Knowledge Intensive Business Processes: Theoretical Foundations and Research Challenges

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Abstract

In very recent times, the pressing need to compete on the basis of human-centered knowledge rather than process automation, has expanded the field of Business Process Management (BPM) to include knowledge intensive business processes. This paper proposes a theoretical framework that combines the related research in BPM and Knowledge Management (KM) fields, including a holistic model of BPM, a process/knowledge continuum and the so-called reversed knowledge pyramid. More precisely, this conceptual paper analyses the reversed knowledge pyramid, along the process/knowledge continuum, taking a holistic approach. This, in turn, sets the much-needed foundations explaining how strategy, processes, people, knowledge and technology (both KM and BPM) all fit together for different types of BPs and create opportunities for value creation and competitive differentiation. The proposed multidisciplinary framework is also used to identify the key research questions that lie at the intersect of BPM and human-centered KM and require a multidisciplinary approach.

1. Introduction

Business Process Knowledge – what is it and why should organizations care? This is a key question organizations aiming to compete based on their knowledge intensive business processes (BPs) are asking, or should be asking in the future. Since technical solutions, such as ERP and workflows systems, for Business Process Management (BPM) support are now considered to be the mainstream IT applications, organizations can no longer compete based on these widely available technologies. In fact, more than two decades of experience in using these complex applications has resulted in efficient processes across the board with process automation technologies becoming more and more ubiquitous. “Emergent work practices are becoming common rather than prescribed projects. Most of the simple tasks have been automated or soon will be” [1].

The next challenge for the more mature BPM organizations is to focus on process effectiveness that is tightly coupled with the process-related, human-centered knowledge, rather than BPM systems. “The shift from transactional to tacit interactions requires companies to think differently about how to improve performance... Moreover, the rise of tacit occupations opens up the possibility that companies can again create capabilities and advantages that rivals can’t easily duplicate.” [2]

Consequently, the world of BPM is expanding to accommodate new types of processes. While in the past the term “business process” was universally accepted to represent highly structured, repetitive transactional BPs, typically at the operational level, the increased need to better understand process-related knowledge, has forced both the researchers and the practitioners to look beyond coordination of very simple work related to data entry and low-level decision-making [3]. Examples of these human-centered BPs, include customer support, design of new products/services, marketing, management of data quality, IT governance, strategic planning. In fact, organizations’ understanding of some of these processes has evolved. For example, the customer support processes have evolved from highly structured, designed to reinforce standardization and eliminate variation, to knowledge-intensive, and in some instances even highly personalized. A contributing factor has certainly been a wide-spread use and increased sophistication of various Business Intelligence (BI) systems that enable organizations to better understand and analyze the needs of different categories of their customers.

The pressing need to compete based on knowledge rather than process automation, has created the need for better understanding of the knowledge dimension of BPs. Consequently, knowledge is now considered an integral part of the BPs and not something to be managed separately. It is deeply imbedded not only in documents, models or formal repositories but also in organizational routines, processes and practices [4]. It is inseparable from individuals and their actions [5]. Knowledge is a combination of experience, context, interpretation and reflection and involves more human participation than information [6].

In essence, BPs integrate knowledge and action, providing new opportunities for bridging the gap that has been widely recognized by the KM community [7]. According to Pfeffer and Sutton, “ one of the main reasons that knowledge management efforts are often divorced from day to day activities is that the people who design and build the systems for collecting, storing and retrieving knowledge have limited, often inaccurate view of how people actually use knowledge in their jobs” [8]. At the same time,
BP provide much needed context and the overall purpose for the KM activities. “KM activities are all over the map…But no one claims the big question Why?” [6]. According to Davenport [6], this particular problem has been identified as the key flaw of KM today.

The recent developments in the fields of BPM and KM have created new opportunities to bring these two fields closer than ever before. However, it is becoming clear that even the basic concepts such as business process, process-related knowledge and even knowledge intensive BPs are still evolving and consequently are being interpreted differently by the BPM and KM communities. In order to promote a much-needed synergy between these two fields, it is necessary to establish a common foundation for interdisciplinary research and practice.

This paper aims to promote a further discussion by BPM and KM practitioners by focusing on the following research question:

What are the main knowledge components of different types of BPs and how can they be used for competitive differentiation?

