

# The mediation role of the PMO in the transfer of knowledge between projects – a case study of five PMOs

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## Abstract

**Purpose:** This article describes advances in the study of knowledge transfer (KT) in project-based organizations (PBOs). Project management offices (PMOs) have both a moderation role and a mediation role to play in KT between projects. In order to improve KT between projects, this paper explores the mediation role of the PMO in the transfer of knowledge with different levels of articulability. The aim is to improve the usability of transferred knowledge.

**Design/methodology/approach:** The case study method was used to investigate KT in five-divisional PMOs within a multinational engineering and project management PBO. Fifteen semi-structured interviews were conducted and the results were analysed using ATLAS.Ti (a computer-aided qualitative data analysis software).

**Findings:** The findings show that it is the way in which the PMO structures knowledge management (KM) infrastructure and processes, which determines the success of its mediation role in the transfer of tacit and explicit knowledge between projects. The articulability of knowledge influences the PMO's mediation role and the PMO's mediation role in turn improves the usability of knowledge, thereby creating a conducive environment for a competitive advantage.

**Originality/value:** This study offers a framework to assist scholars and practitioners to understand the mediation role of the PMO in the transfer of knowledge with different levels of articulability within the projects environment. Such understanding can improve the usability of transferred knowledge, thereby creating a competitive edge for a PBO. The study shows that the PMO can be used as an instrument for KT between projects, a theme that was not found in literature. The paper thus offers new empirical information.

**Keywords:** Knowledge articulability, Knowledge management, Knowledge transfer, Knowledge usability, Mediation role of project management offices:

## 1. Introduction

Literature backs the notion that effective knowledge transfer (KT) leads to a competitive advantage (Argote *et al.*, 2000; Argote and Ingram, 2000; Bellini *et al.*, 2016; Susanty *et al.*, 2012). However, most project-based organizations (PBOs) are yet to take full advantage of this concept to improve their project management and organizational success. This is because most project personnel often focus on the short-term project objectives, and neglect the secondary objectives that are vital in the achievement of long-term project and organizational objectives. They often fail to see the capturing and transferring of project knowledge across

projects as a priority, or as important for long-term benefits (Van Waveren *et al.*, 2014). This shortcoming has prompted the notion that PMOs could facilitate the transfer of knowledge between projects to improve its usability (Liu and Yetton, 2007; Julian, 2008; Sokhanvar *et al.*, 2014; Tshuma *et al.*, 2018). This helps PBOs to attain a competitive advantage (Argote and Tepper, 2016; Chen *et al.*, 2009; Fernie *et al.*, 2003; Haas and Hansen, 2005; Shenhar *et al.*, 2001) needed for growth and sustainability (Gold *et al.*, 2001; Todorović *et al.*, 2015). Knowledge is a key asset that aids PBOs in achieving their strategic objectives (Martinez Sanz and Ortiz-Marcos, 2019). It is transferred informally through informal structures, formally through defined structures and processes or both (Tshuma *et al.*, 2018). Both forms are important for effective, efficient and successful KT. However, when formal structures like the project management office (PMO) are established to facilitate the transfer of knowledge between projects, their mandate can be extended from mediating the formal transfer of knowledge to also include the setting-up of knowledge management (KM) processes and infrastructure that encourages and improves informal transfer of knowledge. A PMO can play both a mediating (facilitating) role and a moderating role in the transfer of knowledge between projects (Tshuma *et al.*, 2018).

Since every project is unique and temporary in nature (Dvir *et al.*, 2006; Aubry and Hobbs, 2010; Lindner and Wald, 2011; Bell *et al.*, 2016; Project Management Institute, 2017; Nicholas and Steyn, 2021), project portfolios are bound to produce high volumes of knowledge (Tshuma *et al.*, 2018). This knowledge ranges from matters related to project management to technological, and entrepreneurial knowledge (Kasvi *et al.*, 2003; Van Waveren *et al.*, 2014; Wei and Miraglia, 2017), and can be either be explicit, tacit or both (Anand *et al.*, 2010; Blumenberg *et al.*, 2009; Dhanaraj *et al.*, 2004). For this knowledge to be turned into a competitive advantage, it needs proper coordination and management. PMOs are therefore thought to be catalysts and/or special purpose vehicles that could process, arrange and manage the knowledge so that it is aligned to the projects' and organizational needs (Tshuma *et al.*, 2018).

### **1.1 Project management offices (PMOs), knowledge transfer (KT) and knowledge articulability**

Project management becomes increasingly difficult when there are multiple overlapping projects, resulting in a need for enhanced governance controls and KM to increase success rates. A PMO, considered as a centralized unit to oversee project management, is often utilized to facilitate KM. Although PMOs are often perceived as operational overhead expenses (Hobbs and Aubry, 2007; Pinto *et al.*, 2010), one of the most popular ways to initiate and accentuate structure and planning in a PBO is still to establish a PMO (Jerbrant, 2014). This research further argues that PMOs could help facilitate the transfer of knowledge between projects for PBOs to improve knowledge usability and achieve a competitive advantage (Argote and Ingram, 2000; Argote and Tepper, 2016). The fact that most project personnel are overwhelmed and pressed for time in their respective projects, forces them to neglect KT (Van Waveren *et al.*, 2014) and makes it difficult to successfully transfer all knowledge needed for organizations to attain a competitive advantage. Therefore, the establishment and assignment of the KT function to the PMO could help PBOs close this gap and remain sustainably competitively (Lubit, 2001). This is because a sustainable competitive advantage is increasingly found to be in knowing how to do things, rather than in having special access to resources and markets. Knowledge and intellectual capital have become both the primary centres of fundamental competencies and the key to superior performance (Lubit, 2001).

