen percent use six or more data sources. The number of countries analyzed in a paper varies between a set of papers that concentrate on one or two countries and a set of papers that study more than fifty countries – both of these groups represent about a quarter of the studied articles. Over seventy percent of all papers are either single country analyses or country comparisons. European Union is in the focus of a large number of articles, most likely due to the high availability of data.

The reviewed research is to a high degree based on data from public sector data providers, where about seventy percent of them are mainly based on public sector data and over ninety percent are at least partly utilizing public sector data. The role attributed to public sector organization in the studied is strong, while it is not as pronounced as the use of public sector data. There may be an opportunity for increased collaboration around research issues with the public sector data providers for the NIC community.

The review of literature shows that authors (in the literature) seem to feel that there is much to be desired with regards to the documentation connected to data use in both, documenting the data sources used and in documenting how the data used was actually used. Over one third of the data-based articles fail in documenting the data source in a transparent way. The problems with documentation hamper possibilities of replicating research, which is an important issue with scientific data-based research.

In the literature observed problems regarding data use in NIC literature include the ill-availability of relevant data and data quality issues. Furthermore, inconsistencies and biases in the use of data may be found. The above may cause the applicability and credibility of obtained results suffer and in case the results are used as the basis for decision-making the problems may cause misleading decisions to be made. Availability of the data has likely determined data-based NIC research to a large degree and has therefore also affected the obtained results and the understanding of the NIC status quo.

A way to resolve the observed shortcomings is to require closer documentation of the data and data sources used in the research publication phase. If data is well documented then research that builds on well documented sources is able to update previous findings based on the same type of data used in the same way and by doing so ensuring longitudinal comparability, which at this time is also one issue that has been observed to hold challenges.

We want to point out some limitations to this work, first of all research on NIC is a marginal niche in within the otherwise quite abundant research on intellectual capital, therefore the results presented here can hardly be generalized beyond NIC research. While we have tried to ensure that all the most relevant articles are included we want to point out the possibility of having inadvertently excluded some relevant articles, however, we feel that the results are representative of the NIC research literature as a whole. We have not contacted the authors of the previous literature to study their data use any further – this may be an interesting avenue for further research. When choosing articles we have not used a multi-expert based (inter-rater) method, all choices are those of the authors.

Future research about the data-use and data sources of NIC that is needed from the point of view of better understanding the NIC status quo and development includes research into the development of well-functioning measures and indicators for the various NIC issues that the community studies and research that explores the state of NIC in different nations. As there is constant development in the world of intellectual capital, fueled by the ever-expanding new ways of using technology, the measures used to capture the status quo must constantly develop with the times, on the other hand, nations in different

measures and indicators – mapping measure / indicator fit with stage of development would be a fine addition to NIC literature. There is also room for research concerning the connections between the NIC research community and the national data policies.

As an answer to the question "Misled by data?" we say "No". Not misled, perhaps led; and while being led, we must be vigilant so that we are not being misled.

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Knowledge Management and Academic Performance in Indian Public Schools

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A B S T R A C T

Knowledge Management (KM) systems were implemented widely in corporate organizations for past three decades, but there is little research on KM in schools. The key objectives of this study are to identify the major components of School Knowledge Management and analyze the impact of KM in secondary education on academic performance, based on the perception of school teachers. The survey-based study is conducted in government schools of an Indian State. Exploratory Factor Analysis and Binary Logistic Regression methods are used to identify the KM factors and their impact on academic performance. This study identified the processes and enablers of school KM and its impact on academic performance. Academic performance, being mentioned as the primary outcome of School KM has not been empirically tested from a School KM perspective earlier. Knowledge creation, technology infrastructure and teacher's competency are identified as KM variables that can significantly influence the Academic Performance and therefore the schools can initiate policies and methods to improve these vital factors.

Keywords: School Knowledge Management, Academic Performance, Secondary Education, Logistic Regression

1. Introduction

Knowledge Management (KM) is a concept that prominently arose in the 1990s. KM initiatives in organizations primarily target on improved performance, competitive advantage, innovation, organizational learning, process integration and continuous improvement of the organization (Davenport and Prusak, 1998; Hatch and Dyer, 2004; Wiig 2004). KM was important in improving the performance of human resources in corporate organizations, both manufacturing and services. But KM in education is comparatively under-researched especially in schools as, they lagged behind to accept KM as a practice (Chu, 2016a; Supermane and Tahir, 2018). Therefore, this study analyzes KM in education, focusing on the government schools in India. School KM was well defined by Cheng (2015) as a set of relatively new organizational activities that make use of knowledge as an important resource to improve organizational behaviours, collaborative learning, student learning, teaching processes, improved decisions and collegial relationships that enable schools to improve their overall performance.

