

Business Process Knowledge Management: Literature Review

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ABSTRACT

Business process knowledge management has become a popular topic thanks to an increase in digitalization projects, technology and IT system optimization and implementation initiatives, as well as an increase in knowledge generated, that requires organizations to review how process and knowledge management should be handled. This review aims to create an understanding on how knowledge management is applied within business process management. This includes identifying, analyzing, comparing and discussing the various application methods described in the literature sources, to create a thorough overview on the topic. The study was conducted as a systematic literature review, using qualitative content analysis method for the interpretation of the literature. Searches in Scopus, Web of Science, Science Direct identified 21 studies included in the review. The papers were analyzed with respect to business process knowledge management approaches. Across the reviewed literature, business process management processes are analyzed in relation to knowledge management processes looking for intersections of process components. Focus is on tacit knowledge that is one of main challenges in management aspect. The review contributes a needed common basis for future business process knowledge management research and practice by proposing the SECI model by Nonaka and Takeuchi (Socialization, Externalization, Internalization, Combination) to classify business process knowledge research, as well as suggesting a new structure of categorizing the various approaches of integrating the two concepts. Lastly, a future research agenda is proposed.

Keywords: Literature Review, Business Process Management, Knowledge Management, Business Process Knowledge Management.

1. INTRODUCTION

The 21st century is a time when organizations are in a mode of constant change, and with the recent onset, spread and impact of the COVID-19 pandemic, companies and individuals are constantly struggling to match the new “status-quo”, which in some industries is still being re-defined on an ongoing basis. Digitalization is no longer a long-term initiative with the aim to improve the competitive advantage, but a necessity to continue operating and to stay solvent and financially stable.

It is also established that with digitalization, technology and globalization, there is a systematic increase in knowledge

creation, which in turn has caused an increase in knowledge rich jobs, thus effective Knowledge Management (KM) has become a major challenge to organizations [1], [2]. Knowledge and process management, when managed separately, can lead to split focus and resources in the organization, reduce their competitive edge and mismanage their intellectual capital, compared to companies that focus on satisfying their customer requirements through a synergetic approach to KM and BPM [3], [4]. Busch [5] highlights three important commonalities between the two constructs: 1. Organizational focus, 2. Knowledge flow focus, 3. “Human social dimension” in the workplace context focus.

These commonalities are also reflected within the “knowledge creation spiral” proposed in the 90’s. Undoubtedly one of the most essential knowledge management models – the SECI model by Nonaka and Takeuchi [6], [7] describing how tacit knowledge is converted to explicit and vice versa (see Figure 1)

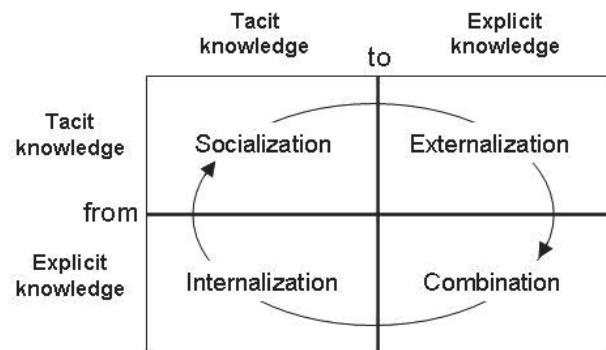


Figure 1 The SECI model (I. Nonaka; H. Takeuchi, 1995)

Various benefits are highlighted as a result of applying BPM and KM approaches jointly to an organizations performance management processes, such as facilitation of continuous and systematic process improvements, spread of innovation and flexibility to chance [8], [9]. Lin & Krogstie [10] suggest that process knowledge, applying semantic annotation in capturing and representing, can be used to analyze existing process models and reusing legacy models in order to create new ones. Sinclair et al. [11] agrees with Jung et al. [12] and Hrastnik et al. [13], that the goal of process knowledge management is to enable feedback from many areas, including prior process performance, to guide new process development, as well as improving existing ones. Information about a process itself and process execution results is valuable corporate knowledge. That is, information derived from business processes can (or must) be gathered and

formalized to enhance the performance of business processes, hence, the organization [12].

However, there is a lack of theoretical “basis” for the merger of the two, that has been empirically proven – despite attempts in the past to create a joint framework, it seems to lack similar context [8], [12]–[17]. This paper aims to examine how knowledge management can be applied in business process management, by analyzing existing theoretical and practical research on the topic and aims to create a thorough overview on how it can be used to improve business processes and to facilitate new knowledge creation and sharing among business process actors. For this purpose, two research questions are proposed to guide the review:

RQ1: Which perspective of the SECI model is represented and discussed in research in the context of applying KM to BPM?

