A Study on the Relation between Business Process Management Maturity and Innovation

Full paper

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Abstract

This paper presents a study of the relationship between business process management maturity and innovation in organizations. Data was collected with a questionnaire that was based on three theoretical models namely a BPM maturity model, and adoption of innovations model and the innovation values chain. Data was collected from several organizations ranging from small to large in several countries in Europe. The findings suggest a moderate and on occasion somewhat stronger relation between the core concepts. These relationship seem to differ when data was analyzed for the separate organizational sizes. The core recommendations are that that organizations need to assess their BPM maturity and 'innovativeness' before concerted efforts are made for improvement, and that an alignment of BPM and innovation may offer positive results in organizational performance.

Keywords

Business process maturity, innovation, innovation value chain, innovation adoption.

Introduction

In recent years the popularity of business process management (BPM) has grown (Plattfaut et al. 2010; Ravesteijn et al. 2012; Rosemann and vom Brocke 2010). This is could partly be as a result of the perception that attention to BPM provides firms with a competitive advantage (Ravesteyn et al., 2012; Chong 2007; Dijkman et al. 2015).

Several studies offer support for the notion that there is a relation between business process (management) maturity and better performance of organizational processes (Herbsleb et al. 1997; Krishnan and Kriebel 2000; Jiang et al. 2004). There is also evidence that BPM may lead to better innovation in organizations (Sanders and Linderman 2014).

On the other hand, there is also interest in factors may lead to BPM maturity (Balzarova 2004; Chong 2014; Ettlie and Reza 1992; Tang et al. 2013; Parast 2011). These studies reveal factors such as resources, awareness, support, value chain integration, and innovation. Balzarova (2004) lists leadership elements, hard elements and soft elements that may be related to BPM success, with one of the soft elements being innovation, whilst De Boer (2015) refers more specifically to technology innovation as a success factor.

The focus of the study that is reported here is specifically on the relationship between the innovation in organizations and their BPM maturity.

The main research question is therefor: What is the nature of the relationship between business process management maturity and innovation in organizations? A general hypothesis is thus that there is a positive relationship between BPM maturity and Innovation.

In order to clarify and demarcate the investigation the following definitions were used for the main concepts. Business processes are sets of activities that are structured and measured with the goal to produce an output for a specific customer or market (Davenport 1993). BPM is subsequently a management technique for managing operations in terms of business processes (Dijkman et al. 2015).

Innovation is conceptualized in two dimensions; namely creation of innovations and adoption of innovations. When talking about 'an innovation' authors in business research normally refer to a new idea, process, product and so forth (Yusof and Abidin 2011). When using the term as a verb (that is "we innovate"), then authors normally refer to the process of innovation which may include the activity of generation (Hansen and Birkenshaw 2007) or development of, for instance, new ideas, products, services, processes and so forth. Adoption on the other hand focuses more on the question of whether the created innovation will actually be accepted or used (Rogers 2003).

A brief review of literature on these topics is presented in the next section, followed by a description of the research method and findings. Some concluding remarks and recommendations are finally offered.

Literature

Business Process Management Maturity

The roots of BPM can be traced back to total quality management (TQM) and business process re-engineering (BPR) and represents a fusion of the best elements of both (Ravesteyn 2007; Plattfaut et al. 2010; Ravesteyn et al. 2012). Along with the increased interest came several theoretical models for studying BPM maturity and developing BPM capabilities (De Bruin et al. 2005; Bucher and Winter 2010). Despite this there seem to be different views on how organizations best achieve maturity (Plattfaut et al. 2010).

The 'Process Management 1-2-3' Model for instance suggests 4 stages of maturity and a pre-level referring to the business need (Cronemyr and Danielsson 2013). At the pre-level there is no maturity and only a focus on functionality. The four stages that could follow are awareness of BPM, BPM established. BPM improved, and BPM adapted. Shafiei and Hajiheydari (2014) suggest 5 maturity levels, each being a foundation for the subsequent level. These levels are: Initial which is characterized by enlightenment; Repeatable, which implies stability; Standardized, characterized by clarity; Managed, suggesting systematic consistency; and Optimal implying a continual focus on improvement.

These models present a phased progression view of BPM maturity. Other models suggest a more dimensional view. Rosemann and vom Brocke (2010), for instance, suggest that there are six main elements in many BPM models and categorizes them as strategic alignment, governance, methods, information technology, people, and culture. Each of these elements needs to reach some level of maturity.