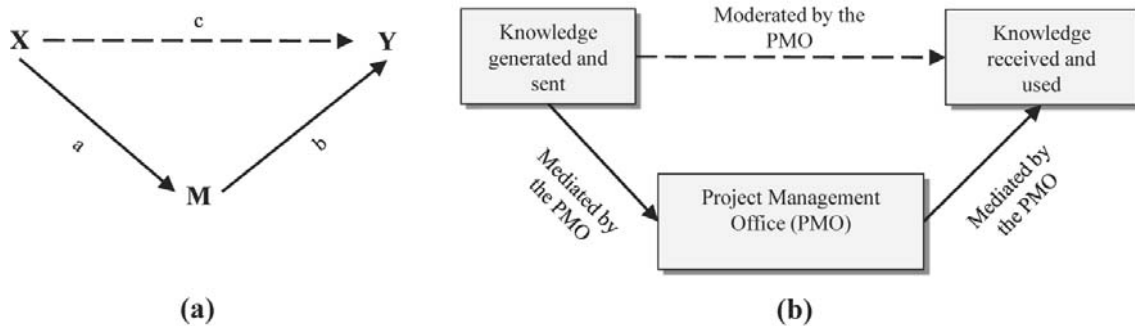
The KT process is well researched and comprises knowledge goals definition, identification, acquisition/capturing, transformation, storing, development/codification, alignment, dissemination, transfer and application (Knowledge Research Institute, 2000; Szulanski, 2000). It is one of the strategic functions of the PMO (Argote *et al.*, 2000; Argote and Ingram, 2000), and the process through which one unit is affected by the experience of another (Argote and Ingram, 2000) or the exchange of systematically organized information and skills between entities (Duan *et al.*, 2010). Knowledge and expertise are assets to any organization and a critical source of a competitive advantage in PBOs (Argote and Ingram, 2000; Chen *et al.*, 2009; Lubit, 2001; Shenhar *et al.*, 2001). Despite the realization of remarkable increases in performance through KT, successful KT is difficult to achieve and requires a specialized approach or concerted effort (Argote *et al.*, 2000) for PBOs to achieve competitive advantage. KM infrastructure and processes are the major elements that drive KT (Cummings and Teng, 2003; Jafari and Charband, 2016). KM infrastructure are the enablers and environment to develop knowledge and stimulate the KM processes within the organization. It includes organizational culture, organizational structure, individuals, and information and communications technology (ICT) (Gold *et al.*, 2001). KM processes include creation, capturing, transferring and reusing of knowledge (Owen *et al.*, 2004; Sokhanvar *et al.*, 2014).

Knowledge articulability is the ability of the source to transfer knowledge in a clearly expressed way (Prinsloo *et al.*, 2017), or the extent to which knowledge can be articulated – verbalized, written or drawn (Bresnen *et al.*, 2003; Cummings and Teng, 2003; Fernie *et al.*, 2003). Cummings and Teng (2003) state that KT success increases as the articulability of knowledge increases, since articulable knowledge is more easy to transfer than less-articulable knowledge. Knowledge usability therefore increases as more articulate knowledge is transferred. It is therefore, what the PMO does to knowledge with different levels of articulability that determines the usefulness or extent of use of the knowledge (Tshuma *et al.*, 2020). Projects produce knowledge with different levels of articulability (Fernie *et al.*, 2003; Tshuma *et al.*, 2018). They produce explicit knowledge (systematic and formal) and tacit knowledge (embedded in people's expertise, experience, instinct and know-how) (Blumenberg *et al.*, 2009; Dhanaraj *et al.*, 2004; Fernie *et al.*, 2003; Malone, 2002; Mezghani *et al.*, 2016), both of which are crucial in the creation and re-use of knowledge, and contribute positively to the projects' success (Owen *et al.*, 2004). Codification and personalization are the two main KM strategies used by PBOs (Fong and Kwok, 2009). In most instances, the transfer of tacit knowledge requires people (personalization), while explicit knowledge is best transferred through tools and systems (codification) (Carrillo *et al.*, 2006; Karlsen and Gottschalk, 2004; Kasvi *et al.*, 2003; Pretorius and Steyn, 2005). The articulability (moving from tacit to explicit knowledge) of knowledge influences the PMO's mediation (facilitation) role. PMOs are therefore expected to develop a strategy through availing the respective KM infrastructure and processes of handling knowledge with different levels of articulability to increase the success of KT. Moreover, the PMO's mediation role should significantly improve the usability of knowledge – a recipe for successful KT and an important step in attaining a competitive advantage.

## 1.2 The mediation role of a PMO

As shown in Figure 1a, *mediation* (facilitation) is a process that seeks to identify and explain underlying mechanisms and processes that connect an observed relationship between an independent variable (X) and a dependent variable (Y) through the inclusion of a hypothetical variable (M), known as a mediator/intermediary/intervening variable (Aguinis *et al.*, 2017).

X affects Y both directly (path c) and indirectly (combination of paths a and b) through the mediator M. The direct effect of X on Y as shown in [Figure 1b](#) (the dotted line) implies a *KT moderation* (supporting) role of a PMO that is beyond the scope of this investigation. The investigation focuses on the indirect effect of X (where knowledge is generated and sent) on Y (where knowledge is received and used) when facilitated, i.e. *mediated* by M, the PMO. The mediation process serves to facilitate, adapt, improve and clarify/explain the knowledge that is transferred.



**Figure 1.** Graphic representation of the mediation model

### 1.3 Objective of the study

The role of PMOs in PBOs and KT are well-researched topics in literature, and effective KT is generally viewed as central to the success of PBOs ([Argote et al., 2000](#)), with a few exceptions. PMOs mediate/facilitate the transfer of knowledge between projects ([Spalek, 2004](#); [Dietrich et al., 2010](#); [Tshuma et al., 2018](#)) and are well placed to set up KM infrastructure and processes to stimulate the transfer of knowledge between projects. However, to the best of our knowledge, no previous empirical studies have been conducted on the mediation role of the PMO in the transfer of knowledge between projects. The findings of this study assist PBOs to successfully transfer knowledge between projects, thereby creating a competitive advantage ([Argote et al., 2000](#); [Argote and Ingram, 2000](#); [Bellini et al., 2016](#); [Susanty et al., 2012](#); [Tshuma et al., 2018](#)) that is mandatory for doing business in highly contested spaces.

The first section of this article introduces the study and draws an overall portrait of the existing literature in relation with the research objective, while a conceptual model of the PMO's mediation role in the transfer of knowledge, with different levels of articulability and the usability thereof, is presented in the second section. An overview of the cases investigated and the research design and methodology are detailed in [Sections 3 and 4](#), respectively. Results are presented and analysed in [Section 5](#). Finally, the discussion and conclusion ([Section 6](#)) provides insights into the PMO's mediation role in the transfer of knowledge with different levels of articulability and also identify limits of this study as well as new paths for future research.

