

**A Journey into the Known Unknowns of Project Knowledge: A review  
of the literature on how the project manager is influenced by  
knowledge domains**

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## **A Journey into the Known Unknowns of Project Knowledge: A review of the literature on how the project manager is influenced by knowledge domains**

**ABSTRACT:** *Organising work through projects, and project knowledge, has traditionally focused on a knowledge domain of discrete tasks with a technical and process orientation. As a result, there is widespread international acceptance of this approach to managing projects, reflected in the knowledge and outcomes in the project management community, and the sponsors of their work. Alternative knowledge domains exist where socio-organisational perspectives of project knowledge are examined. This paper reviews knowledge domains and the perspectives of project managers recognising, and being influenced by, these domains. The paper concludes with a focus on identifying, further research to extend and integrate a holistic approach to project practice in multiple domains.*

**Keywords:** project organising, project knowledge, socio-organisational knowledge, known knowns

*‘Reports that say something hasn’t happened are always interesting to me because as we know, there are known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things [we know] we do not know. But there are also unknown unknowns—the ones we don’t know we don’t know’ (Rumsfeld, 2011, p. xiii)*

What is project knowledge? Defining *project knowledge*, or knowledge used in a project appears straightforward, even obvious. How can a project, defined as activities and methods which are ‘...contemplated, devised or planned...’ (Macquarie Dictionary, 2009, p. 1326), occur without knowledge? The upcoming edition of the PMBOK® Guide 6<sup>th</sup> Ed. (PMI, 2016), interprets *manage[ing] project knowledge* as the “...process of using existing knowledge and creating new knowledge to achieve the project’s objectives”. PMI also defines *project knowledge management* as ‘...identifying knowledge throughout the project life-cycle and transferring it to the target audience so that the knowledge is not lost’ (PMI, 2016)—but not project knowledge. Advocating managing knowledge in the context of managing a project, Kasvi, Vartiainen and Hailikari (2003) stated that project knowledge and knowledge management can be viewed through:

...outputs, not all of which are necessarily intentional: a product (or service) delivered for an internal or external customer; project knowledge related to the product, its production and use; technical knowledge concerning the product, its parts and technologies; procedural knowledge concerning producing and using of the product and acting in a project; and

organisational knowledge concerning communication and collaboration. (Kasvi et al., 2003, p. 571).

These definitions appear to indirectly relate to project knowledge by describing ‘managing’ project knowledge, ‘knowledge management of’ project knowledge, and some ‘outputs’. Perhaps a more appropriate definition of project knowledge can be borrowed from Davenport and Prusak (1998) who defined knowledge as a ‘...fluid mix of framed experience, values, contextual information, and expert insight to provide a framework for evaluating and incorporating new experiences and information’ (Davenport & Prusak, 1998, p. 5).

Project management is established as both a defined occupational group and viewed as an identifiable discipline. Project management has, at the same time, grown to become a dynamic and influential global occupation which ‘...has expanded rapidly and now constitutes a group consisting of over 500,000 registered members globally and more on an informal basis’ (T. M. Algeo, 2015). Managing work through projects covers multiple knowledge domains, including through the application of established bodies of knowledge for such a discipline. The foundation of this method of managing work is oriented toward defined, rational, and systematic approaches. This way of working emanated from areas where project management has held an established place in economic activity, particularly, ‘...engineering, construction, defense, and information technology’ (Turner, Anbari, & Bredillet, 2013, p. 4).

The expansion of project management has been facilitated through the acknowledgement of accepted bodies of knowledge published by multiple membership organisations. The most widely accepted knowledge is contained in the Project Management Institute’s (PMI) Body of Knowledge, titled the PMBOK® Guide (2013), which is considered the default standard to organise project work. The PMBOK® Guide (2013), having started as a summary of practice from engineering, construction, defence, and information technology industries, was first published in the 1990’s. However, the origins may be considered to be based on what ‘most Project Managers do most of the time’ or ‘generally recognised practice’ (Shepherd & Atkinson, 2011). The PMBOK® Guide (2013), has been updated regularly through input from practitioners and academics. The input is governed by a committee, which has been suggested to contain contemporary ‘best’ practices, as accepted by the PMI. As evidence of the breadth of PMI’s membership, the current version is offered in ten languages in addition to English (PMI, 2013).