RQ2: How can knowledge management be applied in the business process management?

2. METHOD

In order to produce a thorough review and mitigate possible bias, it was conducted as a systematic literature review, using MacDonald’s [18] and Siddaway’s [19] guidelines as a framework for this review. The literature selection process is covered in the next chapters. The selected sources were then processed using the qualitative content analysis method.

Scoping

An initial search was performed, in order to identify previous systematic reviews on the research subject matter, and it revealed that whilst a considerable amount of reviews have been published on the topic of knowledge management process, there are no existing literature overviews that explore business process knowledge management. This further illustrates that there is a gap in the existing literature, thus creating an extensive and thorough overview on how the two disciplines can be merged will benefit the scientific community by revealing and summarizing existing approaches on how knowledge management can be applied to business process management.

Planning

As this review is looking at the overall construct of knowledge management, and the application of its principles within the topic of business process management, the search terms selected for the preliminary search were: “business process knowledge management” OR “process knowledge management” OR “management of process knowledge”. Initial scoping revealed that there is an abundance of published sources using the selected keywords that are not relevant to the aim of this research: exploring the process of knowledge management in organizations, which is not a merger of the two disciplines, and purely within the domain of knowledge management.

Taking this in consideration, the initial inclusion criteria for the initial search and filtering process was put forward as follows:

1. The title or abstract must indicate that both disciplines: “knowledge management” and “process management” are discussed.
2. The source must be peer reviewed, and only journal articles, conference proceedings and books are included.

3. There was no limitation set to the publishing year, as this review aims to create a complete overview, both within recent and earlier literature sources.

Identification (searching)

Due to the sparsely available sources on the topic, as indicated during the initial scoping, it was necessary to identify a broad base of literature for the search process. The search was conducted in 3 academic databases: Web of Science, Scopus and Science Direct, using the keywords “business process knowledge management” OR “process knowledge management” OR “management of process knowledge” on January 10th, 2020. The number of hits in each of the databases were as follows:

- Web of Science – 47,
- Scopus – 112,
- ScienceDirect – 196.

In order to identify any potential gaps in the literature selection process, Google Scholar (<http://scholar.google.com>) was searched, but no additional missing sources were identified as a result, and the potentially relevant papers were already included in the identification performed in the 3 academic databases mentioned above.

Screening

First, the sources were de-duplicated (removing 16 titles) and an initial screening of the titles was performed, to eliminate the irrelevant articles. Also, abstracts were screened to eliminate the titles that explored knowledge processes, or knowledge and process management separately, without combining the two. During this step (as outlined below in figure), it was determined that the exclusion criteria need to be expanded to include sources that are exploring very technical aspects of process knowledge, specifically within Information Technology, product design or manufacturing. Specifically, they covered the aspects of business process management, and knowledge management separately, not creating a unified framework and exploring the merger of the disciplines. Those are not relevant to this review, as it aims to explore the managerial implications of applying knowledge management in business process management. However, it is was not possible to determine this by screening the titles alone, thus during the sifting of the full-text version of the article those articles were eliminated.

In addition, the bibliography of the studies included in this review was examined and analyzed, to identify any potentially relevant sources, and 4 additional articles were added. Generally, most referenced by the selected sources explore only one of the two disciplines (knowledge OR process management) and were used as a basis to create a joint view and did not present this themselves.

3. RESULTS

RQ1: Which perspectives of the SECI model are represented and discussed in research in the context of applying KM to BPM?

To answer the first research question, qualitative content analysis was performed using deductive application approach to classify each research paper – as there is already a well-established definition of the perspectives of the SECI model, classifying how tacit and explicit knowledge is created, and transformed (see Table 1) [6], [7].

Table 1 Coding agenda based on the SECI model

Category	Definition
Socialization	The process of creating tacit knowledge through interaction between individuals
Externalization	The process of transforming tacit knowledge to explicit knowledge by writing it down or encoding it in information systems, modelling
Combination	The process of merging multiple sources of explicit knowledge by sorting, adding, categorizing, etc
Internalization	The process of converting explicit knowledge to tacit knowledge by reading, accessing codified knowledge, training, etc

Each literature source may represent multiple aspects of the SECI model, as any piece of knowledge has both tacit and explicit elements, as the model is in essence a spiral model - indicating that tacit and explicit knowledge is linked rather than separate [22]. However, single category/perspective from the SECI model will be assigned to each paper, based on the most frequently represented category in the paper. If there is any ambiguity to define a single category, the paper will be evaluated also in addition based on the context of the research, specifically – the results and conclusions. The results can be seen in Figure 2.