During 1990s the concept of learning organizations received more attention as a way to restructure educational organizations in terms of better autonomy and improved academic performance (Fullan and

Fullan, 1993; Vandenberg, 1993; Louis 1998; Karsten, Voncken and Voorthuis, 2000). It was identified that rather than implementing planned projects for change, the schools should themselves bring change with each team member contributing to change through learning initiatives (Karsten, Voncken and Voorthuis, 2000; Fauske and Raybould, 2005).In this context KM acts as that management practice whose objective is to enhance the organizational learning process in schools for creating a sustainable innovation system through various processes such creation, storage, sharing and application of knowledge (Firestone and McElroy, 2004). Schools can therefore be also called knowledge organizations where teachers, students, parents and staff form the major stakeholders and the role of teachers as knowledge workers is more significant (Tahir et al., 2013).

The education sector in India can be classified into three levels namely school education, graduation and higher education. There are private schools managed by private stakeholders and also public schools purely organized and managed by the government. A vast majority of the Indian students depend on public education because of low cost and accessibility compared to private schools. As far as the economic and social growth of a nation is concerned, the opportunity and quality of secondary education need to be focused on as they contribute significantly to the social, cultural, moral and technological orientation of an individual (Chu, 2016a). Many international and national organizations have started considering the importance of secondary education for developing a creative and skilful youth.

The EFA Global Monitoring Report 2015 presented by UNESCO, with the theme "Education for all', clearly states that the educational priorities and actions initiated after 2015 would be intended to contribute to the final formulation of 'Sustainable Development Goals' in education. The first goal is stated as follows: 'By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes'. This decision was as a result of observation of outcomes from various assessments conducted at national and international levels on quality of secondary education. It is alarming to find that millions of children struggle to acquire even minimum levels of basic skills, which indicates a lack of planning on educational quality improvement (EFA Global Monitoring Report, 2015). Although the secondary curricula have the potential of providing spaces for exploration and experimentation, they are hardly implemented in the majority of cases. This results in long-term consequences where students lack the pragmatic skills to excel in future.

Now from a national perspective, in India, The Ministry of Human Resource Development (MHRD) has taken a number of initiatives including various Centrally Sponsored Schemes (CSS) to enhance quality of education in 2014. About Secondary Schools (IX-X) under the educational scheme, one of the priorities is to improve the quality of secondary education despite providing educational access to more students in the country. Financial assistance is provided to public schools to improve the physical and

academic infrastructure and also for managing all issues of pedagogy focusing on academic performance through professional development of teachers, teaching methodology, assessment and evaluation methodology, teacher training, research inpedagogy, curriculum design and effective pedagogy.

In this context, it is important to analyze the KM practices in Indian public schools. Therefore, the key objectives are to identify the major factors of School Knowledge Management and analyze the impact of KM in secondary education on academic performance, based on the perception of school teachers. Though academic performance was defined in the context of higher education referring to universities, it is also equally relevant in school education. Academic performance in schools is defined as the display of knowledge or skills of students in schools subjects or any expression used to represent students' scholastic achievement (Adediwura and Tayo, 2007). The first objective is to identify the KM practices followed in the Indian context, as the variables of School KM are identified from the past studies conducted in other geographical contexts. Though a few studies were conducted in the past to identify the scope of KM in schools and its variables, a predictive analysis of the impact of these variables on academic performance of students remains neglected except for the study done by Cheng (2012) in Hong Kong secondary schools that focused on knowledge strategies from a process perspective. Besides, the recent studies conducted on School KM focused on strategic outcomes of KM including school learning capacity, KM leadership, Teacher Competencies, School effectiveness in terms of career development, initiatives for implementation of KM and Capitalising School knowledge (Cheng, 2012; Chu 2016a; Chu 2016b; Shih and Tsai, 2016; Cheng, 2017; Supermane and Tahir, 2018; Hallinger, Liu and Piyaman, 2019), ignoring the impact of KM on academic performance of the students. This study identified the possible processes and enablers of school KM comprehensively involving all the internal dimensions (curriculum standards, teaching process, learning initiatives, collaborative learning, shared culture and leadership support) and its impact on academic performance.

The scope of School KM had only been explored in the Asian context and needs to be researched in European and western context as well. As school education is demanding a rigorous revamp in terms of technology and virtual learning, this study would add value to the implementation of effective KM systems in schools.