Presently, there are multiple ‘...formal project management ‘Bodies of Knowledge’: those promoted by PMI, by APM, the UK’s Association of Project Management, by the Japanese ENAA (Engineering Advancement Association of Japan) and JPMF (Japanese Project Management Forum)’

(Morris, Crawford, Hodgson, Shepherd, & Thomas, 2006, p. 712). These provide views on ‘how to’ manage projects, with associated support in training, certification, and networking opportunities. The supporting activity combined with the influence of the PMBOK® Guide (2013), have created a dominant viewpoint of knowledge throughout the project management community. In project management the body of knowledge is considered to be different and less broad and inclusive than other ‘professions’ (Shepherd & Atkinson, 2011) as ‘...traditional professions ...would regard their body of knowledge to consist of the range of ...libraries, research papers and text books that exist in their world’ (Shepherd & Atkinson, 2011, p. 153).

The evolution of project management can be linked to an increase in the breadth of formal training and certification programs, and what underpins the maturing of a discipline—research. The often self-critical perspective illuminated by scholars in their research is available through multiple professional journals, in both practitioner and academic focused disciplines. Conferences have also responded with an increase in research-focused tracks which add to the research-only forums for scholars and higher degree students. However, scholarship, and associated research and publication, has been heavily influenced by rational and positivist thinking, common to the engineering centred origins of project management. A recent bibliographic study of the four leading academic publications in project management observed that article themes remain mostly aligned to traditional thinking with 62 percent linked to the PMBOK® Guide (2013) knowledge areas (T. M. Algeo, 2015).

A key assumption underpinning the strength of the knowledge areas from the PMBOK® Guide (2013) is that it is a universal approach, outlining what the project manager needs to be equipped to manage a project successfully. These logics have created limits and boundaries on the acceptance and use of non-task focused, non-technical perspectives. As the technical and process paradigm (C. Algeo, 2015b) is reinforced by project management institutions and scholars, knowledge boundaries are created and sustained, having the effect of diminishing other knowledge domains identified in Figure 1.

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Insert Figure 1 about here

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These domains of social and organisational knowledge include knowledge drawn from sociology and organisation studies, incorporating an existing large and differing body of research and associated theory. As these domains are outside of project knowledge from the dominant traditional techno-process domain, they are treated as emerging. A more reflexive examination using these ‘emerging’ sources may create an expanded cartography including ‘borrowing’ existing sociological and organisational theory and practice.

Alternatives to the traditional rationalist techno-process approach, and associated positivist epistemology, exist in some project management approaches, as well as in other disciplines.

Phenomena exist in organising work by projects, and include domains of social and organisational elements illustrated in Figure 1. Contemporary researchers have explored areas considered outside of the traditional and process domain through examination of social and organisational focused views, potentially broadening the body of knowledge for project management. In addition, examining these domains of knowledge can be viewed as a way of exploring the plurality of the full span of project management knowledge.

Expanding scope in project management has emerged from research (Söderlund, 2004, 2011, 2013; Soderlund, Bredillet, Twyoniak, & Dwivedulaa, 2014) as part of advocating plurality and defining emerging theory related to the discipline (Lundin & Söderholm, 1995). Broadening the field of view and operation of the project manager was advocated by Morris in 1994 where he coined the term 'Management of Projects' (Morris, 1994). His observation of the need for a shift, from one bounded by the then existing narrowing effect of the techno-process domain, to a '...multiplicity of topics [which] requires researchers to be based more broadly than normally fits comfortably in our educational system argued to expand the views' (Morris, 1994, p. 218). He also understood the difficult and lengthy change required and that, '...there does seem to be a slow - very slow - academic awakening of interest in project-based undertakings...' (Morris, 1994, p. 218). Morris' challenge to known knowledge was to redefine the full scope of projects being managed. This view emphasised a:

...perspective on the real duties of modern project managers. In his conceptualization, project management is seen as not simply a delivery system, or technique-laden toolbox, but a partner with other managerial disciplines in developing the critical actions and interfaces, both internally and externally, that successful projects require (Pinto & Winch, 2016, p. 240).