Some themes emerge when considering BPM maturity models and their implementation. Most notable is the importance of management and its active involvement in BPM and maturity initiatives. In addition it seems that information and its analysis plays and important role in the effort to reach maturity. It is worthy to note however that information technology and information systems (IT/IS) seems to be somewhat neglected (Ravesteyn et al. 2012). Another issue that seems to enjoy limited attention is that of innovation in organizations and how it relates to BPM maturity.

In a more integrated model, developed from of a combination of several contributions, Ravesteyn et al. (2012) suggest 7 dimensions namely Process Awareness, Process Description, Measurement of Processes, Management of Processes, Process Improvement, Process Resources and Knowledge and Information Technology. Across theses dimensions 37 BPM capabilities are defined.

Each of 7 dimensions are briefly described:

- Process Awareness: Referring to a clear relation between the strategy and goals of the organization and business processes, with active involvement of both (executive) management as well as employees.
- Process Description: Processes are transparent by capturing them in process models, defining roles, tasks, responsibilities and guidelines in relation to the strategy.

- Measurement of Processes: For each process in- and outputs are defined, key performance indicators (KPIs) are known, and responsibilities for measuring, collecting and reporting the process KPIs are clear.
- Management of Processes: It is clear who is responsible and how process design, analyses, implementation, execution, and improvement is done.
- Process Improvement: The organization strives to continuously improve processes and actively plans and manages the improvement process.
- Process Resources and Knowledge: The right people (with the required competencies) and resources (money, facilities, systems) are provided in order to execute or improve a process according to its goals.
- Information Technology: The appropriate information systems are used to support the BPM lifecycle.

The Innovation Value Chain (IVC)

As mentioned earlier, the concept innovation can refer to the process where new products, processes, and services are created. Since there is reference to a process this implies that innovation can occur in stages, and this in turns implies that with each stage there is some form of progression. It is therefore reasonable to suggest that value is somehow added during each stage, which essentially implies this process as an innovation value chain (Hansen and Birkinshaw 2007).

A review of the literature suggests that there are several stages in the IVC (Doran and O'Leary 2011; Roper et al. 2008; Roper and Arvanitis 2012). Bouncken and Teichert (2012), who studied innovation from an inter-organizational perspective in the renewable energy industry, for instance, suggest three general phases namely research and development, product development, and dissemination (which include activities such as marketing). Van Horne et al. (2006) suggest six primary activities in the innovation process namely need identification, applied research, innovation development, commercialization, diffusion, and adoption.

The three phases suggested by Bouncken and Teichert (2012) roughly coincide with the primary activities suggested by Van Horne et al. (2006) where the research and development phase of Bouncken and Teichert (2012) seems similar to the need identification and applied research phases of Horne et al. (2006). Similarly product development coincides with innovation development and dissemination coincides with commercialization, diffusion and adoption.

A similar pattern emerges from the models of Roper et al. (2008) and Ganotakis and Love (2012) who look at innovation from the knowledge perspective. They refer to knowledge sourcing (for instance research and development), knowledge transformation (knowledge transformed into outputs) and knowledge exploitation (entering the market).

A more generic model that could apply to all of the above is suggested by Hansen and Birkinshaw (2007). They describe three phases in the IVC namely Idea Generation, Idea Conversion and Diffusion. New innovations normally start with a new idea. Idea generation can occur in teams within the organization, across teams, or externally of the organization (Hansen and Birkinshaw 2007). During the conversion stage or transformation stage generated ideas are converted into new products, service, processes and so forth. The final stage of the IVC is diffusion or the exploitation of the innovation output from the second stage.

Based on the above it is clear that the IVC provides an interlinked and linear, three phased description of how innovation occurs (or should occur) in an organization and the model suggested by Hansen and Birkinshaw (2007) seemed appropriate as a theoretical basis for studying the innovation process because it encompasses the three basic phases suggested by other authors.

Innovation Adoption

New products, services, processes and so forth that have been created but not adopted (and by implication not used) have no value. The topic of innovation adoption implies interest in the factors and sentiment that may be related to the adoption or non-adoption of these new products, services and so forth. The concept

of adoption has been studied extensively and combines different areas of study such as sociology and psychology (Tan and Teo 2002).