2. Literature Review

2.1 Knowledge Management

Knowledge resources are strategic assets that play a significant role in differentiating an entity from competition through the dynamic process of knowledge creation (Drucker, 1966: Nonaka and Takeuchi 1995). In organizations, knowledge is managed through organizational routines, processes, practices

and norms (Davenport and Prusak, 1998). Gartner Group (1998) defined KM as a discipline that promotes an integrated approach to identifying, capturing, evaluating, retrieving, and sharing all of an organization's information assets. The KM processes such as creation, generation or acquisition support the management of explicit knowledge and enhance organizational learning (Firestone and McElroy, 2004; Jain and Moreno, 2015). Lee and Choi (2003) had defined that KM factors include enablers, processes and organizational performance. KM process represent basic operations of knowledge, whereas KM enablers are influencing factors that are necessary to provide the infrastructure to increase the efficiency of KM (Lee and Choi, 2003).

In the case of corporate organizations, KM inside and outside the organization's boundaries contributed to the value chain with the purpose of achieving corporate objectives efficiently (Davenport 1994; Nonaka and Takeuchi, 1995; Nonaka and Teece, 2001; Alavi and Leinder, 2001; Drucker 2001; Dalkir, 2005; Chen and Chen, 2006; Magnier-Watanabe and Senoo, 2008; Shakerian, Dehnavi and Shateri, 2016; Lim et al., 2017). KM is also identified to be significant in the public sector contributing to effective policymaking and better service delivery (Cong and Pandya, 2003; Reige and Lindsay, 2006; Pee and Kankanhalli, 2016). Rapidly evolving technology has paved the way for innovations, which also depended on KM in organizations both inter-and intra organizationally (Obeidat, Al-Suradi and Tarhini, 2016). Sallis and Jones (2002) explained how educational institutions can benefit from KM as the business of education itself is knowledge. Education again can be categorized from primary education to higher education and universities, where the KM practices vary with differences on the institutional objectives. Schools as learning organizations were focused seriously because the ideology reoriented the nature of learning and learning outcomes creating a broader impact on society (Giles and Hargreaves, 2006). Though the idea of schools becoming a learning organization is interesting, schools still have many obstacles such as improving internal communication, regular review of learning experiences, better leadership, addressing the local environment and considering the interests of clients and other stakeholders (Karsten, Voncken and Voorthuis, 2000; Fauske and Raybould, 2005; Tahir et al., 2013).This requires the implementation of systematic KM process to streamline the learning initiatives.

2.2 KM in Schools

KM systems were implemented widely in corporate organizations since the late 1990s, but research on the integration of knowledge practices in schools are few (Fullan, 2002; Lee, Lu, Yang, 2010; Chu, 2016b; Supermane and Tahir, 2018).The role of internet technology and the increasing digitization have increased the complexity of educational practices which made it critical for school organizations to introduce KM (McKenzie, Truc and van Winkelen, 2001; Richard, 2001; Kuo, 2003). School KM was well defined by Cheng (2015) as a set of relatively new organizational activities that make use of knowledge as an important resource to improve organizational behaviours, decisions, student learning,

teaching processes and collegial relationships that enable schools to improve their overall performance. KM and conversion process between tacit and explicit knowledge illustrated by SECI model (Nonaka and Takeuchi, 1995) which can be applied in any industry is also relevant in managing the schools. SECI model explains a set of processes such as Socialization, Externalization, Combination and Internalization, which results in effective creation, transfer, storage and application of organizational knowledge. Joia (2002) conducted study in schools using the SECI to evaluate the knowledge creation and sharing process and their impact on skill development of teachers. The Socialization process enables the creation of new tacit knowledge when internalized knowledge is shared. The externalization helps in converting this tacit knowledge to explicit knowledge through practices of lesson plans, classroom sessions and other learning activities. The documentation of these activities helps in the codification of knowledge and the knowledge embedded in the structural capital get internalized in the next phase. Several factors enable the effectiveness of KM in schoolssuch as leadership support, sharing culture, competency of people and technology infrastructure (Rodrigues and Pai, 2005). Leung (2010) found that leadership and change management, strategies and goals, organizational learning, technical support, school culture and trust among teachers are the critical factors affecting KM in the school context. School leaders need to know their school's overall intellectual capital, not only on an individual level, but about the whole school structure and culture and take strategic initiatives to improve the academic performance (Hargreaves, 1999; Tahir et al., 2013; Chu,2016b). It is the responsibility of the leader(principal) to assess the staff, existing practices and infrastructure before initiating KM in schools (Chu, 2016a; Chu, Wang and Yuen, 2011). Newman (2000) explains five components as function of 'school capacity', namely, individual teacher knowledge, skills and dispositions, professional learning community (across teachers), program coherence, technical resources, and principal leadership.