In order to answer this question, the paper proposes a theoretical framework that combines related research in BPM and Knowledge Management (KM) fields, including a holistic model of BPM and a process/knowledge continuum described in [9], with the so-called reversed knowledge pyramid [10]. More precisely, this conceptual paper analyses the reversed knowledge pyramid, along the process/knowledge continuum, taking a holistic approach. This, in turn, sets the much-needed foundations explaining how strategy, processes, people, knowledge and technology (both KM and BPM) all fit together for different types of BPs and create opportunities for value creation and competitive differentiation. The proposed multidisciplinary framework is also used to identify the key research questions that lie at the intersect of BPM and human-centered KM.

Even though this is a conceptual paper, the analysis of KM aspects of different BP types along the knowledge-process continuum is informed by a detailed KM and BPM literature review and founded in the practical case studies of these areas.

2. Related work

2.1. BPM: traditional and emerging views

Business Process Management (BPM) is now perceived as the number one business priority by CIOs worldwide [11]. Even though BPM is considered an emerging discipline, companies have always been looking for new ways to support and improve their work, with and without technology. Over many years, methodologies and tools have evolved with our improved understanding of human work practices. In particular, the last two decades, have seen BPM evolved from various process-related theories, and practices such as Business Process Reengineering (BPR), Total Quality Management (TQM), Lean management, Six Sigma, supply chain management as well as various process-related technologies such as workflow management systems, enterprise resource planning (ERP) and other integration systems and, recently, technologies for web-service integration. Compared to its predecessors, BPM represents a fundamental shift that focuses on business value creation via ongoing BP improvement and innovation supported by BPM-enabling technology [12]. Contrary to popular belief, BPM is not an updated version of BPR [13], as is often perceived by individuals outside of this discipline. This is because its focus is no longer on radical re-design driven by engineering practices, and not even on process automation. Rather, the focus is on an ongoing management and improvement of all organizational processes, and, in very recent times, organizational agility [14].

The emphasis is now placed on business value creation (not necessarily cost-cutting), via ongoing improvement and innovation of a whole range of processes, across functional, and even organizational boundaries. Most importantly, BPM now considers various BP-related strategies organizations apply to leverage human expertise, knowledge and potential to innovate, while using the available technology in the best possible way. This has led business leaders to consider BPM holistically, extending the boundaries of BPM to include the strategy component, as well as the so-called “people” component that in the past has been subsumed within the “process” component. In essence, strategy defines how organizations deliver value to their customers. Strategy is implemented via BPs i.e. coordinated activities of people with different responsibilities and obligations, as defined by their organizational roles. The role of technology is to help people to execute (and not necessarily fully automate) their processes and, ultimately, make them more effective.

This link between strategy and IT, enabled by the business processes, is important not only for organizations aiming to bridge the gap between business and IT, but also to justify the business value of their BPM initiatives. In fact, according to the latest survey of the BPM practitioners world-wide [15], organization’s ability to link their strategy and business processes is perceived to be one of the key organizational and BPM challenges today.

An example of a holistic BPM is the widely known model proposed by Harmon [9], depicted by Figure 1. Its strategy component includes the enterprise-level process architecture, issues related to process-related performance measurement and the overall BPM governance. The Business Process component includes methodologies for process design and ongoing improvement. The people component
includes BPM related knowledge management, training and issues related to BPM-related job design. Finally, its technology component includes issues and practices relevant for the IT development, including the BPM systems.

In addition to linking organizational strategy and its implementation level, via business processes, Harmon’s model defines three levels of concerns within BPM: the Enterprise, Business Process and Implementation levels. This separation is very important, as “projects or activities at different levels require different participants, different methodologies and different types of support”[9, pp. xxvi].

It is also important to note that the relationship between key components of this model is not simply bi-directional, or always top-down from strategy to IT via BPs, as with other hierarchical models. If BPM is taken holistically, these components become highly intertwined and start to co-evolve and shape each other.

While the previous two decades have seen BPM predominantly practiced at the Business Process Level and within the technology component of the Implementation level, the current focus on knowledge-intensive processes, places the main emphasis on the people component, but also challenges our understanding of the other components, that now need to be reconsidered to accommodate this “new” category of processes. The work presented in this paper, aims to offer important questions in the form of research challenges to help the practitioners as well as researchers to improve our current understanding of the holistic models and practices in BPM.