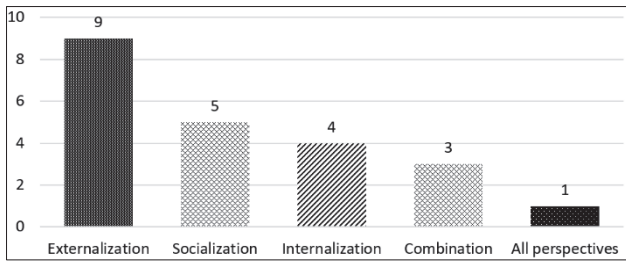


Figure 2 Frequency of papers represented within each SECI model perspective

As can be seen in figure 2, “Externalization” is the focus and representation of almost half of the 21 papers analyzed. The rest of the perspectives are represented more evenly, with the least attention given to “Combination”. There is only one research paper focusing on all 4 perspectives of the SECI model. When reviewing it from the perspective of the context of the research (See Figure 3), most of the currently existing research is within the “IT – Software Development” and “Manufacturing” fields.

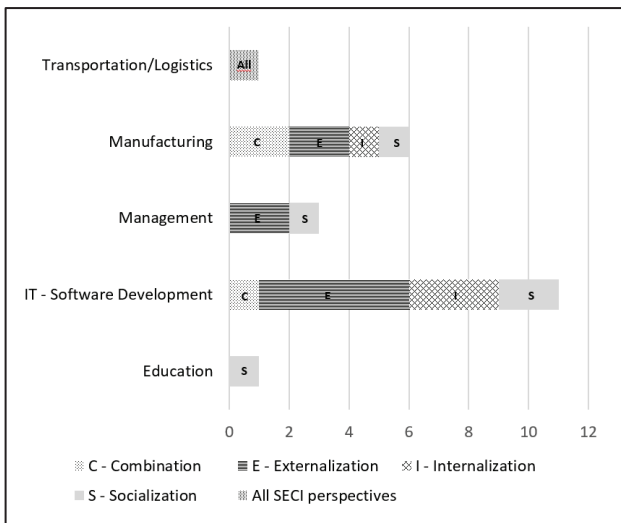


Figure 3 Frequency based on research context

The reason why majority of the research done from a “Externalization” perspective can be deduced. The main requirement of IT systems for the purpose of supporting knowledge or business process management is the ability of capturing tacit knowledge and transforming it to explicit for further categorization during the “Combination” process.

RQ2: How can knowledge management be applied in business process management?

As the theoretical framework of merging business process management and knowledge management has not been clearly established and defined in previous research, inductive category development was used during the analysis of the sources. Initially, a total of 41 unique codes were defined, however, after careful re-examination, formative re-check of reliability and merger of codes, 18 unique categories remained. The categories were also assigned to meta-categories (see Table 2), in order to classify the various approaches, and attempt to create an ontological structure:

Table 2 Meta-category definitions

Meta-category	Definition
Human social dimension	Approaches that focus on the “human interaction” aspects of knowledge management and business process execution, focusing on the activity roles of actors or employees is that we can examine the mapping of tasks [5]. Knowledge network creation within BP’s to enable sharing, cultural setting within which the process operates [23].
Integrating KM within BPM	Using BPM as an overarching concept over KM. KM placed under BPM as it supports other basic processes like research or CRM. In this case, BMP is responsible for the framework and when KM is used in the process [3].
BP’s as knowledge source	The gathering and formalizing of information derived from business processes, with the aim to use it as business process improvement knowledge [24].
Tools/Systems	The usage, development or optimization of IT systems and tools with the aim of collecting, applying and using knowledge to relate it to BP’s [13].
Other	Categories not applicable to any of the above

The definitions of the categories (see Table 3) were created during the analysis process and based on the literature itself: using an iterative process to develop new ways of structuring the approach of applying knowledge management to business process management.

Table 3 Category definitions

Category	Definition
Applying SNA to BPM to gather insights into process actor behavior	Using Social Network Analysis (SNA) to extend BPM, by providing insights into knowledge actor behavior, social and organizational ties and communication [5].
Aligning KM activities/strategy with BP’s	Aligning between KM strategy activities and organization’s business processes, in order to ensure that the indirect measures used are relevant to the organization’s activities [25].
Applying SNA to BPM to extend KM	Using Social Network Analysis (SNA) to improve an organization’s knowledge management strategy [5].
Using/creating knowledge networks	The creation of networks of knowledge workers within and outside the organization working around a joint business process, and sharing procedural knowledge [26].

