Mapping Knowledge-Life Cycle to Process Architecture

Mohammad Omar Sabri
Business Information Technology, Zarqa University, Jordan

msabri@zu.edu.jo

Abstract: A knowledge life cycle has several knowledge management (KM) processes that differ from one model to another. Exploration and utilization of these processes on high levels require mapping them to the core business processes in an organization. A business process architecture (BPA) identifies these core processes and highlights their relationships. Riva method is a BPA approach that allows characterizing these key processes using essential business entities (EBEs). It also proposes a few steps to develop an organization's overall business process architecture (BPA). Matching the appropriate knowledge management (KM) processes to these steps clarifies KM's role in business process modeling. In addition, it contributes to discovering gaps and developing business process modeling (BPM). The Riva-based Knowledge Life Cycle (KLC) model has been suggested to map KM processes to Riva BPA steps. The model is divided into three phases, sequentially including the KM processes of exploration and identification, capturing and refinement, and creation and exploitation. The exploration and identification phase involves searching and discovering business scope resources (Riva step one). Capturing and refinement is the phase of extracting candidate EBEs, determining the EBEs, and filtering them into Units of Work (UOWs) (Riva steps two and three). Finally, creation and exploitation processes involve generating dynamic relationships among UOWs and transforming the UOWs diagram into the first and second-cut process architecture diagrams (Riva steps four, five, and six). A case study of a bank in Jordan will be applied to evaluate this model. A mixed-methods approach using structured and semi-structured interviews will be conducted with the bank financing team to measure KM processes' involvement. Accordingly, the results are expected to identify which KM processes are more engaged to process architecture. It could also suggest using these KM processes as a benchmark to measure the achievement of each BPA step implementation in its domain.

Keywords: Knowledge management processes, Knowledge-life cycle, Business process architecture, Riva method

1. Introduction

A business process architecture (BPA) identifies the key processes to establish a specific business. It also provides a map that guides how these processes are initialized and managed over time (Siviy et al. 2007). Integrating BPA with knowledge management enablers (KMEs), such as information technology and organization structure, has shown effectiveness in developing a dynamic and competitive BPA (Sabri and Odeh 2019). It also suggested a knowledge-based approach for BPA modeling. Nevertheless, the KMEs still do not interact with all the development steps of the process architecture (PA). Utilization of knowledge management processes (KMPs) could be more comprehensive in covering these steps. It could also act as a benchmark for them. In addition, it integrates the BPA domain to the KM area in depth.

Knowledge Management definitions have two approaches; one is a process, and the other is an object. The process approach suggests knowledge encapsulated in individuals, and it is necessary to interact to facilitate this knowledge dissemination and sharing socially (Hislop et al. 2018). Any deliberate efforts for managing knowledge in an organization, such as capturing, creating, sharing, assimilating, adapting, and implementing knowledge, are considered a knowledge process. Thus, a KM could be defined as a set of ordered activities that are implemented in an organization to support knowledge exploitation (Igbinovia and Ikenwe 2017).

This paper aims to develop a model that adopts KMPs in developing a BPA using an object-based approach nominated as the Riva method. This model maps the Riva steps to some KMPs that act as a knowledge-life cycle corresponding to the BPA development steps. A future case study will be applied at a bank financing case study in Jordan to evaluate this model.

2. Process Architecture Modeling and Riva Method

Process architecture is "an organized overview of the processes that exist within an organizational context" (Dumas et al. 2013, p. 38). It connects the entire kernel processes in a business that is essential for the development of a business. It also facilitates the transformation of business processes into application models that are developed by information technology (IT) systems (Peisl 2009).

Riva method is one of the BPA approaches that include action-based, object-based, function-based, goal-based, and reference-based models (Dijkman et al. 2016). It is proposed as a systematic approach for the development of PA using essential business entities (EBEs). This approach is characterized by simplicity and obviosity besides its common diagrams for the same business. It also includes the following steps:

Step 1: Agreement on the field and business scope.