## 2. Conceptual model

Projects, as temporary organizations ([Lindner and Wald, 2011](#); [Sokhanvar et al., 2014](#)) are characterized by precise elements which pose explicit challenges for KT ([Schindler and Eppler, 2003](#); [Fong and Kwok, 2009](#)). The challenges include (1) the uniqueness and

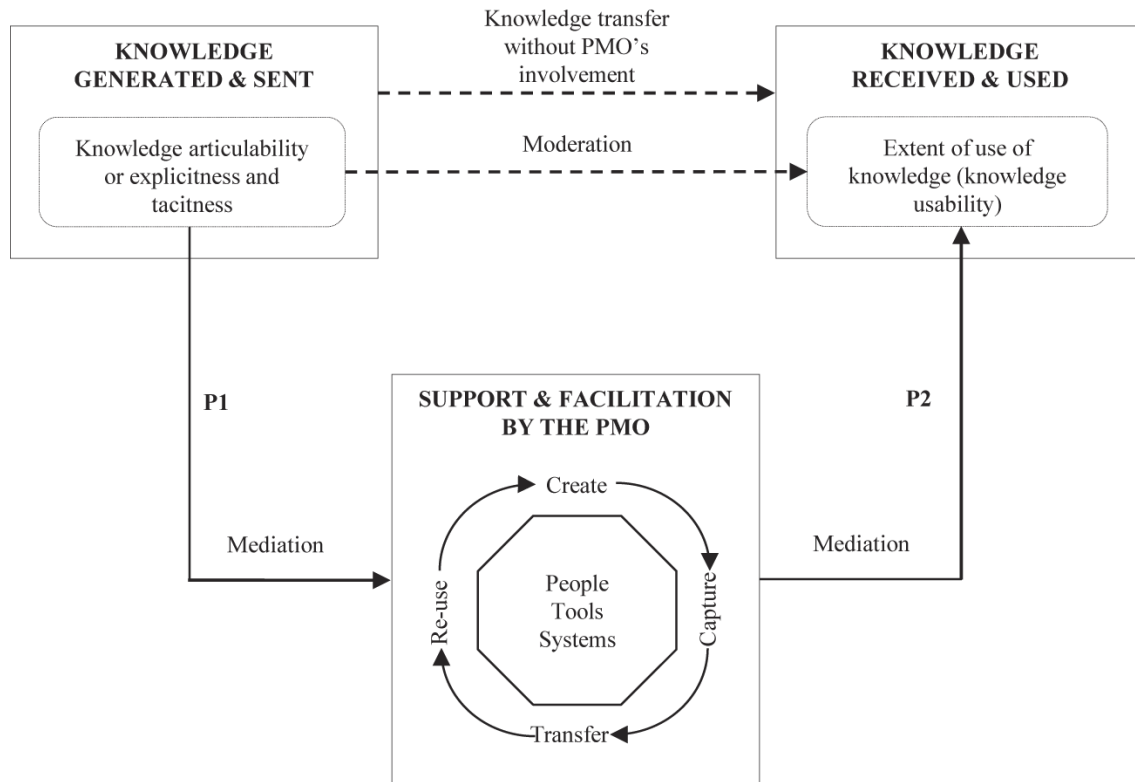
temporariness of projects hinder the advent and development of organizational routines and memory, and therefore hampers organizational learning and KT (Bresnen *et al.*, 2003), (2) discontinuation of project teams leads to disintegration of individual and organizational knowledge (Kasvi *et al.*, 2003), (3) projects lack natural mechanisms of learning and transfer. KT between projects is therefore challenging (Fong and Kwok, 2009), and (4) projects usually have a short-term orientation with a focus on immediate deliverables, whereas KT often requires a long-term perspective – this conflict of goals may result in ineffective KT.

Tshuma *et al.* (2018) developed a conceptual framework on the role of PMOs in the transfer of knowledge between projects. They argued that PMOs play an important role in the transfer of knowledge by supporting and facilitating the transfer of knowledge between projects to improve its usability. They further contended that, without the PMO, this function may not be effectively managed since project team members usually focus on short-term goals of the project and often fail to see capturing and transfer of knowledge between projects as beneficial for long-term benefits (Van Waveren *et al.*, 2014). Better articulated knowledge is easily captured, stored and shared with other recipients, because it is pragmatic and easy to comprehend (Fernie *et al.*, 2003). This proves that better articulated knowledge can be more easily transferred than poorly articulated knowledge (Cummings and Teng, 2003). Poorly articulated knowledge is difficult to diffuse, and thus hinders KT and knowledge usability (Cummings and Teng, 2003). PMOs assist receiving projects to develop absorptive capabilities (Brady and Davies, 2004), to improve knowledge usability. This article focuses on the mediation/facilitation role of the PMO in the transfer of knowledge with different levels of articulability. It explores the influence of the PMO's mediation role on the articulability of knowledge, and the effect of the PMO's mediation role on the usability of knowledge. A conceptual model showing the mediation role of the PMO in the transfer of knowledge with different levels of articulability to improve its usability is presented in Figure 2. This leads to the following research propositions:

*Proposition 1.* The articulability of knowledge influences the PMO's mediation (facilitation) role.

*Proposition 2.* The PMO's mediation role improves the usability of knowledge.

Through its mediation role (Tshuma *et al.*, 2018; Wong *et al.*, 2020), the PMO establishes and aligns KM infrastructure and processes that facilitate the transfer of knowledge with different levels of articulability, at the right time, to the right recipient(s) to improve the usability of knowledge (Lee *et al.*, 2012; Tshuma *et al.*, 2018). Although both tacit and explicit knowledge are crucial in the creation and re-use of knowledge and contribute positively to project success (Pretorius and Steyn, 2005), less articulated knowledge is difficult to diffuse among project personnel, and thus hinders the successful transfer and usability of knowledge (Cummings and Teng, 2003; Fernie *et al.*, 2003). Codification and personalization are the two main strategies used by organizations to manage explicit and tacit knowledge, respectively (Anand *et al.*, 2010; Fong and Kwok, 2009; Horner *et al.*, 2014; Kulkarni *et al.*, 2007; Pretorius and Steyn, 2005; Todorović *et al.*, 2015). What the PMO does to knowledge with different levels of articulability, through its mediation role, determines the usefulness or extent of use of the knowledge and the effectiveness of the PMO's mediation role in KT.