Teachers are knowledge workers and can therefore act as sources of knowledge creation. The existing pedagogy involves a tinkering process where teachers undergo a'trial and error'activity in their classroom. When such tinkering becomes more systematic, more collective and explicitly managed, it is transformed into knowledge creation and generates learning, even if successful knowledge transfer does not occur (Hargreaves, 1999). Another important phase of KM in school is knowledge sharing, as it can transform the teaching profession inintellectual and moral aspects also in developing a collegial knowledge culture in schools (Fullan, 2002; Chu, 2016b). This is possible only if organizations have a sharing culture that promotes a collaborative environment for discussions. However, this is not prevalent in many schools (Harris, 2001) and management intervention and supportive leadership may be necessary to enable mutual support among the teachers to learn and grow. A collaborative environment for teachers to share ideas and provide mutual support offers the potential benefitsof raising teacher confidence, facilitating teacher learning and embedding improvements in professional practice within the classroom (Rhodes and Beneicke, 2002). But it is the sole responsibility of teachers

to ensure their teaching effectiveness. Teachers should regularly update themselves with new information and enhance their knowledge. Benefits of KM based on teachers perceptions include facilitating students'learning, understanding students capability, gaining practical knowledge, facilitating teacher collaboration for knowledge creation, nurturing a sharing culture in the school, creating new knowledge and keeping abreast of new knowledge, compiling expertise from teachers and better document management (Azman, 2003; Chu, 2016). Rodriguez and Pai Model (2005) on KM strategies for school education include eight variables namely: Leadership and Support, Technology and Infrastructure, Knowledge Creation, Acquisition and Learning, Dissemination and Transfer, Application and Exploitation, People Competency and Sharing Culture. These eight dimensions include most typical KM enablers and processes. Chu, Wang and Yuen (2011) used this model to explore the factors of KM implementation in a secondary school in their qualitative study. Compared to the private sector, public sector organizations are challenged by the knowledge hoarding generated by the conventional mind-set of people and hence need to focus on improving organizational culture that supports knowledge creation (Joshi, Jamal and Chawla, 2013; Jain and Jeppesen; 2013). KM in public schools also faces the same challenges. But there are several benefits that public sector organizations can acquire through ideal KM practices which can also be effectively applied in education. Some of them are clearly defined by Cheng (2015) such as improving organizational behaviours, decisions, better pedagogy, student learning, etc. Overall challenges that are faced by public schools in developing KM include the technological limitations in school systems, the lack of time for teachers to facilitate outside the classroom, and budgetary constraints (Edge, 2005).

Cheng (2012) had already identified knowledge retrieval, utilization and sharing as the predictive factors for individual learning capacity and school learning capacity. Applying KM makes the KM processes such as creation, sharing and application create a sound foundation for academic performance of students and performance in other areas and for the school's development as a whole (Zwain, Lim and Othman, 2012; Cheng, 2013; Shih and Tsai, 2016). Shih and Tsai (2016) combined both processes and enablers as predictors of School KM. But the impact of KM on academic performance was not empirically tested in this study; instead, it focused on the strategic outcome such as perceived school effectiveness of career. Cheng (2017) further explored how KM can generate human capital in school organizations. Supermane and Tahir (2018) researched how KM can improve teaching quality and learning initiatives. This study is indeed a shift from studies focusing on strategic outcomes to immediate outcomes that can significantly contribute to strategic goals. Another immediate impact of KM that was not empirically tested is academic performance. This was rather considered to be obvious to achieve, but it is important to explore the effect of the KM processes and enablers on academic performance as it would help the school organizations to improve on every level of KM initiative and make changes wherever required.

Adediwura and Tayo (2007) defined academic performance in schools as the display of knowledge or skills of students in schools' subjects or any expression used to represent students' scholastic achievement. Academic performances are usually assessed or rated based on examinations scores/report card grades (Adediwura and Tayo, 2007; Brackett et al., 2012). The attributes 'grades' and 'attendance' are relevant for predicting the end of the year academic outcomes of student performance and these grades are based on analysis of discipline and elaborate written communication which was contemporarily improvised include mathematical and aptitude skills (Marks and Louis,1997; Luiselli et al., 2005; Fernandes et al., 2012). Though grades are used to objectively evaluate academic performance, the subjective evaluation of the teachers are also well correlated with this objectivity. Meissel, Meyer, Yao and Rubie-Davies (2017) explored the relations between standardized tests and teachers' judgments about student scholastic achievement and identified a strong correlation between the two measures.

3. Methodology

The study is empirical and the data is collected from the secondary school teachers to analyze their perceptions of existing KM practices. The study is done with the support of a structured questionnaire which included fivepoint Likert scale questions based on KM variables identified from past literature. The variables were identified from the qualitative research done by Chu, Wang and Yuen (2011) on KM in a secondary school at Hong Kong using the Rodriques and Pai Model. The authors of this study had indicated the scope of further survey-based studies on these KM variables in a different context for better clarity of learning outcomes in schools. Moreover, the model has comprehensively identified all the major KM processes and enablers that are significant to secondary education from teacher's perspective. Some questions and statements were adapted from qualitative studies of Cheng (2015) on KM in school education. Table 1 illustrates the variables formulated from existing works of literature on teaching and education.