Step 2: Brainstorm the candidate's EBEs (CEBEs) and nominate the EBEs.

Step 3: Selection of the units of work (UOWs).

Step 4: Apply the dynamic relationships between UOWs and prepare a UOWs diagram.

Step 5: Transform the UOWs diagram into the first cut PA diagram.

Step 6: Transform the first cut PA into the second PA.

Integrating BPA steps with KMPs is still a new approach that requires a good understanding of the selected BPA method in order to map with appropriate KMPs. Other previous studies mainly focus on mapping business process modeling concepts into a proposed knowledge-life cycle and knowledge categories, such as formalizable and non-formalizable knowledge (Kalpič and Bernus, 2006).

3. Knowledge Management Processes: A Literature Review

Knowledge is defined as a "process of simultaneously knowing and acting". This process view focuses on the flow of knowledge and the application of expertise, in addition to the processes of creating, sharing, and distributing knowledge (Alavi and Leidner, 2001). These processes permit utilizing of knowledge as an essential aspect of value addition and generation (Migdadi, 2022).

Different models of KMPs were implemented to enhance organizations' efficiency and competitive advantage. These models were related to creating, sharing, and applying knowledge (Jafari and Maleki 2013). Other main processes were also identified and interacted with the previous processes, such as transfer, storage, retrieval, and application (Landroguez and Cepeda-Carrión 2016). Other models of KMPs highlight their role in innovation. Based on 45 papers, Costa and Monteiro (2016) indicated the direct support and leverage of KMPs to innovation. In serving this relationship, they also revealed other variables' roles, such as absorptive capacity and organizational learning. In addition, knowledge creation and application were nominated as major processes through which other knowledge processes impact innovation. As for KMPs' relationship to information systems (ISs), Al-Emran and others (2018) have reviewed existing models from 2001 till 2018 using a list of academic database providers such as Springer, ScienceDirect, Wiley, and IEEE. Their findings indicate that knowledge sharing is the most common process, followed by processes of acquisition and application. They have also found that the questionnaire research method is mainly dependable for data collection in the KMPs context. Furthermore, they have indicated the most used ISs in these studies, including E-business, KM systems, and IS outsourcing.

Systematic KMPs for the most influential knowledge life cycle (KLC) models were reviewed by Evans and others (2015). These models were characterized by the common use of practitioners and scholars' adoption. They were also modern in introducing the KM life cycle and highlighted valuable aspects of understanding the process of organizational knowledge during its lifetime. Some of these models include Meyer and Zack's (1996) and Wiig's (1994) knowledge life cycle models. On the other hand, Heisig (2009) analyzed 160 frameworks introducing different KMPs. The analysis showed that five KMPs were the most commonly mentioned and could be the broad category for all processes. These processes present identifying, creating, applying, sharing, and storing knowledge. Based on previous models and Heisig's (2009) analysis, Evans and others (2015) built their own KM life cycle. The model sequentially comprised seven phases: identify, store, share, use, learn, improve, and create.

Lastly, the nomination of various KMPs through their models and influential roles would not be sufficient without referring to exploration and exploitation processes. These two processes concurrently have a crucial role in organizational success and the knowledge evolution cycle (Zollo and Winter 2002). Furthermore, they form an overlapping field between KM and Dynamic Capabilities (Easterby-Smith and Prieto, 2008). Exploration identifies things an organization captures by concepts and actions such as experimentation, search, discovery, and innovation, whereas exploitation includes production, refinement, efficiency, implementation, and execution (March 1991).

4. A Knowledge Life-Cycle Model Mapping to BPA

Using KMPs to develop the Riva BPA requires identifying the appropriate KMP that corresponds to one or more Riva steps. The steps of the Riva method have a specific definition that could be aligned with a certain KMP role. Accordingly, a group of KMPs was selected to be ordered sequentially in response to the Riva method steps. This group presents the KLC model mapping to BPA (Figure 1).