By applying LEAN thinking	The focus on reducing or eliminating waste and increase efficiency in workflows (processes) through improved knowledge of process actors [15].
Capturing & storing process knowledge	Traceability of knowledge (e.g. critical issues and design decisions) from similar projects and processes in the past and make them available during current process execution to process actors, limiting errors, mistakes and overreliance on tacit knowledge [27].
Creating an ontological structure for KM	Categorizing and creating a hierarchy for KM structures used in organizations, specifically, for KM systems.
Incentivizing knowledge creation and sharing	Motivational schemes and incentives with the aim to motivate additional knowledge creation in the organization [27].
Linking KM activities to BPs	Creating links between an organization's KM initiatives and activities, and ongoing business processes and business process improvement projects [25].
Promoting process cross-team collaboration	Creating or motivating teams from different process teams to collaborate, with the goal to generate new knowledge that can be used to improve existing processes.
Retrieving past process knowledge during current process	Process knowledge is extracted from the information generated throughout the BPM lifecycle, classifying it as knowledge necessary for process execution and what new knowledge is created during process execution, to later use for process improvement [13].
Using Business Process Mining / Modelling	Extracting event logs (technical data) during business process analysis-can be used as a basis to reveal process inefficiencies, redundancies, faults and improvement ideas [17].
Using BPM systems	A BPM system includes the decision-making tools, techniques, infrastructure for "process design, control, improvement, and redesign" Formal process management system makes intentional goal-directed improvements to processes. An effective process management system should result in more knowledge creation [28].
Using KM systems	KM systems are commonly defined solely in IT terms, for example as "information systems applied to managing organizational knowledge" [22].
Using PKM systems	The definition of PKMS here refers to a system based on information technology for managing process knowledge in OKP companies, supporting creation, capture, representation, storage, dissemination and share of information [29].
Extracting process knowledge from involved IT systems	Capturing process knowledge from IT systems that are not PKM/KM/BPM systems in the form of user input/actions (not technical event logs).
Integrating KM & BPM systems	Creating a new IT system for the purpose of incorporating and synchronizing the lifecycle requirements of both systems [30].

It can be determined that "Tools/Systems" has received a lot of attention over the years (See Figure 4), with most authors focusing on involved systems, rather than on the management aspects of it. It is also clear, that the aspects of the human social dimension have not been heavily covered, which reveals a further gap in the research, as a large part of underlying process knowledge is held tacitly [6].

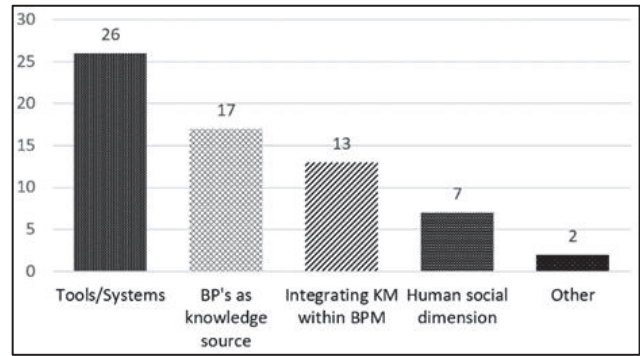


Figure 4 Frequencies of meta-categories

The analysis of the categories reveals a large difference between the most and least common approaches discussed and proposed within the research in the field of business process knowledge management (See Table 4). It is visible, that the two approaches that are most developed, researched and discussed are "Capturing & storing process knowledge" and "Retrieving past process knowledge during current process" – both of them should be used together as part of the knowledge creation spiral (SECI model). Ramesh & Tiwana [26] established a framework for a knowledge management system to support collaboration in new product development and suggested that past prescriptive and descriptive design knowledge aids product designers in development processes. Further contribution to this framework was done by Surysekar & Ramesh [31], elaborating that the rationale for decisions within a new product or service design process needs to be captured and reused in future projects, specifically the lessons learned, however, only in the context of similar processes. Ramesh [21] later expanded the framework by including the importance of traceability between the lessons learned and process documentation, suggesting that this aids to convert the explicit knowledge into new, internalized tacit knowledge for the knowledge consumer. Jung et al. [12] suggested that organization should gather and formalize (make explicit) information gathered from business processes, resulting in process knowledge, that should be applied for the enhancement of said processes.

Using KM, PKM or BPM systems is a well-researched and discussed topic – while only a handful of articles from "Tools/Systems" meta-category are focusing on creating an integrated system to incorporate the lifecycle requirements of both knowledge and business process management systems – this research also being created in the last 5-6 years, thus indicating a gap that is worth to investigate in future research and topical. The topics that are scarcely covered within the research are related to social, communication, collaboration related aspects of applying knowledge management to business processes. However, with the increasing amount of knowledge created through the development of digitalization, more and more tacit knowledge is created and needs to be structured, shared and used to create new knowledge. There is clearly a need to have research in this area.