Table 1: Variables of School Knowledge Management

Item	Variables
1	Curriculum standards and quality (Chu, 2016b)
2	Management and leadership support (Hargreaves 1999; Harris,2001; Tahir *et al.*,2013)
3	Principal's Coordination of activities (Harris,2001)
4	Use of Information and Communication Technology (ICT) (Haughey, 2006).
5	Freedom to develop lesson plans (Newmann,2000)
6	Regular update of subject knowledge (Tahir *et al.*,2013;Petrides and Nodines, 2003)
7	Seminars, Workshops and Trainings (Tahir *et al.*, 2013)
8	Support of fellow teachers (Rhodes and Beneicke, 2002; Azman, 2003)
9	Innovative methods in teaching (Haughey,2006)
10	Regular feedback from students (Chu, 2016).
11	Collaborative environment for open discussion (Dixon, 2000; Paraponaris *et al.*, 2015; Chu, 2016a).
12	Access to alumni (Chu, 2016b).
13	Technology oriented evaluation and reporting (Haughey, 2006; Chu, 2016).
14	Evaluation of teaching methodology (Petrides and Nodines, 2003)
15	Teacher's self-satisfaction on their teaching skills(Newmann,2000)
16	Support for new teachers (Rhodes and Beneicke, 2002).
17	Free Internet access (Paraponaris *et al.*, 2015)
18	Data-driven decisions and interventions by principal (Haughey,2006)
19	Support of administrative staff (Chu, 2016).
20	Appraisal of student suggestions (Paraponaris *et al.*, 2015)
21	Principal's support for teachers (Hargreaves, 1999; Tahir *et al.*, 2013).

The scope of the study is limited to the secondary school teachers of government schools in the Kasargod district of Kerala state. Kerala is the southern state of India with high Human Development Index (HDI) and good literacy rate compared to other Indian states. The district has a total of 90 Government Higher Secondary Schools with an average of 7 secondary school teachers in each school. The list of these 90 schools were taken from the official website of Kerala Government. Out of these 40 schools are rural (44%), 32 schools semi-urban (35%) and 18 schools are urban (21%). But out of 40 rural schools, 10 schools were excluded in the study as they are geographically located in remote areas and are not easily accessible for the researchers. A proportionate stratified random sampling method is used where 28 schools were identified as the stratified sample (13 rural schools, 11 semi-urban schools and 4 urban schools). The random number generator is used in the list of the schools to create the final list for the survey. But due to practical difficulties of getting official approval, we could collect data from 18 schools only. Therefore, a stratified random sample of 175 respondents from 18 Government Schools of Kasargod district constituted the study. The study is purely based on the perception of school teachers on School KM. The researcher personally visited the schools, distributed and collected the questionnaires from teachers.

4. Data Analysis

It was important to identify the key factors of KM in secondary education based on the interrelated variables and therefore, factor analysis was conducted using SPSS v.20. A Principal Component Analysis with varimax rotation was adopted. Exploratory factor analysis requires certain basic

assumptions to be satisfied namely multivariate normality and sampling adequacy (Bryant and Yarnold, 1995; George and Mallery, 1999; Lattin, Carroll and Green, 2003). The KMO Bartlett test includes Bartlett test of sphericity that measures the multivariate normality of variables in addition to analyzing whether the correlation matrix is an identity matrix (i.e., a spherical set of multivariate data) (George and Mallery, 1999; Lattin, Carroll and Green, 2003). The Kaiser-Meyer-Olkin (KMO) test can measure whether the sample size is adequate for conducting factor analysis (George and Mallery, 1999).

The KMO measure of sample adequacy is .654 which is greater than the acceptable threshold of 0.5. Therefore, the sample is adequate for exploratory factor analysis (Table 2). As the Bartlett's Test of sphericity is highly significant ($p < .05$), the correlation matrix is identical and thus suitable for factor analysis.

Table 2: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.654
Bartlett's Test of Sphericity	Approx. Chi-Square	962.354
	df	210
	Sig.	0

Chu, Wang and Yuen (2011) explored the eight KM variables proposed by Rodriguez and Pai (2005) in their qualitative study on a secondary School in Hong Kong. The sub-variables which were further identified (Table 1) from literatures were analyzed in Indian schools and therefore it is important to explore the key factors in the new context. The Exploratory Factor Analysis (Table 3) using Principal Component Analysis with varimax rotation also extracted eight factors, which were conceptually identical to variables of Rodriguez and Pai's (2005) model.