While the project knowledge literature has not been noticeably expanded by non-technical viewpoints, there has been recognition of the importance of additional knowledge beyond the traditional domain of project management. This has included research into project knowledge in: knowledge creation (Canonico, Soderlund, De Nito, & Mangia, 2013); knowledge transfer (Cacciatori, Tamoschus, & Grabher, 2012; Disterer, 2002); knowledge sharing (Fernie, Green, Weller, & Newcombe, 2003; Ghobadi & D'Ambra, 2013); knowledge exchange (Algeo, 2014a; C. Algeo, 2015a, 2015b); knowledge brokering (Holzmann, 2013); professional knowledge (Algeo, 2008; Morris et al., 2006); social knowledge (Bresnen, Edelman, Newell, Scarbrough, & Swan, 2003; Brookes, Morton, Dainty, & Burns, 2006; Small & Walker, 2010); knowledge communities (Lindkvist, 2005) ; and knowledge shaped by schools of project management research (Bredillet, 2007a, 2007b, 2007c, 2008a, 2008b; Turner et al., 2013).

## **KNOWLEDGE PERSPECTIVES**

Project managers, in addition to having project knowledge of varying types, have ‘blind spots’, that is, areas of knowledge which are not ‘known’. Often, as a result of their occupational standards, education, training and experience, they recognise limited perspectives aligned to the dominant discourse which is ‘known’. However, other project knowledge may be recognised as different and worth consideration. Figure 2 presents four quadrants of project knowledge: the project knowledge perspectives of known knowns; known unknowns, unknown unknowns; and unrecognised, unrecalled knowns. This concept may be considered as relevant to the commonly accepted base of project knowledge where the ‘known knowns’ of knowledge areas from traditional perspectives embodied in the PMBOK® Guide (2013). Second, there are ‘unknown knowns’ depicted in the upper right quadrant. At an individual level, knowledge may not be recognised due to several reasons: lack of familiarity as well as knowledge that is unused or not known to the individual. While this knowledge is not ‘known’ there is awareness that it is not ‘known’. In a project, social and organisational knowledge may fit into this quadrant due to the domain sitting outside of the dominant and generally ‘known’ technical and process thinking contained in the PMBOK® Guide (2013) knowledge areas. Third, there are ‘unknown unknowns’ depicted in the lower right quadrant. The knowledge associated with this domain is difficult to describe as, by definition, it is unknowable. Fourth, there are ‘unknown knowns’ depicted in the lower left quadrant which are described as unrecognised and/or unrecalled. As this information is known, it can be accessed but is not conscious to the project manager. Finally, the figure provides an area (in a circle) which represents knowledge specifically contained within the activities of the project and can be expanded to include knowledge contained outside the circle through research, learning, and sharing of knowledge from others. These knowledge perspectives may exist within or outside of any project and once recognised, may illustrate transformational movement into and across domains, generally into domains on the left side of the map.

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Insert Figure 2 about here

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The relatively known unknowns, such as social and organisational aspects of projects can only be incorporated into project knows through the recognition of an expanded role of project managers. Pinto and Winch (2016) comment on Morris’ view of broadening in that:

...a larger perspective on the role of the project manager supports an equally broad set of skills and knowledge for project development. The modern project manager is required to become more fully qualified, not only in the technical details of the project but also an individual who can interface with top management and critical stakeholders early in the project's development; in fact, far earlier and with far greater responsibilities than in the outdated execution model (Pinto & Winch, 2016, p. 240).