**Figure 2.** Conceptual model

### 3. Cases investigated

Five-divisional PMOs within a multinational engineering and project management company based in South Africa, and headquartered in Europe, were investigated through 15 semi-structured interviews. The multinational organization has five divisions namely, *Power and Gas*, *Industry*, *Power Generation Services*, *Energy and Mobility*. Each division has various business units (BUs) and a decentralized PMO. All five-divisional PMOs are unique in their own way, rendering the cases suitable for triangulation and multiple-case study analysis. An overview of the cases investigated is shown in [Appendix](#).

The PBO has an in-house project management program with a primary objective of standardizing project management methodologies, practices, procedures and processes as suggested by [Dai and Wells \(2004\)](#), [Andersen et al. \(2007\)](#) and [Hobbs and Aubry \(2007\)](#). Through this programme, the company trains and certifies its internal project managers to prepare them to manage projects. A guide to project management and all project management repositories are available on the intranet and all project management personnel have access. The project management guide contains project management knowledge areas as chapters and is continuously updated and made available to project personnel via the intranet. This guide, as well as the project management repositories, form part of the research data sources and improves and supports triangulation.

#### 4. Research design and methodology

Three constructs were measured in this study, namely, the articulability of knowledge, the PMO's mediation role and the usability of knowledge. Although case study research remains contentious for both theory building and theory testing, various researchers (Eisenhardt, 1989, 2010; Rowley, 2002; Flyvbjerg, 2011; Yin, 2014; Rose *et al.*, 2015) provide significant evidence that case study research can be very handy, especially where quantitative evaluations or investigations are not feasible. The research methodology is shown in Figure 3 while the research questionnaire is shown in Appendix.

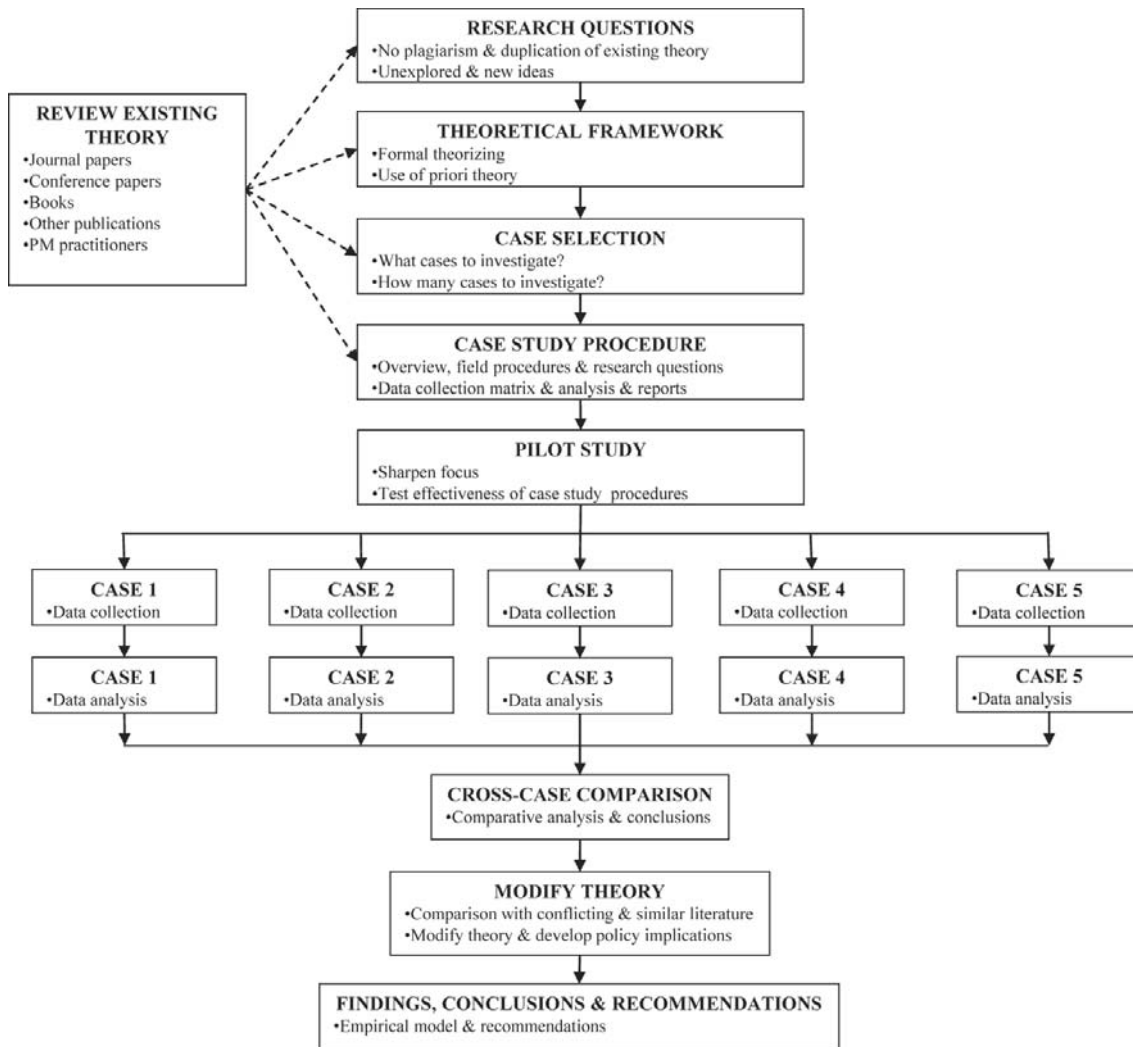


Figure 3. Overview of the research methodology

#### 5. Presentation and analysis of results

Interview recordings of all 15 respondents were captured on *ATLAS.ti* (a computer-aided qualitative data analysis software [CAQDAS]). The transcriptions were coded and four themes established as shown in Appendix. Using the codes and themes generated, each case's data was analysed based on examination, categorizing and tabulating evidence to assess whether the evidence supports the initial propositions of the study or not, and whether any

theories and/or patterns emerged. A comparative analysis (cross-case analysis) per theme amongst the five cases is also conducted to identify trends, similar concepts and relationships. The search for similarities and patterns in seemingly different cases can lead to a more sophisticated understanding which often results in the development of new theories (Eisenhardt, 1989). As possible relationships emerge in some cases, they are tested in each of the other cases – replication logic (Eisenhardt, 2010). Once several relationships begin to emerge across most or all cases, underlying logical arguments are initiated.

### **5.1 Influence of articulability of knowledge on PMO's mediation role – Proposition 1**

*P1.* The articulability of knowledge influences the PMO's mediation (facilitation) role.