Factors that are related to adoption can be both internal and external to an organization as seen in literature (Tan and Teo 2002; Zheng et al. 2008; Udo et al. 2014). External factors can include social norms, government policies, or rules that will make the innovation illegal or hard to get (Tan and Teo 2002; Udo et al. 2014). Internal factors refer to issues such as technical ability, resources and intention to adopt (Tan and Teo 2000; Zheng et al. 2008).

For the purpose of investigating adoption in the project that is reported in this paper the model of Tan and Teo (2000) was used. Their model was developed from a rich history of research on adoption, and is based on the theory of planned behavior (TPB) and the diffusion of innovations theory (Ajzen 1985; Rogers, 2003). They suggest that adoption has three dimension namely: Attitude to Innovation, Subjective Norms and Perceived Behavior. Attitude towards innovation refers to perceptions about an innovation. Subjective norms refers to social influences that may be related to intention to adopt. Perceived behavior refers to believes about having the required resources to adopt an innovation.

Conceptual model

The literature discussion above reveals two main elements that formed the basis for the investigation that is reported here. These are BPM maturity and Innovation. Note that each of these core elements contain several dimensions that in turn contains the concepts that were measured. BPM maturity consists of the seven dimensions as proposed by Ravesteyn et al. (2012) whilst innovation consists of innovation adoption (as conceptualized by Tan and Teo 2002) and the IVC (Hansen and Birkinshaw 2007). The final conceptual model is presented in Figure 1

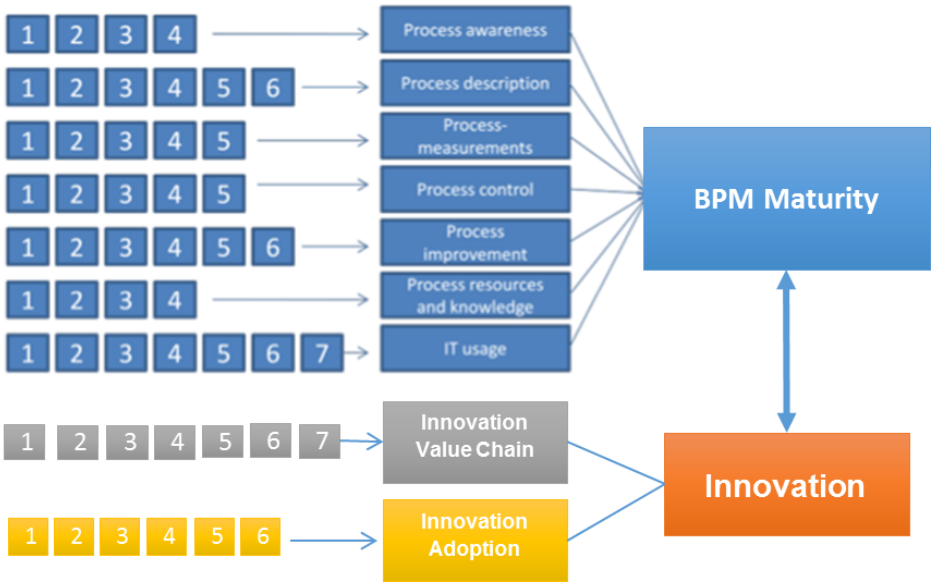

Figure 1: The Conceptual Model

As can be seen in Figure 1, each of the two main constructs (BPM Maturity and Innovation) contains several sub-elements, which in turn contain several concepts. Each of these concepts were operationalized in a questionnaire. This is further explained in the next section along with the process that was followed for studying the relationship between BPM maturity and Innovation in organizations.

Research Method

Data Collection

Data was collected with the use of a questionnaire that was administrated in two ways. First by handing out paper copies of the questionnaire to employees in small and medium sized enterprises as well as several startups. Participants were asked to answer all the questions in the survey. The second method was with an online survey that was distributed in a large enterprise. In total 60 responses were received, however as 11 questionnaires were not completely answered these were discounted and not included in the final analysis.

The respondents from the SMEs consisted of employees working at an organization located in both Ireland and the UK. The startups formed part of an incubator program in Lisbon, Portugal. In the first organization responses came from all levels of the firm except executive, the majority had functions in the sales, marketing and support departments, while at the startup organizations all persons participated. At the large enterprise respondents came from a variety of functional units but all held at least a middle management position. In the next section the questionnaire design is described.