This broadened approach needs to include recognition that the ‘known’ area of project management, *managing projects*, can be supported by social and organisational knowledge and competency. The opportunity is presented to support and develop ‘project organising’ thinking, which aligns with Morris’ concept ‘management of projects’. Incorporating research, practise and theory from areas such as sociology and organisation studies can enable the research to ‘borrow’ from these academic disciplines, integrating, extending and creating new thought.

The ‘knowability’ of project knowledge can also be examined in terms of its’ opposite— the lack of knowledge: ignorance. An alternative hierarchal model has been described by Armour (2000) where the author examined knowledge acquisition and ignorance reduction in the context of software development. Armour (2000) described a view of the types of knowledge ignorance, being ‘lack of ignorance’; ‘lack of knowledge’; ‘lack of awareness’, and ‘lack of process’. This model of knowledge ignorance relates to Figure 1 with ‘known knowns’ similar to ‘lack of ignorance’; ‘unknown knowns’ similar to ‘lack of knowledge’; ‘unknown unknowns’ aligned with ‘lack of awareness’ and ‘lack of process’. The lower left quadrant from Figure 1 does not have a clear connection and may indicate a flaw in the model in Figure 3.

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Insert Figure 3 about here

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The rationalist technical and orientation-through-process approach has also been heavily influenced by continuing research within this domain, creating an execution-delivery paradigm (Morris, 2013), stemming from the work of Cleland (Morris, 2012). The effect of such dominance has been to reduce the voice of perspectives which broaden the discourse, and reflexively explores areas which have proved problematic to project management. However, these areas have remained on the sidelines “...focused on tools and techniques, rather than the organisational requirements of achieving success for the organisations involved in the project” (Pinto & Winch, 2016).

Recent research has examined content of publications related to project management to explore emerging themes presented in recent literature. Of importance was whether project management discourse continued to be focused on traditional subjects or reflected a new, broadened scope. Such direction had been advocated by a study about future directions for research in project management sponsored by the UK government (Winter, Smith, Morris, & Cicmil, 2006). In the work of Winter et al., (2006), the aim was to ‘...define a research agenda aimed at enriching and extending the subject of project management beyond its [then] current conceptual foundations’ (Winter et al., 2006, p. 638). In 2014, Beisenthal and Wilden (2014) examined literature through a software-driven textual analysis of abstracts regarding project governance. The paper noted an increase in project governance themes increasing steadily from 2008 but a continued concentration on traditional agency and stakeholder themes. Noticeably, non-project management journals demonstrated more frequent

focus on governance. In 2015, a bibliographic analysis of keywords sourced from the four leading academic project management journals, observed that the PMBOK® Guide (2013) 'knowledge area' themes continued to dominate the literature, with 61 percent '...closely linked to core project management subjects' (T. M. Algeo, 2015, p. 11). Clearly, the dominant voice of the technical and orientation-through-process continues to be heard, but social, organisational, knowledge, and other perspectives appear to provide new opportunities. These new opportunities create the dominant technically focused themes which form mainstream contemporary project management. These, in turn, influence the large global community of members of the PMI as well as those who utilise project management as a tool. The standardisation of core knowledge is further reinforced through training and professional certification standards established with the overview of PMI, APM, and other institutions. The limitations of this approach has been criticised (Shepherd & Atkinson, 2011), and '...the PMBOK® Guide...still does not, represent the knowledge that is necessary for managing projects successfully' (Morris, 2013, p. 54).

## **PROJECT MANAGER APPROACHES**

The project manager uses a range of learnt approaches to organise work through projects. These approaches rely on knowledge that is technical, social, and organisational. A less experienced project manager may base their approach on knowledge generated from technical training. This training often involves the development of skills through institutional qualifications and industry certifications. Research undertaken by Algeo (2014b) identified the technical approaches used by experienced project managers to acquire and exchange knowledge. Experienced project managers established their physical and virtual project environments as a reaction to organisational pressure to utilise existing technical approaches. These project managers were also constrained by their organisations to '...supply support and scaffolding for learning and reflection within the authentic, real world contexts in which knowledge construction naturally occurs' (Lee & McLoughlin, 2007, p. 23).