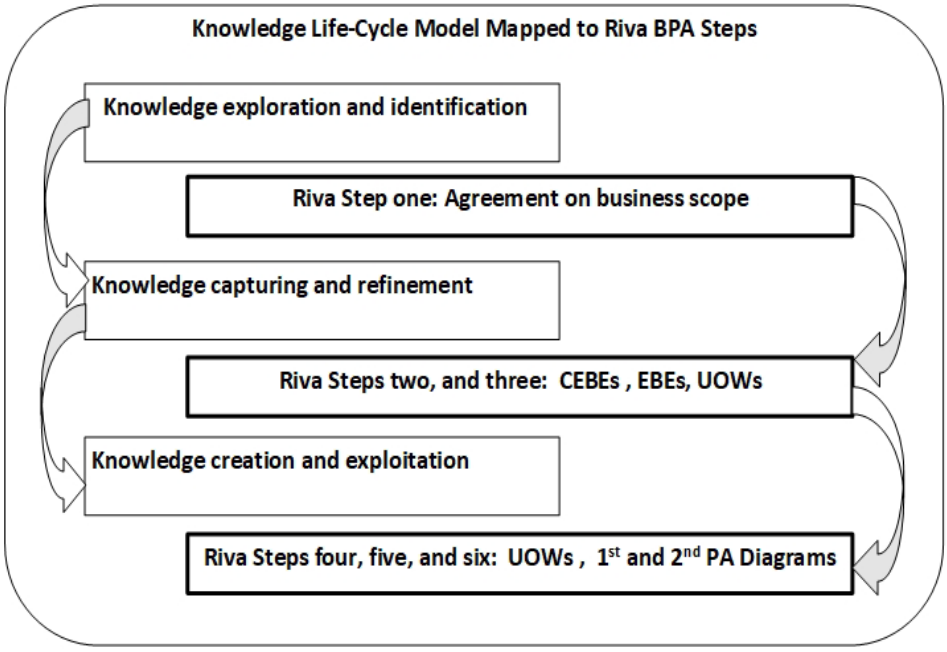

Figure 1: A Knowledge Life-Cycle Model Mapping to BPA

The declaration of each KMP with Riva's steps is as follows:

- Knowledge exploration and identification

Step one: Agreement on business scope

The first step in the Riva method could be mapped to knowledge exploration and identification processes. Knowledge exploration includes *search*, *observation*, and *discovery* (Sabri, 2022), while knowledge identification indicates key problem aspects such as *resources*, *goals*, *participants*, and *existing materials* (Dalkir, 2013). Accordingly, choosing the business field and determining its related resources could be mapped to these processes.

- Knowledge capturing and refinement

Steps two and three: brainstorm the CEBEs and definition of the EBEs, selection of the units of work (UOWs)

Knowledge capturing is finding approaches to transforming *tacit* knowledge into *explicit* knowledge (Dalkir 2013). *Brainstorming* the CEBEs with domain experts in the Riva method is the main process of capturing knowledge through which CEBEs are determined. The CEBEs also require *inspecting* and *nominati*ng EBEs and choosing UOWs in the third step of Riva. This could be implemented in the knowledge refinement process. Knowledge refinement could imply *remov*ing or *addi*ng new rules to specialize or generalize knowledge (Mooney and Shavlik 2021). Certain rules are applied to the third step to distinguish the EBEs from CEBEs and then extract UOWs.

- Knowledge creation and exploitation

Steps four, five, and six: Generation of dynamic relationships between UOWs and preparation of UOWs Diagram, the transformation of UOWs diagram into first and second PA Diagrams

Knowledge creation exists through different approaches, such as *innovations*, *experiments*, knowledge *importing*, and *observation* of the real environment (Dalkir 2013). The generation of dynamic relationships between UOWs, in addition to their diagram implementation, could be mapped to knowledge *importing* and *observation*. Knowledge *importing* involves *elicitation* of knowledge from domain experts and manuals, while *observation* is performed through visiting the environment and watching processes. In step four of the Riva method, linking UOWs and preparing their diagram is accomplished with the support of processes' materials

and case study experts. Visiting, understanding, and observing the work site could also reinforce the development of the UOWs diagram.