The articulability of knowledge influences the PMO's mediation role in KT and KT success (Cummings and Teng, 2003; Prinsloo *et al.*, 2017). The more articulate the knowledge, the easier it is to transfer it, and vice-versa (Cummings and Teng, 2003). Tacit knowledge is usually less articulate, requires people to facilitate the transfer (personalization) and is difficult to diffuse among an organisation's employees (Fong and Kwok, 2009). The transfer of tacit knowledge is therefore quite challenging. However, PBOs that get it right ultimately enjoy the benefits of competitive advantage (Argote and Tepper, 2016). On the other hand, explicit (more articulated) knowledge is usually relatively easy to transfer (Cummings and Teng, 2003; Pretorius and Steyn, 2005). Explicit knowledge is best transferred through project management tools and systems namely codification (Carrillo *et al.*, 2006; Fong and Kwok, 2009; Karlsen and Gottschalk, 2004). Although Dhanaraj *et al.* (2004) argue that tacit knowledge is arguably more valuable and often leads to competitive advantage, both tacit and explicit knowledge are crucial in the creation and re-use of knowledge, and contribute positively to project success (Owen *et al.*, 2004). Projects produce knowledge with different levels of articulability (Tshuma *et al.*, 2018). Therefore, the articulability of knowledge influences and determines how and what the PMO – through its mediation role, should do to the knowledge to improve its transfer and usability in order to guarantee KT success. Since the PMO uses KM infrastructure and processes to facilitate the transfer of knowledge with different levels of articulability, the selection/adoption, arrangement, assignment, management and alignment of the KM infrastructure and processes become critical and a deciding factor whether successful KT and usability will be achieved and improved.

From the individual case analysis, it can be seen that the PMO uses KM infrastructure and processes to facilitate the transfer of knowledge with different levels of articulability to improve the usability. Furthermore, the articulability of knowledge influences the PMO's mediation role in that the KM infrastructure and processes needed to facilitate the transfer of knowledge vary based on the level of articulability of knowledge. Respondents from all the five cases corroborated findings by Cummings and Teng (2003) that less articulate knowledge is difficult to transfer and diffuse, and vice versa. The respondents further agreed that the establishment of the level of articulability should be the first step taken by the PMO before exploring, exploiting and transferring the knowledge since the articulability of knowledge influences the PMO's mediation role (Tshuma *et al.*, 2020). The KM infrastructure and processes to be adopted to transfer knowledge are informed by the level of articulability of knowledge. Respondents stated that the PMO should put in place all infrastructure and processes needed to facilitate the transfer of knowledge with any level of articulability to ensure that all knowledge can be successfully transferred.



KM infrastructure that facilitates the transfer of knowledge with different levels of articulability as identified by the respondents includes the following:

1. organizational structure,
2. incentives, involvement of people,
3. communities of practice,
4. mentoring and peer assist,
5. project reviews,
6. best practices,
7. training/KT workshops,
8. transfer of individual(s),
9. user-friendly knowledge repositories,
10. collaboration,
11. ICT,
12. reporting tools,
13. continuous learning culture and lessons learnt.

The KM processes identified by respondents as crucial in ensuring that knowledge with different levels of articulability is transferred to the right project(s), at the right time, to improve its usability are:

1. knowledge creation,
2. identification of knowledge to be transferred,
3. alignment of KM infrastructure and processes,
4. classification of types of knowledge,
5. integration of knowledge models,
6. protection of knowledge,
7. transfer and
8. re-use of knowledge.

The identification, integration and alignment and/or pairing of the identified KM infrastructure and processes to facilitate the transfer of knowledge with different levels of articulability forms part of the PMO's core functions in KT. Once the level of articulability of knowledge has been established, KM infrastructure and processes commensurate to it are deployed for the successful transfer of knowledge. Explicit knowledge, which is normally more articulate (Cumings and Teng, 2003) – save for a few (specialized and technologically advanced knowledge, for example, knowledge on robotics) – is decoded using the respective KM infrastructure and processes. While tacit as well as the specialized explicit knowledge may require the transfer of individual(s) from other projects (Argote and Tepper, 2016; Bellini *et al.*, 2016), or other means associated with the transfer of tacit knowledge to facilitate the transfer of such knowledge without any difficulties.

In summary, the PMO uses codification and personalization strategies (Fong and Kwok, 2009; Gemino *et al.*, 2015) to facilitate the transfer of knowledge with different levels of articulability and improve its usability. The codification strategy connects people with knowledge that is stored in knowledge repositories and specifically suitable for managing explicit knowledge. On the other hand, the personalization strategy relies on knowledge in people's brains and depends on human interaction. Unlike codification, personalization focuses on person-to-person transfer, and technology becomes an instrument for communicating, and not gathering knowledge. Tacit knowledge is often transferred using the

personalization strategy. The transfer of tacit knowledge, which is mostly less articulate (Cummings and Teng, 2003; Tshuma *et al.*, 2020) is more often done using this strategy. As reiterated by Fong and Kwok (2009), both strategies can coexist and the proportion of the two approaches varies from organization to organization and also depends on the magnitude and the level of articulability of knowledge. Therefore, the study findings support the proposition – *the articulability of knowledge influences the PMO's mediation role*. Through codification and personalization KT strategies, the PMO structures KM infrastructure and processes so that knowledge with different levels of articulability can be transferred to improve its usability.

## 5.2 Effects of PMO's mediation role on the usability of knowledge – Proposition 2

P2. The PMO's mediation role improves the usability of knowledge.

The ultimate goal of KT is to improve the usability and impact of knowledge (Tshuma *et al.*, 2018), thereby accomplishing KT success and ultimately, competitive edge. This allows a PBO to compete and sustain itself (Argote and Ingram, 2000; Argote and Tepper, 2016) and makes the PMO's mediation role crucial in facilitating improved knowledge usability. PBOs therefore, need to fully comprehend and implement the PMO's mediation role in the transfer of knowledge in a manner that will lead to improved knowledge usability. From literature, we learn that KM infrastructure and processes are the primary enablers of KT (Cummings and Teng, 2003; Heisig, 2009; Lee *et al.*, 2012; Jafari and Charband, 2016), and that the PMO's mediation role revolves around them (Tshuma *et al.*, 2018). It is therefore, what the PMO does and how it structures KM infrastructure and processes that enables it to be able to transfer knowledge with different levels of articulability thereby improving its usability to achieve successful KT and competitive advantage.