After gathering technical knowledge from a structured program, such as a degree or certification, a project manager may then attempt to convert this knowledge in an often evolving and dynamic environment (Nonaka, Toyama, & Konno, 2000). In this way project managers socialise their knowledge and learn by doing. Learning-on-the-job may result in a shift in thinking: from technicians using tools, to reflective practitioners. The broadening and integration of project managers knowledge aligns to the core theme of the 'Rethinking Project Management' research study (Winter et al., 2006). The 'Rethinking' agenda espoused shifting from the technical approach used to manage projects to developing a holistic approach focused on the delivery of value using social practices in projects.



Several approaches can be used by the project manager which embeds social practices when managing project knowledge, such as reflection, storytelling, and the establishment of communities of practice. Reflection is referred to by Boud, Keogh, and Walker (1985) as ‘...a generic term for those intellectual and affective activities in which individuals engage to explore their experiences in order to lead to new understandings and appreciation’ (Boud et al., 1985, p. 3). Project managers collaborate in a social context and can further shape, build, develop, and embed their knowledge through individual reflection (Algeo, 2014b). The exploration of how the self has interacted and reacted under certain circumstances can illuminate future pathways not previously considered. Project managers participate in communities of practice which create ‘...shared identity, foster commitment/obligation and co-dependence and support social interaction’ (Hall, 2001, p. 15). The ‘...activities, identities and artefacts, and communities of knowledge and practice’ (Lave & Wenger, 1999, p. 83) offer a social context for the project manager to gain knowledge. This socialisation of knowledge occurs in communities of practice which contain ‘...groups of people informally bound together by shared expertise and passion for joint enterprise’ (Wenger & Snyder, 2000, p. 139). Storytelling is common to interpersonal communication of project managers and serves as a vehicle for knowledge exchange. This approach relates to knowledge exchange where ‘...essential knowledge, including technical knowledge, is often transferred between people by stories, gossip, and by watching one another work. This is a process in which social interaction is often crucial’ (Pfeffer & Sutton, 1999, p. 90).

The approach to knowledge exchange is ‘...a *social process* contingent on histories, professional perspectives and local conditions where interaction results in a systematic mutual approach to identify, capture and share tacit knowledge in order for it to become explicit knowledge’ (C. Algeo, 2015b, p. 121). These social processes occur ‘...between decision makers and other individuals or groups of people who were working together to achieve an outcome...[and] can both facilitate and constrain the exchange of knowledge’ (Tasselli, 2015, as cited in Algeo, 2015a, p. 12). However, Algeo (2014b) found that project managers exchange knowledge in a predominantly impersonal and formal manner, and the exchange is systematic, yet social. A disconnect was identified in what the experienced project manager said they did to exchange knowledge with what their work colleague said they did, in addition to the different approaches observed *in situ*. This suggests that the project manager used different approaches to manage projects as a result of the social norms which could further reinforce individual behaviour.

To ensure knowledge has meaning, it ‘...must be continuously re-created and re-constituted through dynamic, interactive and social networking activity’ (Swan, Newell, Scarbrough, & Hislop, 1999, p. 14). The creation of meaning occurs when tacit knowledge is converted to explicit knowledge. This conversion was developed into a ‘Model of Dynamic Knowledge Creation’ by Nonaka et al., (2000). To understand these ‘...complex social processes that go on at various levels of project working’ (Cicmil, Williams, Thomas, & Hodgson, 2006, p. 676) an interpretivist approach is

required to develop a social construction of reality in the project. This construction of the lived experience (Schwandt, 1994) may create an organisational advantage using the exchange of social and intellectual capital, where ‘...researchers increasingly recognize group-specific communication codes as a valuable asset within firms’ (Nahapiet & Ghoshal, 1998, p. 254). When examining the lived experience in a project context Algeo (2014b) found that project managers exchanged knowledge in a social, systematic manner.