2.2. Knowledge Management (KM)

Over the last decade, the field of knowledge management has also evolved. For many years, KM research and practice followed the so-called Technology-Push model of KM [16]. In fact, this is still the most dominant research and technology paradigm in KM. It is based on the idea that technology could be used to capture, codify, and store knowledge and then transfer (send) it to a user who needs it at a particular point of time. However, there is strong evidence that, in spite of extensive investments and very sophisticated systems, this approach fails to deliver business value to organizations [16]. The fundamental problem is in the underlying, mechanistic, information-processing model of KM [17]. This widely used model assumes that technology can be used to push the right knowledge to the right people at the right point of time. However, as Newell at al. [18] pointed out, ICTs marketed as KM systems obscure and deny the socially constructed nature of knowledge.

On the other hand, knowledge-intensive BPs confirm the relevance of, and the need for, the emerging “Strategy-pull model of KM”. Essentially, “this model embodies organizational processes that seek a synergistic combination of data and information-processing capacity of information technologies and the creative and innovative capacity of human beings” (pg. 15) [16].

Furthermore, “one of the main reasons that knowledge management efforts are often divorced from day to day activities is that the people who design and build the systems for collecting, storing and retrieving knowledge have limited, often inaccurate view of how people actually use knowledge in their jobs” [8]. While the explicit knowledge (procedures) can be captured and stored, tacit or experiential knowledge, that includes the know-how, mental models and complex organizational practices, is impossible to capture in its entirety.” “This is why the codification process for the richest tacit knowledge in an organization is generally limited to locating someone with knowledge, pointing a seeker to him/her and encourage them to interact” [19].

Merging the BP view of the firm with a Knowledge Process (KP) view of the firm requires several basic assumptions that will provide the overlap between BP and KP within a firm. These assumptions revolve around the view of KM, organizational learning (OL) and the adjustment of the knowledge pyramid as presented by Jennex [10]. While prior KM practices have focused specifically on gathering all available knowledge, KM must become a practice designed to accumulate only the knowledge necessary for improving the organization’s effectiveness. OL, for a firm with this view of KM, then becomes focused on only the improvement of those activities that begin with their core business processes and extend to other knowledge intensive
processes that would result in creating increased value for the firm.

The revised knowledge pyramid [10] posits that the Data-Information-Knowledge-Wisdom (DIKW) is actually inverted from the normal view. The justification for this view is that given a set of x data provided by organizational sensors, the manner in which these data are assembled provide at a minimum a set of x information. A similar argument is made for Knowledge and then Wisdom as an organization moves up the inverted knowledge pyramid. With an increasing amount of data that occurs through both human and mechanical sensors [10], the possible combinations of Information-Knowledge-Wisdom generated become exponentially increasing. KM practice must be positioned to recognize the potential overload resident within an organization’s data collection efforts and must develop the KM practice contribution to the organization by focusing on only DIKW that is relevant to improving BP efficiency within an organization. The ability to focus organizations to discovering and using only information-knowledge-wisdom that improves BP efficiency is how unique capabilities are constructed and used to create competitive advantage.

2.3. KM and BPM Integration – Related work

As indicated, BPM provides the context needed for knowledge processes. People create, co-create, share, transfer and apply knowledge in the context of their everyday activities i.e. business processes they participate in, in order to achieve organizational goals and create value. In fact, BPs can be considered as knowledge-in-action or actionable knowledge.

Hence, this paper reinforces the need to better integrate knowledge management with business process management, especially in the context of knowledge-intensive BPs. At the same time, a very comprehensive review of BPM and KM literature confirms that this integration problem is very challenging. “It is still not clear how to integrate knowledge management more thoroughly into business process management... connecting knowledge activities to the core business processes is the second and more effective stage of knowledge management in an organization” [20].

Judging by the limited number of papers published on this topic, this research challenge is yet to be addressed. For example, El Sawy et. al. [21] discuss knowledge management strategies for business process redesign, inspired by the obvious limitations of the widely used BP improvement methodologies that tend to focus too much on control flows. Dalamaris et. al. [22] describes a framework for the improvement of knowledge-intensive BP based on a BP-related ontology. Marjanovic and Seethamaraju [23] describe a case study of a practice-oriented business processes and analyse its knowledge dimension. Amavadi and Lee [24] propose seven dimensions of process knowledge that include structure, personnel and coordination, performance and tools, discourse, results, quality and implications. More recently, Sanikar and Deokar [25] also consider knowledge intensive processes and propose a set of design principles for development of process-based knowledge management systems. It is important to observe that process-related knowledge is not just another component of a BP that could be easily distilled in a form of “knowledge-flow”, similarly to the data-flows between different tasks in a process. Even more, “a BP can be viewed as the nexus around which knowledge sharing and creation can thrive”[21].