The questionnaire

As prescribed by the conceptual model there were two sections to the questionnaire. One dealt with BPM maturity and the other with Innovation. The questions on BPM maturity followed the BPM dimensions described in Ravesteyn et al. (2012). The 7 dimensions are all scored with a number of statements. Participants were asked to score the statements on a scale of 1-5. 1 was strongly disagree, 3 neutral and 5 was strongly agree. A five point Likert scale was used in this research project for items that were based on the conceptual model.

The innovation section contained two sub-sections, one based on the IVC and the second on Innovation Adoption in accordance with the conceptual model. This consists of statements on creative members, cross-pollination of ideas, use of external sources of knowledge, idea selection, development and diffusion. Funding was also included in the questioning of the IVC in regards to idea selection. Innovation Adoption questions were formulated using the model of Tan and Teo (2002). This provided statements relating to Attitude to Innovation (Relative Advantage and Risk), Subjective Norms (Customers and Competitors) and Perceived Behavioral Controls (Self-Efficacy and Facilitating Conditions). Again, for the innovation part of the survey the respondents were asked to score each statement on a scale of 1-5 depending how strong they disagreed or agreed with the statements. The BPM maturity part of the model has been validated earlier by Ravesteyn et al. (2012), the IVC validated by Smit (2015), and the Innovation Adoption dimension by Tan and Teo (2002).

Analysis

Once the questionnaires were collected the data was entered into SPSS for analysis. Reliability was tested with a factor analysis. The Cronbach's Alpha coefficient for each of the BPM Maturity and Innovation dimensions are presented in Table 1.

Dimension	Cronbach's Alpha
Process Awareness	,675
Process Description	,894
Measurement of Processes	,836
Management of Processes	,818
Process Improvement	,806
Process resources and knowledge	,808
Information Technology	,852
Innovation Value Chain	,752
Innovation Adotion	,738

Table 1: Cronbach's Alpha

The coefficients in Table 1 are all above the 0,700 level which implies that the items that were used to measure each element have a relatively high internal consistency.

Following this a correlation analysis was conducted using Spearman's rho coefficient to test the relationship between BPM Maturity and Innovation. Spearman's rho was used as the Likert scale produces ordinal data (Smit, 2015). These findings are discussed in the next section.

Findings and Discussion

In terms of knowledge and experience of respondents, 25% had little to no knowledge and practical experience with BPM, 22.9% had some knowledge on BPM but no practical experience, and 25% had some knowledge and a limited amount of practical experience with BPM (participated in 1 to 3 projects). Finally 27.1% had both knowledge and practical experience with BPM (>3 projects). This offers a sample population with fairly evenly mixed experience.

For the sake of understanding the context the BPM Maturity of the individual categories of organizations are presented in Figure 2. This was calculated by using the arithmetic mean of each BPM Maturity dimension and subsequently calculating the arithmetic mean over the 7 dimensions. This is in line with the method of Ravesteyn et al. (2012).

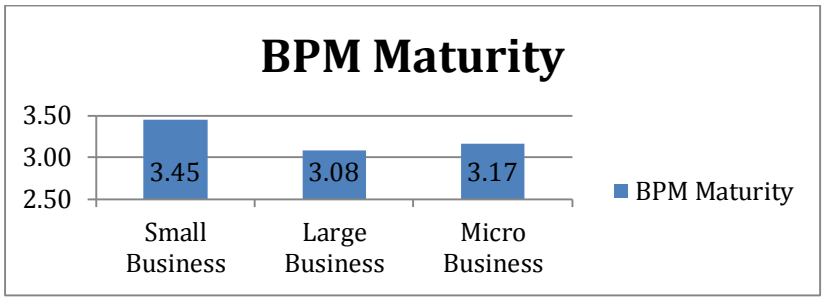

Figure 2: BPM Maturity

As can be seen in Figure 2 the category of SME organizations scored 3.45. This represented the highest maturity score from all the categories considered. The large enterprise in our study scored 3.08 and the startups had an average BPM maturity 3.17. It is interesting to note that all of the categories in this study score a higher maturity than the average of all the organizations researched by Ravesteyn et al. (2012), which was 3.02. This could mean that organizations have made investments in BPM maturity initiatives that have paid off.

Table 1 represents the correlation analysis of the complete sample.