Social interaction is essential for knowledge to be exchanged in a mutually beneficial and systematic manner in order to achieve a desirable outcome. Exchanging project knowledge is a ‘...powerful way to share, replicate, and scale up what works in development’ (Kumar & Leonard, 2011, p. 1). The project manager can facilitate these social interactions in an organisation using a logistical, structural, and cultural frame by (O'Dell & Grayson, 1998, p. 157):

- Identifying a common purpose and common fate to minimise organisational barriers;
- Valuing knowledge sharing over personal technical expertise and knowledge creation;
- Creating opportunities for contact, relationships, and common perspectives among people who may not work side-by-side;
- Recognising and capturing tacit knowledge; and
- Building knowledge sharing into work practices by allowing time and offering rewards.

The development of a social reality to manage work within this ‘organisational reality’ requires individuals to understand ‘...actual practices and not their formal descriptions ... guiding focus, decisions, norms, expectations, understanding of procedures, technology, and so on’ (Klev & Levin, 2012, p. 84). These solutions imply organisational learning has occurred, and may have generated ‘...negative and positive reactions’ (Klev & Levin, 2012, p. 86). In these deliberations ‘... the individual project manager is key to organizational learning because it is the thinking and acting of individual practitioners that produces learning’ (Argyris, 1995, p. 26).

## CONCLUSIONS

Project knowledge can be viewed as problematic. The dominant knowledge domain of discrete tasks with a technical and process orientation shapes much of the knowledge which exists in project management. The understanding of the concept of knowledge appears limited, incomplete, and fragmented. Attempts to view knowledge outside of that domain are hindered by a paradigm which is also influenced by boundaries shaped and reinforced by institutions with multiple formal project management ‘Bodies of Knowledge’ (BoK). Knowledge can be identified in terms of knowledge domains (techno-process; social; organisational) as well as from the perspective of ‘knowability’. While there may be some variation on an individual basis, that which are ‘known knowns’, often the dominant voice from various BoKs, are the most recognised and used. Accessing and utilising

‘unknown knowns’ may provide a rich field of information for project managers. However, these fields are limited by a lack awareness of social and organisational knowledge. This limitation may be addressed through research and diffusion, as well as individual experience when managing a project. Project managers use a range of learnt approaches to organise work through projects, where contexts to construct project knowledge often cross domain boundaries. Finally, project managers naturally build their social and organisational knowledge through experiences, including participation in communities of knowledge and practice, which span multiple domains.

In 2003, Kasvi et. al. lamented that ‘...in spite of increasing prevalence of project work, literature and research on project knowledge management or learning project organisations are still sparse’ (Kasvi et al., 2003, p. 581). Even with research into project management and knowledge management in the ensuing years, there still appear to be knowledge ‘blind spots’ in project management. The variation between individual project managers in the exploration of known unknowns continues. This provides an opportunity for further research as the traditional techno-process viewpoint is laden with positivist thinking. Perhaps additional plurality may develop in project management outside of the discourse associated with that paradigm. In addition to positivist epistemology, will a more post- positivist school emerge? Can an application of post-positivism generate insights which are less relativist or incommensurable, allowing room for a broadened and nuanced view of project knowledge to develop? Researchers may consider exploring how views of critical realists can complement positivists as the subjective and qualitative researchers have complimented the positivists. There may also be merit in exploring the expansive array of theory from the sociological and organisation fields, as a more integrative approach can extend into collaboration across these fields, potentially exposing economic, social, and organisational value. As project management continues to be adopted in service and knowledge oriented work and organisations, broadened project knowledge can create value and meaning. The recent development of project organising special interest groups, facilitating the development of a more broad span of project knowledge at conferences both in Europe—EURAM, and Australasia—ANZAM, are steps in the right direction.