Data analysis from the responses of the five cases shows that KM infrastructure strategies employed by the PMO in facilitating the transfer of knowledge with different levels of articulability to improve the usability of knowledge are embedded in organizational routines, relationship strategies, and standardized and formal strategies. According to Howard-Grenville *et al.* (2016), routines are fundamental to accomplishing organizational work. They are important temporary organizational structures through which work in organizations is performed and accomplished (Feldman, 2000). Routines provide an innovative approach to map the process of interaction between the PMO and the PBO (Bredillet *et al.*, 2018). The identified KM infrastructure embedded in organizational routines includes continuous learning culture, trust, collaboration, effective communication and feedback and best practices – standards, processes and templates, project reviews, lessons learnt sessions, organizational structure, people and management support, user-friendly knowledge repositories and manuals. They facilitate the transfer of knowledge with different levels of articulability thereby improving the usability of knowledge. One of the PMO Managers stated that;

... by communicating frequently and collaborating with the receiving projects. It must also encourage the receiving projects to approach them when in need and also give them feedback for future purposes.

Iqbal (2013) states that the biggest mistake that PMOs make, is thinking that they are enforcers rather than relationship facilitators. He further states that the success of the PMO's

mediation role relies heavily on establishing trust and building relationships with their internal clients. This study shows that the PMO uses KM infrastructure embedded in relationships to facilitate the transfer of knowledge with different levels of articulability thereby improving its usability. These include:

1. communities of practice,
2. on-the-job training,
3. job shadowing,
4. double fills,
5. job rotation,
6. expert advice and interviews,
7. exit interviews,
8. peer assist,
9. mentoring
10. and internships.

Furthermore, the study shows that the PMO uses the following KM infrastructure embedded in standardized and formal strategies to facilitate the transfer of knowledge with different levels of articulability.

1. incentives,
2. ICT,
3. reporting tools,
4. managing personnel – transfer of individual(s),
5. physical involvement and engagement,
6. research and development – innovation.

Job shadowing, on-the-job training, job rotation and double-fills are excellent methods used by the PMO to facilitate the transfer of tacit knowledge associated with a job to a likely replacement. However, due to personnel and budgetary constraints, this may not be feasible in some PBOs. There needs to be a financial will from PBOs for these methods to take off. Individuals with specialized knowledge (specialists) can provide expertise to a project(s) by working in cross-functional teams. Their advantage is that they have a potential to share and transfer both explicit and tacit knowledge (Perkins and Bennett, 2013). Capturing of tacit knowledge of retiring and/or resigning employees is sometimes possible through exit interviews provided the right atmosphere and personal relationships exists between the interviewer and the exiting employee. The PMO could manage this process effectively to avoid losing valuable tacit knowledge. Double-fills and job shadowing could be adopted by the PMO especially if the exit employee has given sufficient notice before departing. Again, for these KT strategies to effective, there needs to be good relations and understanding amongst the parties involved. Knowledge creation, identification, integration, alignment, classification, protection, transfer and re-use were identified by the respondents as KM processes used by the PMO to facilitate the transfer of knowledge with different levels of articulability to improve its usability. None of these processes works in isolation. They are integrated to the KM infrastructure and compliment, support and assists each other (Sokhanvar *et al.*, 2014). The fact that some processes were not cited by other respondents does not make them less important. All respondents came out very strong on knowledge alignment highlighting the fact that knowledge is useless without being aligned to the right KM infrastructure and project at the right time. The study results support the proposition, “The PMO's mediation role improves the usability of knowledge”. The PMO manages and

coordinates KM infrastructure and processes to enable successful transfer of knowledge with different levels of articulability to improve the usability of knowledge.

## 6. Discussion

The PMO through its mediation role plays a significant role in ensuring the effective transfer of knowledge with different levels of articulability so that its usability is improved (Tshuma *et al.*, 2020). This often leads to successful KT and attainment of competitive advantage (Lubit, 2001; Haas and Hansen, 2005; Argote and Tepper, 2016) needed to sustain and grow PBOs (Hurt and Thomas, 2009). This study argues that without the PMO, the KT gap would widen and most PBOs would find it difficult not only to achieve competitive advantage but also to sustain and grow themselves. The articulability of knowledge's influence on the PMO's mediation role and the effect of the PMO's mediation role on the usability of knowledge have been investigated. Results show that the PMO establishes, aligns and manages the KM infrastructure and processes to ensure that knowledge with different levels of articulability is transferred at the right time, to the right project(s) to improve the usability of knowledge and ultimately, KT success and competitive advantage.

### 6.1 The articulability of knowledge influences the PMO's mediation role

Results from this case study show that the articulability of knowledge influences the PMO's mediation role. This goes to show why PMOs are frequently restructured and transformed (Aubry *et al.*, 2010; Hobbs and Aubry, 2007) – their roles are not fixed due to the ever-changing environment, objectives, requirements and needs, and in this context, due to the differences in the level of articulability of knowledge to be transferred (Tshuma *et al.*, 2020). The alignment of KM infrastructure and processes to the codification and personalization KT strategies through the PMO's mediation role is shown in Table 1. It reveals that the level of articulability of knowledge determines the KT strategy to be adopted by the PMO to successfully transfer knowledge.

KM infrastructure and processes used by the PMO change, based on the level of articulability of knowledge to be transferred. The “one-size-fits-all” concept does not apply here. Less articulate knowledge is more difficult to transfer than better articulated knowledge as established by the case study respondents and also by Cummings and Teng (2003). Therefore, the two strategies that should be adopted by the PMO to facilitate the transfer of knowledge with different levels of articulability to improve its usability are personalization and codification (Bresnen *et al.*, 2003; Fong and Kwok, 2009; Gemino *et al.*, 2015; Kasvi *et al.*, 2003; Malone, 2002; Todorović *et al.*, 2015). Codification strategy formalizes organizational knowledge for a broader scale of utilization and requires abundant implementation of ICT (Fong and Kwok, 2009). This strategy works perfectly well for explicit knowledge or knowledge that is well articulated. On the other hand, the personalization strategy focuses on person-to-person transfer and ICT becomes an instrument for communication and not for gathering knowledge. It works well for tacit or less articulate knowledge (Fong and Kwok, 2009).