	Process awareness	Process description	Measurement of Processes	Management of processes	Process improvement	Process resources and knowledge	Information Technology	BPM Maturity
Innovatin Value Chain	,489**	,250	,253	,253	,384**	,451**	,258	,437**
Innovation Adoption	,379**	,220	,162	,432**	,287*	,420**	,165	,405**
Innovation	,480**	,273	,257	,420**	,359*	,541**	,246	,496**

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 2: The Relationship between BPM Maturity and Innovation complete sample

In Table 1 the relationship between all dimensions of BPM maturity (as well as their averaged responses, BPMM) and the averaged responses for IVC, Innovation Adoption and all innovation concepts are presented. As can be seen three dimensions of BPM maturity are moderately related to Innovation and its dimensions. These are Process Awareness, Management of Processes, Process Knowledge and Resources. BPM maturity as a whole and Innovation only scores a moderate .480 using a Spearman's Correlation. The most positive relationships with Innovation come from the Process Knowledge and Resources and the Process Awareness dimensions. However, both of these are moderate. Furthermore we haven't considered

the size of the organizations in our sample. But so far BPM maturity may be seen as having a positive, but moderate, relationship with Innovation.

Next the relationship between BPM maturity and innovation in different categories of organizational size is analyzed. The dimension averages of each respondent were calculated and they were grouped into their respective size category. Following this a Spearman rho was conducted on each of the organization size categories.

The results for the category with SMEs are presented in Table 2.

	Process Awareness	Process Description	Measurement of Processes	Management of Processes	Process Improvement	Process resources and knowledge	Information Technology	BPM Maturity
Innovation Value Chain	-,252	,027	-,243	-,476	-,461	,054	-,251	-,525
Innovation Adoption	,896**	-,333	-,348	,028	,200	,671*	-,489	,119
Innovation	,456	-,167	-,185	-,097	-,172	,443	-,316	-,126

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 3: BPM Maturity and Innovation of SMEs

The results reveal a weak negative relationship between the BPM Maturity and Innovation with a score of -.126 (Table 2). However if we look at the BPM maturity of the organizations in this category (based on the mean scores) we find that it is the highest in this study (3.45). Based on this study we find a negative relationship with Innovation. This finding does have its limitations as there is only one company in this category but it does raise an interesting question in regards to this relationship between BPM and Innovation with company size. Since our SMEs have the highest average score in regards to Innovation and BPM maturity, and the relationship between them is weak, it is makes it interesting to see if the two other categories with lower BPM Maturity and Innovation scores have a more positive relationship.

The large enterprise category reveals a somewhat different finding as shown in Table 3.

	Process Awareness	Process Description	Measurement of Processes	Management of Processes	Process Improvement	Process resources and knowledge:	Information Technology	BPM Maturity
Innovation Value Chain	,614**	,541**	,474*	,288	,713**	,642**	,236	,690**
Innovation Adoption	,179	,171	,124	,446*	,315	,429*	,103	,387*
Innovation	,396*	,382*	,332	,467*	,548**	,702**	,197	,644**

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 4: BPM Maturity and Innovation of a large enterprise

The strongest relationship between BPM maturity and Innovation. Based on our analysis we find a score of .644.. It supports our believe that size makes a difference when it comes to the relationship between BPM maturity and innovation. It suggests that the bigger an organization gets, the more positive relationship BPM maturity has with Innovation. These results support the findings of Tang et al. (2012) research on business process outsourcings positive association with Innovation. Interestingly it seems that higher scores in BPM maturity and Innovation by an organization means that the relationship between the two are negatively impacted. Here we find that the large enterprise scores the lowest in BPM Maturity and also on the innovation construct while simultaneously showing the most positive and significant relationship. This outcome contradicts the findings by Dijkman et al. (2015) who found that "higher innovativeness is associated with higher BPM maturity". Perhaps this means that large organizations are best at aligning process management and innovation initiatives. This also could be a topic for future research.

The final category left to analyze is that of the Startups as presented in Table 4.