Table 3: Exploratory Factor Analysis

Item	Factor	Variables included in the factor	Factor Loading	Eigen Value	Variance explained %	Cumulative variance explained %
1	Acquisition and learning	Innovative method of teaching	0.771	4.669	11.304	11.304
2		Support for new teachers	0.756			
3		Freedom to develop lesson plans	0.669			
4		Collaborative environment for open discussion	0.641			
5	Dissemination and Transfer	Support of fellow teachers	0.955	2.488	10.603	21.907
6		Regular feedback from students	0.899			
7	Leadership and Support	Principal's support for teachers	0.943	2.044	10.453	32.36
8		Principal's Coordination of activities	0.921			
9		Management and leadership support	0.506			

10	Application and Exploitation	Appraisal of student suggestions	0.764			
11		Curriculum standards and quality	0.682			
12		Evaluation of teaching methodology	0.662	1.503	10.111	42.472
13	Knowledge Creation	Use of ICT	0.803			
14		Regular update of subject knowledge	0.747			
15		Seminars, workshops and Trainings	0.508	1.431	8.754	51.226
16	Sharing Culture	Access to alumni	0.839			
17		Support of administrative staff	0.837	1.237	8.202	59.428
18	Technology Infrastructure	Data driven decisions and interventions by principal	0.764			
19		Free internet access	0.725	1.153	7.594	67.021
20	People Competency	Technology oriented evaluation and reporting	0.692			
21		Teacher's self-satisfaction on their teaching skills	0.498	1.013	6.974	73.996

The eight factors, namely: Acquisition and Learning, Dissemination and Transfer, Leadership and Support, Application and Exploitation, Knowledge Creation, Sharing Culture, Technology Infrastructure, People Competency together contribute 73.996 percent of cumulative variance to the study. The remaining 26 percent are contributed by other factors.

A binary logistic regression was applied to estimate the impact of KM in Government Schools on academic performance of the students. The academic performance of students is the dependent variable and the independent metric variables are Acquisition and Learning, Dissemination and Transfer, Leadership and Support, Application and Exploitation, Knowledge Creation, Sharing Culture, Technology Infrastructure, People Competency. The hypotheses for the logistic regression can be stated as follows:

H0: The School KM factors do not have a significant impact on Academic Performance.

H1: The School KM factors have a significant impact on Academic Performance.

The binary logistic regression model is as follows: $\text{Ln}[p/(1-p)] = \alpha + \beta x + \varepsilon$, where p is the probability that the event occurs. The p/(1-p) is the odds ratio which is the ratio of the probability of an event occurring to the probability of the event not happening. The α is the Y intercept; x is a set of predictors; ßs are regression coefficients.

A 5-point Likert-scale with questions ranging from strongly disagree (1) to strongly agree (5), was used to measure the opinion of teachers on the sub-variables (Table 1) of KM in schools. The reliability of the questionnaire is tested for the KM Enablers and KM Processes with a sample of 30 respondents and the Cronbach's alpha values are .813 and .794 respectively. Since the reliability is 81% and 79% respectively, which is above the acceptance level of 70%, the questionnaire was considered reliable.

The maximum likelihood estimation procedure is used to estimate the binary logistic regression model.

Since the p-value is 0.007(<.05), it proves that overall model was statistically significant. This indicated that the full model was a better predictor than a model with the intercept alone. The model is statistically reliable in distinguishing KM practices that can create an improvement in academic performance and those that cannot. It is required to test the basic assumption of evaluating the goodness-of-fit of the model and the Hosmer –Lemeshow Test (Table 4) is used for it (Hosmer and Lemeshow, 2000).The resulting test statistic was not statistically significant ($\chi 2$ value 14.401 and, p-value 0.072); therefore, the null hypothesis (H0: There is no difference between the observed and the model predicted values on academic performance) was rejected. This implied that the model fits the data well at a statistically, acceptable level.

Table 4: Hosmer and Lemeshow test

Step	Chi-square	df	Sig.
1	14.401	8	0.072

Another test statistic (Table 5), the Nagelkerke R2, indicates how useful the explanatory variables were in predicting the response variable. The Nagelkerke R2, which varies from 0 to 1, was 0.256, indicating the model was useful in predicting the impact of KM practices on academic performance.

Table 5: Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	81.361	0.113	0.256

The logistic regression coefficient, standard error, Wald's chi-square, p-value and odds ratio for each of the predictors are shown in Table 6. The Wald and associated p-value is used to test the statistical significance of each coefficient (β) in the model (Field, 2007), which represent the KM variable.