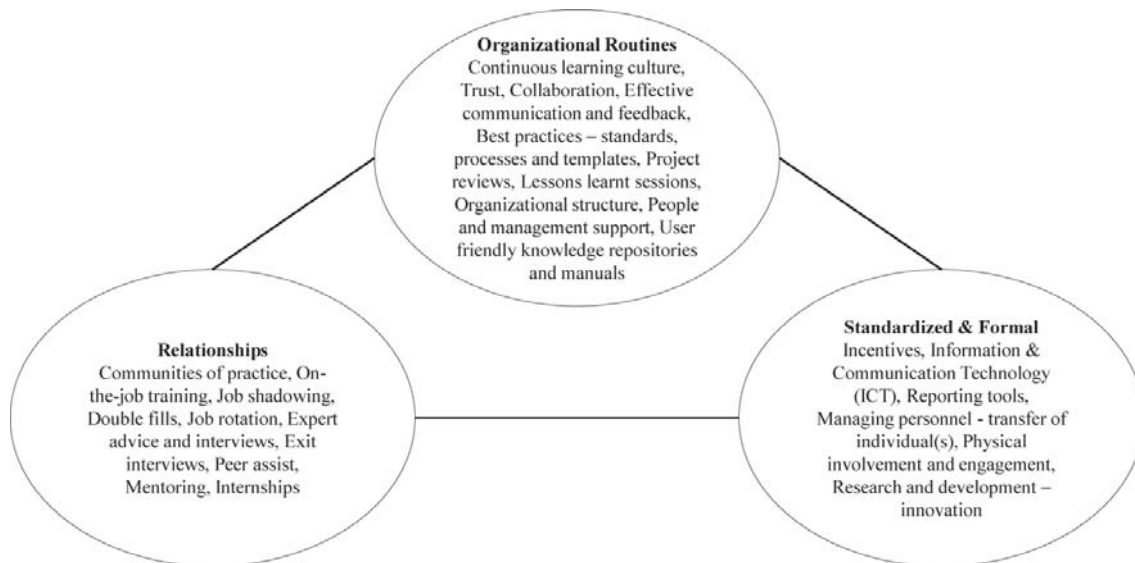
**Table 1.** Alignment of KM infrastructure and processes to the codification and personalization KT strategies

| KM                | Codification  | Personalization  |
|-------------------|---|--|
| KM infrastructure | <ul style="list-style-type: none"> <li>• People – Incentives (Argote and Tepper, 2016; Bresnen <i>et al.</i>, 2003)</li> <li>• People – Management involvement and support (Andersen <i>et al.</i>, 2007)</li> <li>• Systems – Best practices (standards, processes and templates) (Kerzner, 2006; Andersen <i>et al.</i>, 2007)</li> <li>• Systems – Collaboration (Bond-Barnard <i>et al.</i>, 2013, 2018; Bellini <i>et al.</i>, 2016; Wong <i>et al.</i>, 2020)</li> <li>• Systems – Communities of practice (Aubry <i>et al.</i>, 2011; Bresnen <i>et al.</i>, 2003; Malone, 2002)</li> <li>• Systems – Continuous learning culture (Atkinson <i>et al.</i>, 2006; Duffield and Whitty, 2016)</li> <li>• Systems – Training and KT workshops (Hill, 2004)</li> <li>• Systems – Lessons learnt and project reviews (Liu and Yetton, 2007)</li> <li>• Systems – Organizational Structure – Experience, credibility, accessibility and maturity of PMO (Susanty <i>et al.</i>, 2012)</li> <li>• Tools – Information and Communication Technology (ICT) (Newell, 2004)</li> <li>• Tools – Reporting tools (Duffield and Whitty, 2016)</li> </ul> | <ul style="list-style-type: none"> <li>• People – Incentives (Argote and Tepper, 2016; Bresnen <i>et al.</i>, 2003)</li> <li>• People – Management involvement and support (Andersen <i>et al.</i>, 2007)</li> <li>• Systems – Collaboration (Bond-Barnard <i>et al.</i>, 2013, 2018; Bellini <i>et al.</i>, 2016; Wong <i>et al.</i>, 2020)</li> <li>• Systems – Communities of practice (Aubry <i>et al.</i>, 2011; Bresnen <i>et al.</i>, 2003; Malone, 2002)</li> <li>• Systems – Double fills/job rotation and shadowing (Perkins and Bennett, 2013)</li> <li>• Systems – Internships and on-the-job training (Perkins and Bennett, 2013)</li> <li>• Systems – Training and KT workshops (Hill, 2004)</li> <li>• Systems – Transfer of individual(s) (Argote and Tepper, 2016)</li> <li>• Systems – Expert advice and exit interviews (Perkins and Bennett, 2013)</li> <li>• Systems – Lessons learnt and project reviews (Liu and Yetton, 2007)</li> <li>• Systems – Organizational Structure – Experience, credibility, accessibility and maturity of PMO (Susanty <i>et al.</i>, 2012)</li> <li>• Tools – Information and Communication Technology (ICT) (Hill, 2004)</li> </ul> |
| KM processes      | <ul style="list-style-type: none"> <li>• Knowledge creation (socialization, externalization, internalization, combination) – (Nonaka, 1994; Owen <i>et al.</i>, 2004)</li> <li>• Knowledge capture (identify, store, protect, classify, align) – (Bresnen <i>et al.</i>, 2003; Fernie <i>et al.</i>, 2003; Owen <i>et al.</i>, 2004)</li> <li>• Knowledge transfer (integrate, adapt, apply) – (Bond-Barnard <i>et al.</i>, 2018; Bresnen <i>et al.</i>, 2003; Owen <i>et al.</i>, 2004)</li> <li>• Knowledge re-use (share, distribute, forward) – (Ilsiao <i>et al.</i>, 2005; Kulkarni <i>et al.</i>, 2007; Owen <i>et al.</i>, 2004)</li> </ul>   | <ul style="list-style-type: none"> <li>• Knowledge creation (socialization, externalization, internalization, combination) – (Nonaka, 1994; Owen <i>et al.</i>, 2004)</li> <li>• Knowledge capture (identify, store, protect, classify, align) – (Bresnen <i>et al.</i>, 2003; Fernie <i>et al.</i>, 2003; Owen <i>et al.</i>, 2004)</li> <li>• Knowledge transfer (integrate, adapt, apply) – (Bond-Barnard <i>et al.</i>, 2018; Bresnen <i>et al.</i>, 2003; Owen <i>et al.</i>, 2004)</li> <li>• Knowledge re-use (share, distribute, forward) – (Ilsiao <i>et al.</i>, 2005; Kulkarni <i>et al.</i>, 2007; Owen <i>et al.</i>, 2004)</li> </ul>  |