In fact, process-related knowledge requires us to reconsider our understanding of a process itself as well as process improvement efforts. In the past, popular classifications of organisation’s BPs were very much focused on process structure, thus reinforcing the underlying assumption that processes need to be modeled in order to even be accepted as processes. BP improvement methodologies were therefore largely focused on the improvement of models. The resulting expectations were the improvement of the processes modeled. While this was an accepted wisdom when dealing with highly structured processes, this is not the case with knowledge intensive processes. In fact, a previous case study of an e-procurement process by Marjanovic and Seethamaraju, [23], confirms that the as-is and to-be processes could even have the equivalent models, with the later version being a significant improvement of the former. The same case demonstrated the need for a

![Figure 2. A process/knowledge continuum [9]](image_url)
different type of BP improvement methodology based on a set of knowledge processes. The same point was also confirmed by ElSawy who argues that “KM can be thought of as a strategy of business process redesign” and “the second wave of BP Improvement” [21].

While process-related knowledge and knowledge intensive processes could be defined in many different ways, as a starting point, this paper adopts a classification of BPs along the process/knowledge continuum, originally introduced by Crandall, Klein, and Hoffman [26] as summarized by Harmon [9], depicted by Figure 2. The process/knowledge continuum describes typical types of processes ranging from very simple procedural processes, performed by people following a step-by-step procedure, more complex processes performed by knowledge workers, to very complex, knowledge intensive processes performed by experts.

Additionally, we contribute the view of integrating business processes into the inverse pyramid to further illustrate both the relationships of KM to BP and the difficulties inherent in achieving a competitive advantage in an organization (See Figure 3). The arrows in Figure 3 illustrate the path using data/information/knowledge/wisdom combinations to arrive at an end result process. The arrow tip should be interpreted as a single point in all possible combinations existing within a particular section of the inverse knowledge pyramid.

These BPs can be classified as simple procedural processes performed by ordinary workers, more complex processes performed by knowledge workers and expert processes performed by domain experts, typically with 10 or more years of experience.

Figure 3 illustrates a relationship between different types of BPs, the elements of the inverse K-pyramid (data, information, knowledge, wisdom), and BP-enabled competitive differentiation. This simple classification is expressive enough to facilitate our analysis of process-related knowledge as it focuses on the knowledge people need to have in order to perform process tasks, rather than the order of these tasks, as it is typically done in control-flow oriented classifications.

The processes, illustrated in Figure 3 by arrows, BP1 and BP2 show that the data and information are simplistic and the number of possible combinations is low relative to the potential combinations of data and information that result in knowledge and wisdom. BP3 illustrates those processes that are more complex and require knowledge workers to achieve organizational efficiencies. BP4 and BP5 represent the expert knowledge intensive business processes that result in ultimate organizational efficiencies. However, notice that the representation indicates that BP4 reaches an organizational competitive advantage while BP5 does not. Even though BP5 may result in a very efficient process, the combinations resulting in BP5 does not achieve a competitive advantage for the organization.

This representation illustrates the discernment of the multitude of combinations of the DIK layers that result in the choices of Wisdom. Not all, and likely very few combinations of DIK will result in an organizational competitive advantage. Even more, only some of these combinations will reach BP-enabled competitive differentiation. Although it is impossible to capture all key success factors behind every combination in order to predict their outcomes, some important factors are already known and need to be considered as follows.

First of all, the knowledge pyramid “sits in” an environment, depicted by Figure 3, as a “Competitive Business Environment”, that will obviously impact on possible ways an organisation can achieve competitive advantage, that may or may not be process related. The classical model of Porter’s Five Forces [27], provides an effective way to analyse organisation’s competitive environment. However, we also posit that, when considering competitors, it is important to have an indication of their ability to run similar processes, as perceived by a shared pool of customers. For example, an organisation focusing on BP2 (a very simple procedural process with routine decisions and predefined outcomes) could achieve a competitive differentiation on a basis of process efficiency (making their BP2 run faster). Only in a competitive environment where the other competitors
do not have the same processes fully automated need an organization achieve a competitive combinatorial process illustrated by BP4. For example, in the early days of process automation, running a more efficient (faster) customer-facing BP such as “Processing of Home Loan application”, would certainly guarantee an advantage over the other competitors. This was possible in a competitive environment, where companies used to take up to a month to process the applications manually, and would certainly guarantee an advantage over the other competitors. In this case, just the combination of data and information levels of the knowledge pyramid was sufficient, as BP2 is a simple process.

