

Developing a Maturity Model for Knowledge Management (KM) in the Digital Age

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Abstract: This paper arises from a work-in-progress academia/industry collaborative research project to develop a knowledge management (KM) maturity model as a component (critical capability) of the IT Capability Maturity Framework (IT-CMF). The aim of the project is to develop a knowledge management (KM) maturity model that is 'fit for purpose' for organisations in the digital age. In undertaking this work it became clear that, outside of the fundamental challenges of KM, new significant challenges and questions are becoming apparent arising from the digital transformation and subsequent changes in how data, information and knowledge are stored, disseminated, analysed, communicated and used. The research questions we address in this paper are as follows.

- 1) How does digital transformation impact on approaches to KM?
- 2) What are the implications of digital transformation for how we should develop KM maturity models/practice advice?

Within the first research question some of the significant issues that have arisen during our work include the distinction and relationship between data, information, and knowledge in the light of data analytics and other related technologies. Social media has also changed the nature of knowledge creation and communication in, for example, facilitating commentary and opinions. The increasing volume of knowledge being created and the pace of change influences organisational learning. Is it always the case that stored knowledge will still be pertinent to understanding the next problem that arises as dynamic and improvisational capabilities, rather than core capabilities, become increasingly important? In terms of the second research question the changing nature of the KM context influences how guidelines can be developed and implemented. The rise of data analytics, for example, requires new relationship building and analytic capabilities in terms of liaising with the increasing number of organisational units that collect and analyse data. The increasingly ubiquitous nature of knowledge sharing also raises different issues in terms of assessing quality and currency as the central control of knowledge collection is losing ground. These, amongst other changes, may mean that previous 'truths universally acknowledged' within KM as 'best practice' now require re-examination. It may be increasingly difficult to prescribe certain practices that will be appropriate in most organisations or in most cases. This, therefore, has implications for how maturity models to support KM in the digital context are developed.

Keywords: knowledge management, maturity models, digital transformation, information management, data analytics, academia/industry collaboration.

1. Introduction

This paper arises from a work in progress academia/industry collaborative research project to develop a Knowledge Management (KM) maturity model as a component (critical capability) of the IT Capability Maturity Framework (IT-CMF) (Curley, 2004, Curley et al. 2015). As a component of IT-CMF, the aim of this project is to develop a KM maturity model that is 'fit for purpose' for organisations in the digital age.

The digital transformation of organisations requires an enterprise mind-set and impacts every function and business unit. Digital technology needs to become central to how the business operates, and organisations effectively need to re-think and possibly re-invent their business models, so that they continually learn from

interactions with customers, suppliers, and partners in the business ecosystem in order to remain competitive. The greater organisational reach of digital transformation across the entire organisation and the business ecosystem gives rise to new significant challenges and questions associated with the growth of relevant data and associated changes in terms of how data, information and knowledge are stored, disseminated, analysed, communicated, and used. The research questions we address in his paper are as follows.

- 1) How does digital transformation impact on approaches to KM?
- 2) What are the implications of digital transformation for how we should develop maturity models or practice advice?

This paper is organised as follows. Section 2 provides a contextual background to IT-CMF and the scope of its KM capability. Section 3 presents the output from a literature review that addresses our first research question, namely 'How does digital transformation impact an approaches to knowledge management?'. Section 4 discusses the second research question in terms of the implications of digital transformation for how KM maturity models and practice advice should be developed. This is based on a discussion of our experiences developing our KM maturity model. Finally, section 5 presents our conclusions where we summarise and reflect on the key issues raised.

2. IT-CMF and scope of its KM-related capability

IT-CMF is an action-oriented IT capability toolset of 35 IT-related critical capabilities (one of which is KM) developed by the Innovation Value Institute (IVI) research entity. Each capability is divided into a series of categories and associated capability building blocks, and for each capability, a series of management insights, maturity roadmaps, assessment instruments, and improvement guidelines has been developed. The framework's five-level maturity curve, ranging from initial to optimizing, enables organisations to systematically assess and understand their current IT capability maturity, strategically prioritize specific capabilities, and move toward their desired target maturity state (Curley et al., 2015). This work is supported by a diverse international consortium of organisations, government agencies, and academic institutions, that aim to address the challenges faced in optimizing the business value derived from the application of IT through an open innovation, collaborative design science approach (Curley et al., 2015) that incorporates the insights of workgroups of subject matter experts from both industry and academia.