## 6.2 The PMO's mediation role improves the usability of knowledge

This investigation shows that the PMO's mediation role improves the usability of knowledge thereby creating an environment conducive for competitive advantage in PBOs. The PMO's mediation role is centred around the management, coordinating, integrating, interfacing and alignment of KM infrastructure and processes (Malone, 2002; Blomkvist, 2012; Lee *et al.*, 2012; Sokhanvar *et al.*, 2014). This enables knowledge with different levels of articulability to be transferred between projects. It is therefore, how the PMO structures KM infrastructure and processes that determines the successfulness and effectiveness of its facilitation role. Literature (Cummings and Teng, 2003; Tshuma *et al.*, 2020), as well as the outcomes of this study, show that knowledge with different levels of articulability requires different KM infrastructure and processes for it to be useable to the receiving project(s). Furthermore, the study shows that the KM infrastructure strategies employed by the PMO in facilitating the transfer of knowledge with different levels of articulability to improve its usability are embedded in organizational routines, relationship strategies and standardized and formal strategies as shown in Figure 4. They help the PMO in focusing their energies and fully

exploring each of these strategies. For example, for strategies embedded in organizational routines, the PMO must get buy-in from the PBO to ensure that the entire infrastructure needed is embedded in the routines of the organization. Relationship strategies are associated with KM infrastructure needed to facilitate the transfer of tacit knowledge, which is usually less articulate. The PMO should therefore invest in building relationships, trust and credibility for this strategy to work efficiently and effectively (Iqbal, 2013). KM infrastructure embedded in standardized and formal strategies is influenced largely by the level of articulability of knowledge (tacit or explicit), speed, format and medium to be used in the transfer of knowledge (Chen *et al.*, 2014; Argote and Tepper, 2016). Furthermore, the PMO uses codification and personalization strategies to ensure an effective transfer of knowledge with different levels of articulability (Bresnen *et al.*, 2003; Fong and Kwok, 2009; Gemino *et al.*, 2015; Kasvi *et al.*, 2003; Malone, 2002; Todorović *et al.*, 2015). Once these KM infrastructures are in place, the next step will be for the PMO to use KM processes to ensure that knowledge with different levels of articulability is aligned, coordinated and managed so that its usability is improved.



**Figure 4.** Embedment of KM infrastructure strategies

The KM processes used by the PMO to ensure that knowledge with different levels of articulability is transferred at the right time, to the right recipient and to improve its usability include:

1. knowledge creation (Nonaka, 1994; Owen *et al.*, 2004),
2. knowledge capture (Bresnen *et al.*, 2003; Fernie *et al.*, 2003; Owen *et al.*, 2004),
3. knowledge transfer (Bond-Barnard *et al.*, 2018; Bresnen *et al.*, 2003; Owen *et al.*, 2004) and
4. knowledge re-use (Hsiao *et al.*, 2005; Kulkarni *et al.*, 2007; Owen *et al.*, 2004).

However, KM processes are supported by KM infrastructure and vice versa (Lee *et al.*, 2012). They work hand in glove. One cannot function without the support of the other. Therefore, the PMO ought to manage, integrate and coordinate these KM infrastructure and processes to enable successful transfer of knowledge with different levels of articulability.

## 7. Conclusions

Five cases within a multinational engineering and project management organization were investigated to explore and understand the role of the PMO in the transfer of knowledge with different levels of articulability to improve its usability. The aim of the study is to supplement short-term project objectives with longer-term project and organizational objectives from a KT perspective to help PBOs with PMOs to achieve competitive advantage. A model for the mediating role of the PMO in the transfer of knowledge with different levels of articulability to improve its usability has been developed. The model shows that the articulability of knowledge influences the PMO's mediation role and the PMO's mediation role in turn improves the usability of knowledge thereby creating a conducive environment for competitive advantage in PBOs. Personalization and codification are the two strategies adopted by the PMO to facilitate the transfer of knowledge with different levels of articulability to improve its usability. The alignment of KM infrastructure and processes to the codification and personalization KT strategies through the PMO's mediation role is crucial if the transfer of knowledge with different levels of articulability to improve knowledge usability is to be achieved. However, this alignment requires constant monitoring and restructuring wherever and whenever necessary to avoid PBOs from becoming victims of the ever-changing projects environment.

The PMO's mediation role is centred around the management, coordinating, integrating, interfacing and alignment of KM infrastructure and processes. Therefore, it is what the PMO does and how the PMO structures KM infrastructure and processes that determines the success and effectiveness of its facilitation role. The study further shows that the KM infrastructure strategies employed by the PMO in facilitating the transfer of knowledge with different levels of articulability to improve its usability are embedded in organizational routines, relationship strategies, and standardized and formal strategies. In as much as short-term project goals are important in PBOs, long-term project and organizational goals (inclusive of KT) are also important, especially for business continuity, economies of scale and growth initiatives (Shenhar and Dvir, 2007; Hurt and Thomas, 2009). The proposed KT model is centred around the PMO's mediation role in transferring knowledge with different levels of articulability. It will help close the gap between short-term project objectives and long-term project and organizational objectives. This will lead to improved usability of knowledge and competitive advantage – a pre-requisite for sustainability and growth. To scholars, this study presents a new perspective to the PMO's role in KT. For practitioners, the embedment of KM infrastructure into organizational routines, relationships and standardized and formal strategies shows the importance of the alignment of organizational and project goals. Without this alignment, successful KT could be a nightmare.

The study did not investigate any PBO without a PMO. The full involvement of the PMO includes facilitating the management, alignment, integration, interface and coordination of the transfer of knowledge with different levels of articulability to improve its usability. It may be very challenging for a PBO without a PMO to achieve similar results to those with PMOs within a short period of time and with limited dedicated resources. The PMO is usually seen as an overhead cost (Aubry *et al.*, 2010; Curlee, 2008; Hobbs and Aubry, 2007, 2008; Kwak and Dai, 2000; Pinto *et al.*, 2010; Project Management Institute, 2017) which most upcoming PBOs cannot afford. Therefore, a study on how PBOs without PMOs could manage the transfer of knowledge with different levels of articulability to improve its usability and achieve competitive advantage could contribute significantly to the functioning of such PBOs.

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