However, this is no longer the case. Most of the simple tasks have been automated or soon will be [1]. This means that the BP-related strategies, based on process automation (as in the case of BP2) are no longer sustainable in most industry sectors. As previously discussed, organisations are looking for the new sources of competitive differentiation that is more sustainable and harder to replicate by competitors. This is why they are now focusing on knowledge-intensive processes, requiring more complex combinations of DIKW that need to be further analysed and understood. Obviously, this calls for a holistic approach to analysing these KIBP, including its strategy, people, processes and technology perspectives, as previously discussed in the context of Harmon’s holistic BPM model.

The following section will introduce an integrated framework for the analysis of process-related knowledge and zoom in on different patterns of DIKWs for different types of business processes, taken in a holistic approach.

3. A theoretical framework for KM and BPM integration

This section introduces a theoretical framework that combines the previously introduced models from the KM and BPM disciplines, namely, a holistic model of BPM, a model of process/knowledge continuum and our BP-related extension of the reversed knowledge pyramid. The main objective is to illustrate how the key elements of all three frameworks shape each other in the context of three different types of BP, and together determine patterns of DIKW. In particular, types of process-related knowledge need to be considered in the context of BP-related strategy.

The integrated framework is depicted by Table 1. The first column describes the key elements coming from different theoretical frameworks, used to analyse three different types of BPs captured by columns 3, 4 and 5.

The second column is used to help the reader to correlate each key element from column 1, with the corresponding theoretical framework, coded according to the legend presented at the top of the table. For example, the element called “BP Type” comes from the process-knowledge continuum, coded as 1. The same process-knowledge continuum was used to describe the main characteristics of all three types of processes, provide examples and classify the types of workers required (captured by column 1, rows 2, 3, 4). Business examples used include the retail sales BP representing a simple procedural process, the equipment repair BP that is a more complex process, performed by knowledge workers and the new product development as an example of a very complex BP performed by experts.

Data sources, Information type, types of process knowledge and knowledge intensity (Rows 5, 6, 7, and 8), that originally come from the reverse pyramid framework, together describe the elements of the DIK “patterns” associated with different types of BPs. For example, information needed for simple procedural processes is predefined and known in advance.

The same key element “Information type” is also considered by the Holistic BPM model, within its BPM systems component (coded as 2.4). At the same time, the people component of the same framework is predominantly described by the combination of several elements, including “Worker Types”, “Types of Process knowledge”, “Knowledge intensity”, defining what kind of knowledge is required to perform these processes and to what extent it could be captured in its explicit form. BP Modeling and BP Improvement Methodologies originally come from the Process component of the holistic model, while the last two elements come from its strategy component. When interpreting the above coding it is important to keep in mind that the proposed elements are not mutually exclusive. For example, even though BP Modeling comes from the Process component, as classified by the holistic BPM model, it is also related to the people component, as people’s knowledge determine the extent to which the given type of BP can be modeled.

Even though the Wisdom component of the reverse pyramid is not explicitly listed, we argue that the best place to include it is within the Strategy component, captured by the “Process-related competitive advantage”. Simply because design and implementation of a sustainable process-related strategy, requires high quality data (D), good understanding of all these key elements and their inter-relationships (I), knowledge of possible actions that could be taken and how to take them (K), but most importantly wisdom (W) to design the strategy and “figure out” what needs to be done to implement it, in order to create a sustainable competitive advantage.

Even though this key component (W) cannot be captured, we posit that the described patterns of the key elements of process-related knowledge for three different types of BPs (represented by columns 3, 4 and 5) offer some important clues, about possible ways to how a sustainable competitive advantage
could be achieved. For example, “Process efficiency” is highly appropriate for the simple BPs, but as previously explained, it is not a very sustainable. BPs that are more knowledge intensive (the right hand side of the second column and the third column) open up possibilities to compete on the basis of human knowledge, if it is leveraged in the most appropriate way. That may not be always possible, as previously illustrated by our example of the process BP5, depicted by Figure 3.