IVI is currently in the process of updating the IT-CMF body of knowledge to develop and increase its relevance to the continually evolving digital environment. This activity involves an assessment of what has changed as a result of digital transformation in the relevant critical capability, in this case KM, and the implications of this for accurately describing the key components, named within the framework as categories and capability building blocks, as well as providing informative guidance in terms of associated maturity levels. We need to be able to accurately show the characteristics of a high maturity state for the different aspects of the KM capability in the digital age. Any analysis of what has changed within KM must also incorporate an acknowledgement of what has remained constant and fixed within KM. In terms of developing maturity models and practice guidelines we need to be cognisant of the sometimes overly hyped digital revolution agenda and thus need to provide considered information on what practices are unlikely to need adapting and which ones do, in fact, need to change to appropriately respond to different challenges. In order to provide some background to our development work we outline below the goals, objectives and value statement of the existing IT-CMF KM-related capability (referred to within version 1 of IT-CMF as Knowledge Asset Management) (Curley et al., 2015).

The goal of the capability is centred on getting the right knowledge, to the right people, at the right time, and thereby improving the quality of decision-making. Its objectives include to:

- Promote access to formalized documented knowledge and tacit, contextual knowledge by facilitating collaboration and communication between employees and, where appropriate, between employees and external experts.
- Scan the business environment to identify knowledge that is relevant to the organisation.
- Coordinate with those managing the other multiple sources of organisational data to incorporate all data into knowledge insights.
- Organise and index knowledge assets so that they can be easily found and accessed.
- Maximise the effective use of knowledge through facilitating learning and knowledge application to, for example, innovation.

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- Measure the use and impact of knowledge assets for relevant organisational activities including, for example, research and development, operations, and training.

The value derived from this capability includes the facilitating of better learning and organisational decision-making by leveraging and applying knowledge (Curley et al., 2015).

3. How does digital transformation impact on approaches to KM?

This literature review outlines the fundamental issues or concepts within KM, including its relationship to information and data. It further discusses the ways in which digital transformation has changed KM, and the implications of these changes for managing a KM capability in a digital business landscape.

3.1 Historical context - the fundamentals of KM

The use of IT to facilitate and help manage knowledge is a relatively new development but the problem of how to store knowledge so that people can find it and then use it has existed for millennia. KM must be understood in the context of the complexity of this problem. The relationship between data, information and knowledge is often discussed as an introduction to the problem of knowledge management, as explained in, for example, (Alavi and Leidner, 2001). The traditional view is that they exist in a hierarchy of complexity starting with data and finishing at the apex of knowledge. KM is then the application of appropriate management techniques to maximize the quality of what happens at the 'apex of knowledge' and its subsequent usefulness to the organisation. The nature of this process and the relationship between data, information and knowledge is, however, disputed. (Tuomi, 1999), as an influential example, argues that data makes sense only after we have information, and that information emerges only after we already have knowledge. As discussed by (Alavi and Leidner, 2001) this reversed hierarchy of knowledge is shown to lead to a different approach to developing information systems that support knowledge management and effective learning insofar as shared understanding must come before information or data can be of use. (Alavi and Leidner, 2001), finish their review of KM with the conclusion "*that information is converted to knowledge once it is processed in the mind of individuals and knowledge becomes information once it is articulated and presented in the form of text, graphics, words, or other symbolic forms*" (p.109).

Knowledge is a subjective understanding which can be formalized into an external source as information (e.g. in an article), which can then provide a framework for data to be interpreted. This distinction between tacit knowledge (in someone's head) and explicit knowledge (in an external form) is a divide well established in the literature and also within related fields such as information sciences, for example, Buckland's distinction between 'information as thing', 'information as process', and 'information as knowledge' (Buckland, 1991). His model proposes that knowledge or information systems can store explicit knowledge or 'information as thing' and this should facilitate learning processes 'information as process' that eventually lead to tacit knowledge 'information as knowledge' and appropriate action or decisions. The fundamental challenge of KM is that it manages or coordinates entities, such as documents, data etc., which may in themselves appear relatively straightforward but the process by which they are used by humans to develop and then apply knowledge is often nonlinear and unpredictable.

3.2 The impact of digital transformation on KM

The major shift that has happened in KM arising from the new digital landscape is the increase in the amount and types of data, information and knowledge that is available and the associated rise in the number of people who can therefore provide and use these for an organisation (Mackay et al., 2015). This has influenced the relationship between data, information and knowledge and changed the power relationship between different stakeholders. It has also exacerbated the problem of the need for contextual or indeed expert knowledge to 'make sense' of data (Mackay et al., 2015) and raised challenges in finding effective ways to judge the trustworthiness and authority of information coming from so many new and often unfamiliar sources (Watkinson et al., 2015). The rise of the 'internet of things' in which objects can provide data (Kaivo-oja, et al. 2015) has the potential to recharge KM as a management practice but also raises new ethical and organisational dilemmas. Knowledge integration from this new range of sources rather than knowledge production becomes the key challenge and existing KM processes and models are unlikely to be 'fit for purpose'. This also has an impact on the management of KM relationships with the wider organisational structure as the range of organisational units that collect data, and are thus potentially relevant as knowledge sources, is growing. Organisations are also becoming increasingly global and new social web technologies, by

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providing access to both knowledge context and content, can assist in overcoming the barriers of distance and time engendered by increasing internationalization and enable distributed organisations to thrive (Siakas, et al., 2010).