Lastly, a topic that has not been covered at all within the selected articles for this review, is the external aspect of business process and knowledge management – the customer, even though it is one of the important end goals of applying both constructs: operate and improve their processes in the best way, to know and as a result, satisfy customer requirements [3].

Table 4 Categories frequency within KM's application to BPM

Category	Frequency
Capturing & storing process knowledge	17
Using KM systems	8
Retrieving past process knowledge during current process	7
Aligning KM activities/strategy with BP's	5
Using BPM systems	4
Using PKM systems	4
Creating an ontological structure for KM	3
Promoting process cross-team collaboration	3
Using Business Process Mining/Modeling	3
Combining SNA, BPM and KM	3
Integrating KM & BPM systems	3
Extracting process knowledge from IT systems	2
Incentivizing knowledge creation and sharing	1
Using/creating knowledge networks	1
Linking KM activities to BPs	1
By applying LEAN thinking	1
Grand Total	66

3. DISCUSSION

This paper collects and analyses sources that discuss the application of knowledge management within business process management, published in the period from 1999 till 2019. As a result, conclusions regarding methodological and theoretical concerns are covered in the following sections.

Theoretical concerns and research methodological issue

Majority of research done on the topic has been done focusing heavily on technical aspects, either from an IT or manufacturing perspective – focusing on defining requirements, specifications or prototypes for knowledge and business process management systems, business process modelling software, or improving process knowledge repository databases. While the analyzed sources do examine managerial implications of applying knowledge management within process management, in most cases only a few theoretical models and frameworks within KM and BPM are being discussed and compared, and the research is very fragmented, making comparing and creating new theoretical framework and models difficult. While some of the authors attempt to create an integrative framework for combining process and knowledge management [8], [12], [13], [15]–[17], it is also fragmented in terms of context, chosen theoretical ideas as the base and the research methods. To conclude, very little research exists examining this topic from a management perspective, and there is a lack of a common theoretical model and framework to drive discussions further.

Observations and recommendations

Based on the classification according to SECI perspectives suggested in this research paper it can be observed that most articles have focused on externalization (transformation from tacit to explicit knowledge) as a result from most research done from an IT perspective. Thus, future research should examine and focus on the social or human aspects of knowledge management's integration within business process management, internalization and socialization aspects of the SECI perspective. Leandro Jesus and Michael Roseman (cit. Paschek et al., 2018) [3] also mention the shift from business to customer processes or customer journeys as a trend in recent research. As seen from the sources selected for this review, most business processes are

focused internally, while most customer processes are extending past organizational boundaries, and may add a multitude of touchpoints. Continuous process improvement through KM is one of the possible benefits of BPKM [11], [31], [32] - including customer knowledge management in future research can contribute an additional data source - by turning customers from consumers of goods to valuable sources of knowledge [33]. Further research should incorporate customer journeys or value chain, as well as customer knowledge management, to expand the more traditional perspective on applying KM within business processes.

Another area lacking focus is stimulating knowledge creation and sharing across business process actors, while this aspect is covered, it generally lacks focus and an in-depth analysis as part of the research. The fragmented nature of the articles within knowledge management's application to business process management illustrates an immature field of research. It is fragmented both in terms of context, theoretical perspectives and lacking common theoretical framework of bringing the two aspects together.

4. LIMITATIONS

The review is limited to analyzing and making claims on research papers that discuss business process knowledge management from management, not from information technologies or manufacturing perspective. Thus, the number of included papers in this review (21) is a rather small sample size, and cannot be used to making a thorough, general and theoretical framework suggestion for integrating BP and KM frameworks into one. However, it provides a clear view of the gaps in the field, where future research can focus on to drive forward the scientific discussion.

5. CONCLUSIONS

Business process knowledge management, while an important, topical and increasingly popular topic to study, still lacks a common and integrative theoretical framework. This literature review reveals a field that is immature, very fragmented, with multiple gaps, that should be pursued in future research:

- Customer knowledge management and business process management,
- Social, communication and collaboration aspects of integrating knowledge management within business processes,
- Business process knowledge management from a management perspective.

This review contributes to the field in three ways: (1) Proposing and validating the usage of the SECI model to classify research related to business process management, thus helping future researchers with a valid framework of classifying their theoretical analysis, (2) Creating a set of meta-categories and categories to group the various approaches of combining KM within BPM, (3) Providing an overview of previous research, it's approach and focus, as well as revealing gaps and future research possibilities.

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