Developing the UOWs diagram step in the Riva method paves the way for extracting the first and second-cut PA diagrams in steps five and six. These steps could be considered part of knowledge *exploitation* since they imply using and further developing existing knowledge (liu 2006). They also perform *reductions* at the first cut PA nominated as Riva heuristics to extract the second cut PA. This assures efficiency and real-world representation of processes, part of knowledge exploitation.

5. Methodology

The model of mapping the Riva steps with KMPs demands a real environment to be evaluated. A bank in Jordan was selected to demonstrate this model since it was already utilized as a case study to align knowledge management enablers (KMEs) to Riva process architecture (Sabri and Odeh 2019). Therefore, further development of the BPA using KMPs could be facilitated using the same case study and completing BPA mapping to both KMEs and KMPs. The bank is divided into three cases of PAs: deposits, financing, and treasury units. The bank financing case study will be used to evaluate this model. A mixed-methods approach using quantitative and qualitative methods is applied to evaluate this model. A qualitative approach includes a semi-structured interview with the financing team experts. In contrast, the quantitative approach is based on a structured interview using a Likert scale of five-point type. The main structured questions of the interview are suggested to include the following questions in Table 1.

Table 1: Questions

No.	Question
Knowledge exploration and identification (Riva step one)	
1.	Defining the scope of bank financing requires finding what resources are included.
2.	Missing to define any of the existing resources of the bank financing could be addressed through searching and observation.
3.	Understanding the bank financing field must accurately determine objectives, employee roles and positions, and primary resources.
Knowledge capturing and refinement (Riva steps two and three)	
4.	A team meeting that brainstorms CEBEs supports the identification and documentation of any missing CEBE that represents bank financing business.
5.	Bank financing EBEs have further descriptions and restrictions that differ from CEBEs
6.	Inspecting bank financing UOWs requires filtering many various EBEs
Knowledge Creation and Exploitation (Riva steps four, five, and six)	
7.	It is indispensable to ask banking financing experts how UOWs are related to each other in their domain.
8.	Visiting the bank work environment and watching the workflow facilitate understanding the interaction between different UOWs
9.	The development of the first cut PA corresponds to the UOWs diagram and perform by its utilization.
10.	Further modifications that transform first-cut PA into second-cut PA make PA more efficient and reflective of the real environment.

6. Conclusion and Future Work

This paper highlights the role of knowledge management processes in a significant area of an organization, the business process architecture. Linking knowledge processes to core business processes makes their role more obvious and effective in business development. They also establish a benchmark to assess the critical processes. Riva method is one of the BPA approaches that have clear steps to develop a PA. These steps could correspond to a sequential group of KMPs. The KMPs include exploration and identification, which are mapped to step one. Then, capturing and refinement are mapped to steps two and three, and creation and exploitation are mapped to steps four, five, and six.

A future case study of a bank financing unit in Jordan will be demonstrated to evaluate the model of mapping BPA with KMPs. Further studies could include mapping KMPs with different business process modeling in addition to their roles as an evaluation model.

References

Alavi, M., & Leidner, D. E. (2001) "Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research issues", *MIS Quarterly*, Vol 25, No. 1, pp 107-136.

Al-Emran, M., Mezhuyev, V., Kamaludin, A., & Shaalan, K. (2018) "The Impact of Knowledge Management Processes on Information Systems: A Systematic Review", *International Journal of Information Management*, Vol 43, pp 173-187.

Costa, V., & Monteiro, S. (2016) "Key Knowledge Management Processes for Innovation: A Systematic Literature Review", *VINE Journal of Information and Knowledge Management Systems*, Vol 46, No. 3, pp 386-410.

Dalkir, K. (2013). *Knowledge Management in Theory and Practice*. Routledge.

Dijkman, R., Vanderfeesten, I. and Reijers, H.A. (2016) "Business Process Architectures: Overview, Comparison and Framework", *Enterprise Information Systems*, Vol 10, No. 2, pp.129-158.