Finally, our table also illustrates that, as BPM reaches a more mature stage, organisations are gradually shifting their focus, further and further away from the left side of the table, describing very simple BPs, towards more complex processes. The associated research challenges are also following the same direction as illustrated by the next section.

4. Research Challenges

Our in-depth analysis of process-related knowledge in the context of three different types of BPs has identified a number of open research problems, confirming that the multidisciplinary field of KIBPs represents the next frontiers of both BPM and KM research. The following list summarizes the key research challenges that have been identified so far. They span all four elements of the holistic BPM and therefore need to be studied from different perspectives, with some yet to be discovered.

The list is by no means exhaustive, but does offer some important insights, that are supported by the current literature to further illustrate their importance.

- How to design, implement and evaluate new Improvement methods for KIBP?

Just like other processes, KIBP need to be improved. However, unlike simple BPs that have been the prime candidates for the currently used model-based BP-improvement methods, KIBP require a fundamentally different approach. The next stage of BPM calls for new type of BP improvement methods that need to be knowledge-based El Sawy [21].

The ongoing case studies in this domain, such as the one described in [21], illustrate that the ongoing improvement of a KIBP is itself a knowledge-intensive (meta-) process, consisting of a set of highly contextual knowledge processes. As these knowledge processes include ongoing acquisition, creation and co-creation, sharing, application and transfer of both explicit and experiential knowledge, they are best performed by domain experts, with deep experiential knowledge in the given context. However, the progress that has been made in this direction is still very limited. The key research problem is how to design, implement and evaluate new improvement methods suitable for KIBP.

It is also important to note that this fundamental shift in BPM thinking does not only impact on BPM research, but also prompts us to reconsider BPM-related education and professional development, in both university and professional settings.

- How to ensure ongoing improvement and innovation of KIBP?

Our research confirms a long-term mantra of BPM that BP improvement needs to be an ongoing process rather than a project with the start and end date. This is even more important in the case of KIBP to ensure that organisations continue to leverage its process-related knowledge. As already pointed out, simple BPs were more suitable for the improvement projects typically undertaken by the consultants. However, if an ongoing improvement of KIBP is meant to be practiced by the knowledge workers themselves, it needs to be fully embedded into the processes themselves, rather than bolted on. Previous KM research confirms that unless knowledge processes are made ubiquitous to human work, they are perceived as additional work on top of the real work and are very likely to fail [17]. This leads to another important research/organizational challenge related to organizational criteria used to measure knowledge work and encourage or inhibit knowledge sharing among employees.

- How to measure the performance of KIBPs and knowledge workers involved?

In addition to the above stated challenges, it is even more critical to design and evaluate the most appropriate criteria (KPI) to assess the performance of knowledge workers in the context of KIBP as well as the performance of the processes themselves. To make knowledge processes, required for the ongoing improvement of KIBP, these KPI need to be designed to encourage collaboration and knowledge co-creation. This in turn is very likely to change our understanding of the upper components of the reversed knowledge pyramid to accommodate concepts such as “collective knowledge”, “knowledge co-design”, that represent much more than collaboration and coordination of individual experts.

- How to transform KIBP Management into KIBP Leadership?

As Hammer pointed out in his own critical review of BPR [27], one of the problems with BPR was the lack of a way of effectively implementing the process improvements that energized and empowered employee teams who were coming up with the BPR improvement ideas. It is a well-known fact that empowerment can be achieved through leadership, more than management. However, KIBP Leadership involves much more than “management support”, (always cited as one of the key success factors of BPM, as it cannot be implemented in a top down fashion. Moreover, this leadership needs to transformational in nature [28] and requires not only shared goals, but shared responsibility for the overall process performance and its outcomes.

“Transformational leaders build a coalition to guide the transformation process and work to develop
a sense of teamwork. With trust as a foundation, companies or groups within companies can share their knowledge to achieve results that excel the sum of parts” [29].

Therefore, the time has come to replace the term BPM with BP leadership to make this vision of shared responsibility possible.