	Process Awareness	Process Description	Measurement of Processes	Management of Processes	Process Improvement	Process resources and knowledge	Information Technology	BPM Maturity
Innovation Value Chain	,102	-,214	,130	,105	,297	,090	,039	,078
Innovation Adoption	,121	,081	,186	,238	,193	,043	,016	,135
Innovation	,131	-,041	,169	,186	,263	,061	,072	,115

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 5:. BPM Maturity and Innovation of Startups

The relationship here is positive but relatively weak. Based on a Spearman's correlation analysis we found a score of .115 (Table 4). According to Chong (2007) small organizations have difficulty implementing BPM. Also, it might not be worth to try an achieve a BPM maturity level if there is not a strong positive relationship between BPM maturity and innovativeness. Still, as we found above, it might be worth trying to determine the BPM maturity level that is best aligned to a strong innovation capability. This would be in line with the ideas of Plattfaut et al (2012) as mentioned in our literature section.

Conclusion

The purpose of the investigation presented in this paper was to investigate the relationship between BPM maturity and innovation. The study was conducted by means of a questionnaire based on three theoretical models that were combined. The findings suggest that there is not always a positive relationship between BPM maturity and Innovation. Across our entire dataset a positive relation was found but in-depth analysis seems to suggest that the relationship between BPM maturity and innovation varies depending on the size of the organization, but also on the BPM Maturity and Innovation scores. Interestingly enough in our findings we see that the higher an organization is rated in BPM Maturity and Innovation the weaker the relationship between them is. In our study the highest scoring organization (in BPM Maturity and Innovation) shows a negative relationship between the two constructs. Subsequently the large enterprise, which scores lowest in BPM Maturity and Innovation, has the strongest and most positive relationship between BPM Maturity and Innovation

There are some limitations to the study. In both the SME as well as the large enterprise categories of respondents only one company is assessed. These are Irish and American companies both from an Anglo-Saxon culture (Gupta et al. 2002). Although the startups consist of a greater number of companies, there is still one obvious limitation, geographical area. They are all from one incubator in Lisbon, Portugal. As Hofstede et al. (1997) demonstrate, geographic area can impact on the organizations culture and power distance among other things. In addition the sample size for each of the three categories are relatively small. This implies that the results are indicative of some trends, and will require further study with a more homogenous and larger sample.

For organizations that are currently struggling with innovation and that are looking towards process improvement initiatives to improve their innovative capabilities some recommendations can be made. First try to determine the current situation regarding both the organizations BPM maturity and innovation adoption and value chain. For this the model and questionnaire created in this research can be used. A second recommendation would be not to try and improve maturity scores as such but rather to focus on the alignment between the BPM maturity and innovation. This is based on the fact that in this study higher scores in BPM maturity and Innovation means that the relationship between the two are negatively impacted. While at the same time we found that a lower but more aligned score (at the large enterprise) results in the most positive and significant relationship. However it would be prudent for each organization to take its own context into account and consider its course of action based on their circumstances.

REFERENCES

Ajzen, I. 1985. "From Intentions to Actions: A Theory of Planned behaviour," in *Action-control: From cognition to behavior*, J. Kuhl, & J. Beckman (eds.), Heidelberg: Springer, pp. 11-39.

Balzarova M.A., Bamber, C.J., McCambridge, S. and Sharp, J.M. 2004. "Key success factors in implementation of process-based management," *Business Process Management Journal*, (10:4), pp. 387 -399.

Bucher, T. and Winter, R. 2010. "Taxonomy of Business Process Management Approaches," in *Handbook on Business Process Management 2,* J. vom Brocke, and M. Rosemann, (eds.),. Berlin Heidelberg: Springer, pp.93-114.

Chong, S. 2014. "Business process management for SMEs: an exploratory study of implementation factors for the Australian wine industry." *Journal of Information Systems and Small Business* (1:1-2), pp. 41-58.

Cronemyr, P. and Danielsson, M., 2013. "Process Management 1-2-3 – a maturity model and diagnostics tool," *Total Quality Management & Business Excellence* (24:7-8), pp. 933-944.

Davenport, T. 1993. *Process innovation: reengineering work through information technology*, Boston: Harvard Business School Press.

De Boer, F.G, Müller, C.J. and Ten Caten, C.S. 2015. "Assessment model for organizational business process maturity with a focus on BPM governance practices," Business Process Management Journal, (21:4), pp. 908 – 927.

De Bruin, T., Rosemann, M., Freeze, R. and Kulkarni, U. 2005. "Understanding the main phases of developing a maturity assessment model," In Campbell, B, Underwood, J, & Bunker, D (eds.) *Australasian Conference on Information Systems (ACIS)*, Sydney.

Dijkman, R., Lammers, S. V., and de Jong, A. 2015. "Properties that influence business process management maturity and its effect on organizational performance," *Information Systems Frontiers*, 1-18.