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PM Knowledge Domains	Techno -process Knowledge	Social Knowledge	Organisational Knowledge
DEFINITIONS	Project Management knowledge as rational and universal underpinned by logics of science and engineering,	Project Management knowledge relating to social phenomena: external influences on living organisms including behavioural, historical and developmental.	Project Management knowledge as an "examination of how individuals construct organizational structures, processes, and practices and how these, in turn, shape social relations and create institutions that ultimately influence people." From Stewart Clegg, James Russell Bailey, <i>International Encyclopedia of Organization Studies</i> (2008)
KNOWLEDGE AREAS	Drawn from contemporary project management evolving from rationalist engineering, scientific, and systems theory and practice. (e.g. PMBOK® Guide, an others).	Drawn from sociology and anthropology theory and practice.	Drawn from organization studies, organization behaviour theory and practice.
<b>DOMINANCE</b>	<b>ESTABLISHED</b>	<b>EMERGING</b>	<b>EMERGING</b>

Figure 1: Project Knowledge Domains

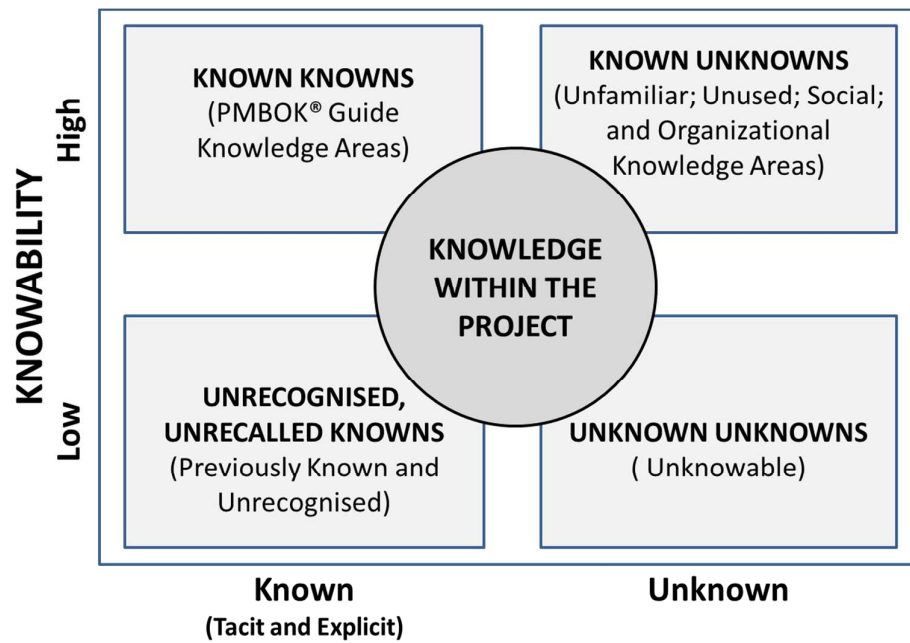


Figure 2: Project Knowledge Perspectives (adapted from Brockmier) (Brockmeir, 2011)

ORDERS OF IGNORANCE	TYPE	DESCRIPTION
0OI <i>0<sup>th</sup> Order Ignorance</i>	<i>Lack of Ignorance</i>	I <u>probably</u> know something...
1OI <i>1<sup>st</sup> Order Ignorance</i>	<i>Lack of Knowledge</i>	I <u>don't know</u> something...
2OI <i>2<sup>nd</sup> Order Ignorance</i>	<i>Lack of Awareness</i>	I <u>don't know that I don't know</u> something...
3OI <i>3<sup>rd</sup> Order Ignorance</i>	<i>Lack of Process</i>	I don't know of a suitably efficient way to find out that I don't know that I don't know something...
4OI <i>4<sup>th</sup> Order Ignorance</i>	<i>Meta Ignorance</i>	<i>I don't know about the Five Orders of Ignorance...</i>

Figure 3: Knowledge Ignorance (adapted from Armour) (Armour, 2000)