5. Conclusion

In the world of fully automated or soon-to-be automated BPs, an organisation’s ability to leverage its process-related knowledge becomes an important source of its sustainable competitive differentiation. Yet, this is one of the key challenges for both BPM and KM fields today. When it comes to knowledge-intensive processes, we argue that any approach to create a sustainable competitive advantage by focusing predominantly on the data and information (D and I components) of the reverse knowledge pyramid is very limited and is destined to fail. Our collective focus needs to shift towards the K and W components, researching the clues, patterns, critical success factors and the other yet-to-be discovered elements and perspective. Given the fact that we are dealing with highly contextual tacit knowledge and wisdom that is beyond anyone’s ability to fully understand it, we could only strive to create an evolving road map (rather than the territory), giving practitioners some valuable insights, while helping other researchers to further progress this important work. The integration framework, offered by this paper, sets the necessary foundations, aiming to make the first steps in this direction.

6. References:


Table 1: A framework for BPM and KM integration

<table>
<thead>
<tr>
<th>BP Complexity</th>
<th>Originating model / framework:</th>
<th>More complex processes</th>
<th>Very complex processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Characteristics</td>
<td>1) Process-knowledge continuum 2) Holistic BPM – 2.1 Strategy; 2.2 People; 2.3 Process component; 2.4 BPM Systems 3) Reverse pyramid – 3.1. Data; 3.2. Information; 3.3. Knowledge; 3.4. Wisdom</td>
<td>Simple procedural processes</td>
<td>Branching sequence; Many rules or decision points; Less defined subject matter</td>
</tr>
<tr>
<td>BP Complexity</td>
<td></td>
<td></td>
<td>Sequence defined by process; heuristic and guesses; evolving subject matter</td>
</tr>
<tr>
<td>Examples</td>
<td></td>
<td>Equip. Repair; Field sales; Process Analysis</td>
<td>New Product development; S/W system Design; Consulting</td>
</tr>
<tr>
<td>Worker Types</td>
<td></td>
<td>Ordinary workers</td>
<td>Knowledge workers</td>
</tr>
<tr>
<td>Worker Types</td>
<td></td>
<td></td>
<td>Experts</td>
</tr>
<tr>
<td>Data sources</td>
<td></td>
<td>Deterministic</td>
<td>User-selected</td>
</tr>
<tr>
<td>Data sources</td>
<td></td>
<td></td>
<td>Require human-expertise</td>
</tr>
<tr>
<td>Information type</td>
<td>3.2; 2.4</td>
<td>Predefined; highly structured; coming from BPM, ERP or Workflow systems</td>
<td>Structured and unstructured; Generally similar system sources</td>
</tr>
<tr>
<td>Information type</td>
<td></td>
<td></td>
<td>Structured/unstructured; Source cannot be predicted in advance;</td>
</tr>
<tr>
<td>Types of process-related knowledge</td>
<td>1</td>
<td>Predominantly explicit in the form of process models</td>
<td>Knowledge-intensive processes that require human expertise for completions. Mix of human and mechanical data collection</td>
</tr>
<tr>
<td>Types of process-related knowledge</td>
<td></td>
<td></td>
<td>New combinations of data and information occur frequently through human interpretation</td>
</tr>
<tr>
<td>Knowledge intensity</td>
<td>1; 3.4</td>
<td>Knowledge is resident in the process model. Data is captured largely by mechanical sensors</td>
<td>Knowledge-intensive processes that require human expertise for completions. Mix of human and mechanical data collection</td>
</tr>
<tr>
<td>BP Modeling</td>
<td>2.3</td>
<td>Quite detailed</td>
<td>Only High Level</td>
</tr>
<tr>
<td>BP modeling methodologies</td>
<td>2.4</td>
<td>Traditional</td>
<td>Knowledge-based</td>
</tr>
<tr>
<td>BP Automation</td>
<td>2.4</td>
<td>Automated with little human interaction.</td>
<td>Human interaction required at key points.</td>
</tr>
<tr>
<td>Process-related competitive advantage</td>
<td>2.1</td>
<td>Process efficiency; standardization to minimize variations</td>
<td>Process effectiveness; knowledge processes designed to leverage human knowledge</td>
</tr>
<tr>
<td>Process-related competitive advantage</td>
<td></td>
<td></td>
<td>Expert’s knowledge; competitive advantage not achieved through processes but is linked to expert work outcomes</td>
</tr>
<tr>
<td>BP performance monitoring</td>
<td>2.1; 2.2.</td>
<td>Measures related to process efficiency and control: cost/time/output/throughput</td>
<td>Measures related to process effectiveness expressed in terms of goals and learning</td>
</tr>
<tr>
<td>BP performance monitoring</td>
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