Table 6: Logistic Regression

	B	S.E.	Wald	df	Sig.	Exp(B)
Acquisition and learning	-0.783	0.573	1.867	1	0.172	0.457
Dissemination and transfer	-0.599	0.739	0.657	1	0.418	0.55
Leadership and support	-0.097	0.947	0.01	1	0.919	0.908
Application and Exploitation	-1.422	0.627	5.144	1	0.023	0.241
Knowledge creation*	0.024	0.776	0.001	1	0.975	1.025
Shared culture	-0.818	0.443	3.404	1	0.065	0.441
Technology infrastructure*	1.442	0.876	2.708	1	0.1	4.23
People Competency*	0.005	0.145	0.001	1	0.973	1.005
Constant	5.396	3.734	2.088	1	0.149	220.462

Note: '*" indicates variables with odds ratio greater than 1

The results indicate that the application and exploitation of knowledge is significant to academic performance in schools (p-value .023< .05). Hence the Ho is rejected for this KM process. Other factors are currently not significant in improving the academic performance of students. This result is purely based on the perception of school teachers. Considering the Odds ratio (Exp (B), in Table 6 it is observed that the Exp (B) of Knowledge Creation (1.025), Technology Infrastructure (4.230) and People Competency (1.005) are greater than 1 and it indicates that a slight increase in value of these variables can result in improving academic performance by 1.025 times, 4.23 times and 1 time respectively. This indicates that these KM practices can probably improve the academic performances in public schools to a greater extend compared to other parameters of KM. Notably, the technology infrastructure plays a significant role in improving the KM practices for better academic performance of students.

5. Discussions

The existing studies on KM in education reveals many factors that are significant in improving the academic quality such as leadership support, collegial relationship among the teachers, organizational behaviour, teaching methodology and student learning (Chu, Wang and Yuen, 2011; Cheng, 2015; Chu, 2016b; Cheng, 2017). But this study has identified the processes of KM that enhance learning along with the enablers that significantly contribute in the execution of the knowledge processes. Out of the eight factors Acquisition and Learning,Knowledge Creation, Dissemination and Transfer, Application and Exploitation are the KM processes (Nonaka and Takeuchi, 1995; Cheng, 2012). Leadership and Support, Sharing Culture, People Competency and Technology Infrastructure are the knowledge enablers (Chu, Wang and Yuen, 2011). The knowledge facilitators in organizations that positively enable the KM processes such as Organisational Culture, Organisational structure, Technology Infrastructure, Human Resource Management processes, etc. are also referred to as knowledge enablers (Lee and Choi, 2003). Among the KM factors, Acquisition and Learning process involve the methods used by teachers in searching knowledge and learning; Knowledge Creation involve workplace knowledge creation through ICT and initiatives to develop new knowledge; Dissemination and Transfer refers to facilitations of transferring knowledge and information within the organization; Application and Exploitation involves employee's attitudes and requirements for applying knowledge and putting it into practice (Rodriques and Pai, 2005; Chu, Wang and Yuen, 2011). Table 3 clearly illustrates the various School KM activities that are initiated for the above processes. These processes are important in the SECI model for KM in Schools. When Acquisition and Learning contribute to the process of socialisation, the externalisation of knowledge is initiated by Creation, Dissemination and Transfer. Application and Exploitation contribute to Codification and Internalization of Knowledge.

It was identified from the analysis that the Technology Infrastructure plays a significant role in improving the academic performance through KM. The existing infrastructure is not found to be

satisfied as the relationship of Technology Infrastructure to academic performance is not significant. Although the schools are equipped with internet access and Use of ICT, the extent to which they are being utilized to improve the academic quality is not sufficient. The studies conducted in other Asian countries like China, Malaysia, Taiwan and Japan clearly states the contribution of technology in education, as the development of internet technology has increased the scope of KM in education (Richard, 2001; David, 1999; Kuo, 2003; McKenzie, Truc and van Winkelen, 2001; Chu, Wang and Yuen, 2011; Cheng 2017). This is a challenge to public schools compared to private schools in India.

People's Competency is an inevitable factor in education. Though the recruitment of teachers in public schools is conducted systematically, a consistent development of skill is lacking as teaching is always limited to a regular tinkering process (Hargreaves, 1999). In this study the competency is measured by analysing how effectively the teachers use technology for evaluation and to the level of self-satisfaction they have on their teaching skills. Teachers should be well aware of their effectiveness and should always strive to develop their teaching skill (Chu, 2016). Personal strategies of teachers also tend to influence the knowledge culture within schools. Thepersonal strategies can manipulate the way people seek and tolerate new knowledge, and how ideas are valued and used (Hamid, 2008). Higher levels of personal knowledge strategies are also likely to result in a stronger belief in the quality process of decision making in schools and teachers are required to develop their learning competency in order to acquire subject knowledge and pedagogical knowledge when implementing the new curriculum. (Cheng, 2012; 2015).