Dumas, M., La Rosa, M., Mendling, J. and Reijers, H.A. (2013) *Fundamentals of Business Process Management*. Heidelberg: Springer.

Easterby-Smith, M. and Prieto, I.M. (2008) "Dynamic Capabilities and Knowledge Management: An Integrative Role for Learning?", *British Journal of Management*, Vol 19, No. 3, pp 235-249.

Evans, M., Dalkir, K., & Bidian, C. (2015) "A Holistic View of the Knowledge Life Cycle: The Knowledge Management Cycle (KMC) Model", *The Electronic Journal of knowledge management*, Vol *12,* No*.* 1, p 47.

Heisig, P. (2009) "Harmonisation of Knowledge Management–Comparing 160 KM Frameworks around the Globe", *Journal of Knowledge Management*, Vol *13,* No*.* 4, pp 4-31.

Hislop, D., Bosua, R., & Helms, R. (2018) *Knowledge Management in Organizations: A Critical Introduction*. Oxford University Press.

Igbinovia, M. O., & Ikenwe, I. J. (2017) "Knowledge Management: Processes and Systems", *Information Impact: Journal of Information and Knowledge Management*, Vol 8, No. 3, pp 26-38.

Jafari, M., & Maleki, M. (2013) "A Review on Knowledge Management Process Models in Former Two Decades", *International Journal of Information, Business and Management*, Vol 5, No. 2, pp 263-273.

Kalpič, B. and Bernus, P. (2006) "Business Process Modeling through the Knowledge Management Perspective ", *Journal of Knowledge Management*, Vol 10, No. 3, pp 40-56.

Liu, W. (2006) "Knowledge Exploitation, Knowledge Exploration, and Competency Trap", *Knowledge and Process Management*, Vol *13,* No*.* 3, pp 144-161.

March, J.G. (1991) "Exploration and Exploitation in Organizational Learning", *Organization Science*, Vol 2, No. 1, pp 71-87.

Martelo-Landroguez, S., & Cepeda-Carrión, G. (2016) "How Knowledge Management Processes Can Create and Capture Value for Firms?", *Knowledge Management Research & Practice*, Vol 14, No. 4, pp 423-433.

Meyer, M. H., & Zack, M. H. (1996) "The Design and Development of Information Products", *MIT Sloan Management Review*, Vol 37, No. 3, pp 43-59

Migdadi, M.M. (2022), "Knowledge Management Processes, Innovation Capability, and Organizational Performance", International Journal of Productivity and Performance Management, Vol 71, No. 1, pp 182-210.

Mooney, R. J., & Shavlik, J. W. (2021, March). A Recap of Early Work on Theory and Knowledge Refinement. In *AAAI Spring Symposium: Combining Machine Learning with Knowledge Engineering*.

Peisl, R. (2009) *The Process Architect: The Smart role in Business Process Management*. IBM Red Paper: IBM.

Sabri, M. O. (2022, August). Knowledge Management and Dynamic Capabilities: A Digital Embracing of Interrelated Processes. In *European Conference on Knowledge Management* (Vol. 23, No. 2, pp. 1026-1031).

Sabri, M. O., & Odeh, M. (2019) "The Impact of Knowledge Management on the Development of Innovative Business Process Architecture Modelling: The Case of Banking in Jordan", *International Journal of Technology Management & Sustainable Development*, Vol 18, No. 2, pp 197-220.

Siviy, J. M., Penn, M. L., & Stoddard, R. W. (2007). *CMMI and Six Sigma: Partners in Process Improvement*. Pearson Education.

Wiig, K. M. (1994). *Knowledge Management Foundations: Thinking about Thinking-How People and Organizations Represent, Create, and Use Knowledge*. Schema Press, Limited.

Zollo, M., & Winter, S. G. (2002) "Deliberate Learning and the Evolution of Dynamic Capabilities", *Organization science*, Vol 13, No. 3, pp 339-351.