The environment in which organisations now operate is much more volatile and erratic than when the KM discipline was established, and organisations need capabilities to operate and react to these changes (Kaivo-oja et al., 2015). Thus the major change for KM is not so much in terms of managing knowledge content, as technology has developed to deal with this, but in terms of how people can effectively respond to, learn from and apply that content. Learning is becoming even more important and continuous informed adaption is now crucial (Lee et al., 2012). This is likely to also involve the ability to forget or not to act on knowledge gained from past experiences as this may no longer be valid in the current environment (Pavlou and El Sawy, 2010). The traditional KM emphasis on the importance of learning from past knowledge is now challenged in some cases. The tension and the relationship between learning from previous knowledge and being able to adapt and change direction as new knowledge comes into an organisation is becoming more pronounced and this is a difficult conflict for organisations to manage. Knowledge and expert understanding is, in one sense, needed more than ever to interpret and 'make sense' of the increase in data and information coming into an organisation but experts must also be flexible enough to make radical rather than incremental shifts in practice, based on that input, if necessary.

This ability to effectively use and apply knowledge to actually make a positive difference to an organisation is key to gaining value from KM and is most influentially discussed, introducing the term 'absorptive capacity', by (Cohen and Levinthal, 1990). The evidence on the actual improvements brought about by effective KM is difficult to reliably quantify but this ability to transfer knowledge to appropriate action has emerged as a key critical success factor (Serenko and Dumay, 2015). There is some evidence that the careful use of social IT can assist in enabling effective knowledge transfer to action (Siakas et al. , 2010).

One interesting question is the issue of locating useful key performance indicators (KPIs) to help organisation's measure their KM performance. The distinction made by Gold (Gold, 2001) between KPIs specific to KM and more general organisational KPIs, which are nevertheless dependent on KM, does still seem to hold as a useful approach within the digital environment. KM is not an 'end in itself' so high performance in KM based purely on KM metrics is of limited value if it cannot also be demonstrated that it is having an impact on related organisational metrics (e.g. speed of response to new information on changes in the market). Although it is not possible to measure tacit knowledge, it can be possible to develop mechanisms to measure its impact as discussed by (Chen and Fong, 2012) in their paper on KM and developing dynamic capabilities.

4. What are the implications of digital transformation for how we should develop KM maturity models and practice advice?

In this section we discuss our experience of developing a KM maturity model that is 'fit for purpose' in the digital age and highlight the most intractable and difficult concepts with a particular focus on ones which we feel have been most influenced by digital transformation. The purpose of this is to inform the debate on how research can best guide KM practice through maturity models by investigating a particular instance of this process. Firstly, we will provide a simplified overview of the key concepts we included in our KM critical capability in order to facilitate feedback from any readers. Secondly, we select some of these concepts and discuss some of the challenges encountered in developing guidelines for those concepts. Finally, we discuss some further general challenges with the rationale for maturity models in the context of such a fast changing environment.

4.1 Key concepts (capability building blocks) of the KM capability

The table below outlines the conceptual model we developed for the KM capability which consists of some generic categories and more specific capability building blocks. These concepts were derived through discussion with KM industry and academic subject matter experts.

Category	Capability Building Block
Capability model	Culture
	Structures/Relationships
	Organisational Cognition
	People
	Processes
	Tools and Technologies
Harvesting the capability	Strategy Development, Review, and Target-Setting
	Knowledge Discovery and Capture
	Knowledge Asset Organisation/Classification and Access
	Knowledge Analysis
	Knowledge Sharing
	Governance

4.2 Challenges encountered in developing KM concept guidance

This section highlights a number of key concepts about which some of the most complex discussions were had, e.g. in relation to their definition/scope and a description of ‘what good looks like’.

4.1.1 Knowledge Analysis

The scope of the knowledge analysis capability building block is defined as follows. ‘To establish and implement processes, skillsets, tools and linkages (e.g. to tacit knowledge) to seek and derive insights and intelligence from the organisation’s existing/accumulated knowledge resources in order to facilitate informed decision-making. This may arise both in response to general guidelines as prescribed by the KM strategy, and specific enquiries arising from within the organisation’.

Knowledge analysis is an area which has perhaps been most influenced by digital transformation as new technologies which facilitate both the generation of and the potential ‘sense making’ from large amounts of data, information and knowledge are becoming more common place. Organisations need to improve at analysing large amounts of data in ways that will provide them with new knowledge. The traditional divide between data processing, information management and knowledge management is shifting in organisations.