Doran, J and O'Leary, E, 2011. "External Interaction, Innovation and Productivity: An Application of the Innovation Value Chain to Ireland", *Spatial Economic Analysis*, (6:2), pp. 199-222.

Ettlie, J. E., and Reza, E. M. 1992. "Organizational integration and process innovation" *Academy of Management Journal*, (35:4), pp. 795-827.

Gupta, V., Hanges, P. J., & Dorfman, P. 2002. "Cultural clusters: Methodology and findings". *Journal of world business*, (37:1), pp. 11-15.

Hansen, M. T., and Birkinshaw, J. 2007. "The innovation value chain". *Harvard business review*, (85:6), pp. 121-130.

Herbsleb, J., Zubrow, D., Goldenson, D., Hayes, W., and Paulk, M. 1997. "Software quality and the capability maturity model". *Communications of the ACM*, (40:6), pp. 30-40.

Hofstede, G., Hofstede, G. J., and Minkov, M. (1997). *Cultures and organizations*. New York, NY: McGraw Hill.

Jiang, J.J., Klein, G., Hwang, H.G., Huang, J., and Hung, S.Y. 2004. "An exploration of the relationship between software development process maturity and project performance," *Information & Management* (41:3), pp. 279-288.

Krishnan, M., and Kriebel, C. 2000. "An empirical analysis of productivity and quality in software procducts," *Management Science* (46:6), pp. 745-759.

Parast, M. M. 2011. "The effect of Six Sigma projects on innovation and firm performance". *International Journal of Project Management*, (29:1), pp. 45-55.

Plattfaut, R., Niehaves, B., Pöppelbuß, J., and Becker, J. 2011. "Development of BPM Capabilities–Is Maturity the Right Path?" *European Conference on Information Systems*. Paper 27, pp. 1-13.

Ravesteyn, P. 2007. "Business Process Management Systems: Hype or New Paradigm,". *in Proceedings of the 18th Conference of the International Information Management Association*. Beijing, China, pp. 147-157.

Ravesteijn, P, Zoet, M, Spekschoor, J and Loggen, R. 2012. "Is There Dependence Between Process Maturity and Process Performance?" *Communications of the IIMA*, (12:2), pp. 65-80.

Rogers, E. M. 2003. *Diffusion of Innovations*, Fifth Edition. New York: Free Press

Roper, S., and Arvanitis, S. 2012. "From knowledge to added value: A comparative, panel-data analysis of the innovation value chain in Irish and Swiss manufacturing firms," *Research Policy*, (41:6), pp. 1093-1106.

Roper, S, Du, J and Love, D.H. 2008. "Modelling the innovation value chain," *Research Policy*. (37), pp. 961–977.

Rosemann, M., & vom Brocke, J. 2010. "The six core elements of business process management," in *Handbook on Business Process Management 1*, J. vom Brocke, and M. Rosemann, (eds.),. Berlin Heidelberg: Springer, Berlin Heidelberg: Springer, pp p107-122.

Sanders, J.L. and Linderman, J.K. 2014. "Process management, innovation and efficiency performance," *Business Process Management Journal*, (20:2), pp. 335 – 358.

Smit, J. 2015. "The Innovation Value Chain and Adaptability of Organizations,". *Journal of International Technology and Information Management*, (24:3), pp. 57-73.

Shafiei, A and Hajiheydari, H, 2014, "Developing a business process management maturity model: A study of 300 Iranian superior companies," *International Journal of Engineering and Technical Research*. (2:10), pp. 231-242.

Tan, M and Teo, T.H.S 2000. "Factors Influencing the Adoption of Internet Banking," *Journal of the Association for Information Systems*, (1:5), pp. 1-44.

Tang, J., Pee, L. G., and Iijima, J. 2013. "Investigating the effects of business process orientation on organizational innovation performance," *Information & Management*, (50:8), pp. 650-660.

Udo, G., Bagchi, K. and Maity, M. 2014. "Exploring Factors Affecting Digital Piracy Using the Norm Activation and UTAUT Models: The Role of National Culture," *Journal of Business Ethics*, Dec, pp. 1-25.

Zheng, N, Guo, X and Chen, G, 2008. "IDT-TAM Integrated Model for IT Adoption," *Tsinghua Science and Technology*, (13:3), pp. 306-311.