When the teachers effectively use the technology infrastructure to update the developments, the regular tinkering process can be made more creative, systematic and explicit resulting in Knowledge Creation (Hargreaves, 1999). This can be enhanced through participation in seminars, workshops and conferences (Tahiret al., 2013). The study reveals that knowledge creation process can definitely contribute to academic performance of students. Knowledge creation in this study actually refers to creation of new knowledge through learning initiatives and use of information and communication technology for regular updates.

6. Conclusion

As far as the economic and social growth of a nation is concerned, the opportunity and quality of secondary education need to be focused as it contributes significantly to the social, cultural, moral and technological orientation of an individual. As such orientation can be greatly brought through effective KM practices; this study reveals an eye-opening reality of the impact of KM practices on academic performance in public schools in India. Some of the significant contributions of the study include:

1. Out of the School KM factors, Acquisition and Learning, Knowledge Creation, Dissemination and

Transfer, Application and Exploitation are the KM processes, and Leadership and Support, Sharing Culture, People Competency and Technology Infrastructure are the KM enablers. Although these variables were explored in other geographical contexts, it was not explored in the Indian context so far. Except for the study conducted by Shih and Tsai (2016) other recent studies focused on one or few of KM processes or enablers. But this study comprehensively identified all major factors of school KM, both processes and enablers.

2. Although the public schools are equipped with internet access and Use of ICT, the extent to which they are being utilized to improve the academic quality is not sufficient. Knowledge Strategies that can effectively utilize the technology infrastructure through KM systems in schools are mandate for better academic outcome.

3. Apart from the schemes implemented by national and international agencies to improve the competencies and skills of teachers, personal knowledge strategies should be initiated by teachers for self-evaluation and individual learning to increase their competency.

4. When the teachers effectively use the technology infrastructure to update the developments, the regular tinkering process can be made more creative, systematic and explicit resulting in Knowledge Creation, contributing to academic development of students.

5. Academic performance, being mentioned as the primary outcome of School KM has not been empirically tested from a School KM perspective earlier. The knowledge creation, technology infrastructure and teachers competency being identified as KM factors that can influence the Academic Performance, the schools can initiate policies and methods to improve these vital factors.

It was interesting to note that the key KM factors that predicted higher impact on academic performances were enablers such as technology infrastructure and people competency. The knowledge creation process needs to be revamped with dissemination and application of knowledge, which would undoubtedly enhance the academic quality and school effectiveness (Shih and Tsai, 2016). Moreover, knowledge creation can pave way to innovation and creativity. It is high time to remove the dilemma of what is important and how to prioritize based on the changing scenario of education. Though Fullan (2002) has stated that sustainability depends on system wide efforts at the level of schools, communities and districts, as well as radically more enlightened policies and incentives at the level of the state and the state took up various initiatives to this regard, the outcome is yet to materialize.

The study is limited to the government schools of Kasargod district in Kerala state. Kerala is an Indian state with high Human Development Index (HDI), where education is given prime importance compared to other states of India. Therefore, the sample could be an ideal representative for the study, though the results could not be generalized fully in Indian context. But the curriculum and practices of education followed in all the states are similar and hence not fully limited in scope. Future studies can

better focus on other districts of the country on the same parameters. From an international perspective the findings of this study can be generalised in Asian context, as this study was inspired by School KM conducted in Iraq, China, Thailand and Malaysia (Zwain, Lim and Othman, 2012; Cheng, 2013; Chu, 2016; Shih and Tsai, 2016; Supermane and Tahir, 2018) and further tested in Indian context. Future researches need to explore the scope of KM processes and enablers in European and western contexts. Besides the study is limited to the subjective evaluation of teachers on KM practices existingin secondary education and teachers are the best respondents for this study, as they are the key knowledge workers directly involved in School KM and also in the evaluation of academic performance of students. This study also limits to identifying the impact of KM on academic performance. There are several other aspects of school education such as pedagogy, teacher skill development and leadership which can be explored based on KM practices. Besides, feedback from other stakeholders such as students' parents and the administrativeauthorities in education development on improving the KM practices can also enhance the future research.

The future studies can be extended to the perception of other stakeholders of schools including students, parents, administrators and the public. Approach of school KM also need to be researched in the European and western contexts. Practically school KM factors can be used for the implementation Knowledge Management Systems (KMS) in school in future to streamline all the knowledge activities effectively. This is highly relevant in the context where teaching and learning are becoming virtual and more technology orient.

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