When developing maturity guidelines for this KM concept we needed to consider the effective and appropriate use of data analytics technology, whilst also considering that the ability to ‘ask the right’ questions of the data was essentially a knowledge management skill rather than a purely technical ability. The growth of data analytics also increases the need for those working in KM to effectively coordinate and collaborate with new stakeholders as the potential sources for useful input into knowledge grow. It thus also has an influence on other KM concepts such as ‘People’ and ‘Structures and Relationships’. Technological developments have also influenced the relationship between ‘knowledge asset/classification and access’ and ‘knowledge analysis’ as it is no longer always the case that classification comes before analysis. There are now multiple ways to view and organise data and information to provide potential knowledge and these are often done in real time on an ‘as needed’ basis.

4.1.2 Knowledge Discovery and Capture

The scope of the knowledge discovery and capture capability building block is defined as follows. ‘To establish the mechanisms (processes, roles, skillsets, sources, and linkages e.g. agent networks, connection to experts) to locate, evaluate, assemble and record knowledge that exists either within or external to the organisation, as directed by, for example, KM strategy or specific investigation requests’.

The increasing amount of potential sources of knowledge presents new challenges for knowledge discovery and capture. A particular problem is developing the capability to effectively evaluate sources in terms of Thornley et al. 2016. Developing a Maturity Model for Knowledge Management (KM) in the Digital Age. European Conference on Knowledge Management, Belfast, N. Ireland. 1-2 September, 2016.

authority and trustworthiness. The growth of social media provides new possible sources of useful knowledge but it also bypasses most tried and tested methods that people use to establish legitimacy in terms of its lack of peer review (in many cases) and other traditional barriers to the publishing of inaccurate information

4.1.3 Governance

The scope of the governance capability building block is defined as follows. 'Monitor and oversee the extent to which the knowledge management strategy is aligned with the business strategy. Track the extent to which the knowledge management strategy is being properly implemented by the knowledge management programme. Define and use processes to assess and ensure, for example, the integrity, completeness, and currency of knowledge assets'.

The increasingly ubiquitous capture, storage, and analysis of data, information and knowledge presents new potential governance challenges in terms of who really is responsible for knowledge. As captured in our definition above we have focussed on responsibility for ensuring that strategy and processes are congruent with the needs of the organisation. It is debatable whether this should also include more legal and compliance responsibilities in terms of how knowledge is collected, stored and shared. As regulations around data, information and knowledge grow, providing guidance on 'best practice' also merges into providing legal advice on compliance with all the associated potential pitfalls.

4.3 Implications of digital transformation on the value and use of KM maturity models

In this section we briefly highlight some more general points on the impact of digital transformation on the overall value and purpose of KM maturity models in terms of our understanding of best practice and organisational learning.

4.3.1 Does best practice still exist?

The pace of technological change and the increasing volume of research which could potentially inform practice makes it more challenging to define and prescribe certain practices as being more likely to lead to success than others. It may be that maturity models need to slightly shift their approach in describing different maturity levels of practice in ways which are less tied to particular technologies or environmental assumptions. This then may require further support and guidelines within the model or in supporting its implementation so organisations can adapt it to their particular situation.

4.3.2 Organisational learning

An underlying shared assumption/belief of our work is that whilst information and data can be stored externally, knowledge is essentially something that can only exist inside someone's head. As such, insofar as knowledge can be managed, it is fundamentally a problem of managing people in terms of what those individuals know and how they share and use what they know. The aforementioned pace of change has challenged traditional learning approaches and now most employees are required to update their learning throughout their career. The problem of how this can be best managed in the increasingly fast pace of modern workplaces, which is both an impetus and a potential barrier to learning, is perhaps something that KM needs to become more concerned about. The end of a 'job for life' for most people and an increasingly pragmatic workforce who are prepared and indeed often forced to move jobs with reasonable frequency is a significant challenge for retaining, developing and using knowledge for organisations.

5. Conclusions

In this paper we have outlined some of the major shifts occurring in KM as result of digital transformation and some of the subsequent challenges in developing KM maturity models that can help guide and advise organisations on improving their KM capability. Managing knowledge is a fundamentally challenging activity because of its intangible nature and its dependence on the actions and behaviours of people. In many ways new digital developments have made it easier to collect, store and analyse data and information in ways that can provide knowledge, but it has also undeniably made it harder in others. In a similar way, the fast pace of change makes it more important than ever for people to know 'what is new' and judge its relevance to their organisation but it also presents them with challenges in doing this effectively. KM maturity models are one way to help organisations to do this but we need to ensure that as we develop practice guidelines we find a

way to describe best practice which is actually useful for those operating in such a complex and challenging environment. This may require some re-thinking of how best to go about developing KM maturity models and we actively welcome any feedback on our work thus far.

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