How Do BPM Maturity and Innovation Relate in Large Companies?

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Abstract. Due to the increasing level of globalization competition between companies is growing. As a consequence, large companies need to enhance both their productivity and innovation simultaneously. Where business process management methods, such as BPM maturity models, are typically seen as a means to improve performance and productivity, their impact on innovation is unclear. Therefor the objective of this study is to determine what the relation is between business process management maturity and Innovation in large companies. A research model is developed based on existing theory on innovation adoption, innovation value chain and BPM maturity models. Subsequently a questionnaire is constructed to gather data at four large European organizations. Based on both a correlation and regression analysis of the data provided by 143 respondents a moderate relation between the overall Innovation construct and BPM maturity is shown. The proportion of variance in innovation that can be explained by BPM maturity amounts to 22,4%. This means that investing in BPM capabilities is not enough to increase the innovation capability of an organization.

Keywords: Process management · BPM maturity · Innovation adoption
Innovation value chain

1 A Need for Innovation

The process of globalization has given rise to an increased competition between companies on a global level. As a consequence, large companies are under pressure to enhance productivity and innovation simultaneously (Sanders Jones and Linderman 2014). In particular companies based in developed countries are increasingly challenged by competitors from developing countries, which are quickly picking up in the quality of their offerings while exporting globally at lower prices. To be able to compete, existing processes need to be continuously managed and improved in line with strategic aims, to enhance efficiency and time-to-market (Hung 2006). Moreover, the increased competition calls for higher levels of innovativeness (Tidd 2001). Business process management (BPM) is a management discipline including the recognition, definition, analysis, repeated improvement, automation, execution,

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measurement and tracking of business processes (Scott 2007). By means of maturity models companies can assess their process architecture and distinguish capabilities that require enhancement (Forstner et al. 2014). Subsequently innovation is the process through which enterprises convert ideas into new or enhanced products, services or processes (Baregheh et al. 2009). It has been much argued that successful innovation requires a degree of flexibility that contrasts the efficiency orientation of BPM (Sanders Jones and Linderman 2014; Dijkman et al. 2016). In light of the need for successful performance in both disciplines, this study aims to expand existing studies by examining the relation between BPM maturity and innovation in large companies. The focus of this research is on large, multi-national companies. The motivation for this is that, though increasingly preoccupied and devoted to innovation, large companies are found to struggle with successful innovation (Christensen 2013). Based on the above this study is committed to answering the following research question: *What is the relation between business process management maturity and innovation in large companies?*

The remainder of this paper is organized as follows, first the literature that is the foundation to the conceptual model is described. Section 3 provides insight in the data collection for this research and in Sect. 4 the analysis of the data is discussed. Finally, conclusions and implications are given in Sect. 5.

2 Literature

In this section a brief overview is provided on the theory and methods that are the foundation to the conceptual model constructed for this research.

2.1 Innovation

In a most basic definition of innovation the notion of novelty must be included (Gupta et al. 2007). Furthermore, in the context of organizations there is also the need of commercialization and/or successful implementation of innovations (Popadiuk and Choo 2006). It is therefore generally conceptualized that innovation is a process starting from idea creation, through to implementation/ commercialization. Innovation can be seen as a multi-level process through which organizations convert ideas into new or enhanced products, services or processes to increase their competitive advantage (Baregheh et al. 2009). Besides innovation being a driver of change in products or services, it can also be a driver of change for enterprises (Smit 2015). Organizations can adopt external innovations to change the way they operate or are organized. Based on this we divide innovation in two concepts (1) Innovation Value Chain (IVC) and (2) Innovation Adoption.

The Innovation Value Chain is described by Hansen and Birkinshaw (2007). According to them the IVC consists of three phases: Idea Generation, Idea Conversion and Diffusion. Innovations typically start with a new idea. The generation of an idea can occur in teams within the organization, across teams, or externally to the organization (Hansen and Birkinshaw 2007). During the conversion stage ideas are transformed into new products, service, processes etc. In the final phase, diffusion, the innovation is put into exploitation. From this it is clear that the IVC provides an interlinked and linear, three phased description of how innovation presents itself in an organization.

Innovations that have been created but not adopted and used have no value. The adoption of innovation studies the factors and sentiment that may be related to the adoption or non-adoption of new products and services. Several studies show that such factors can be both internal and external to an organization (Tan and Teo 2000; Zheng et al. 2008; Udo et al. 2016). External factors are for example social norms, government policies, or rules that will make the innovation illegal or hard to get (Tan and Teo 2000; Udo et al. 2016), while internal factors relate to aspects such as technical ability, resources and intention to adopt (Tan and Teo 2000; Zheng et al. 2008).

Based on the above the innovation concept in our conceptual model is based on both the IVC theory of Hansen and Birkinshaw (2007) and the innovation adoption model by Tan and Teo (2000).

2.2 Business Process Management Maturity

Maturity models allow deductions on which capabilities an organization should improve (Forstner et al. 2014). Thus, a BPM maturity model helps organizations enhance their business process architecture to reach company goals. The number of studies on BPM maturity models has increased alongside the growing interest for BPM, which itself has its roots in both total quality management and business process re-engineering (Ravesteyn and Versendaal 2007; Plattfaut et al. 2011). Currently there are several theoretical models for studying BPM maturity and developing BPM capabilities (De Bruin et al. 2005; Bucher and Winter 2010). However, it is still not clear how organizations best achieve maturity (Plattfaut et al. 2011). Also, there is a discussion on the optimal level of maturity for BPM since a maximization of BPM maturity need not be necessary for realizing the organization's objectives according to the business strategy (Rosemann et al. 2004). Furthermore, the majority of available BPM Maturity models is descriptive (Tarhan et al. 2016) and cannot be used in a prescriptive manner. In their study Tarhan et al. (2016) found that most models only measure the BPM maturity and just three of the models also measured the (organizational) performance. One model that is prescriptive in its nature is the OMG BPMM model. This model was developed by Curtis and Weber and is based on the architecture of the Capability Maturity Model (Heller and Varney 2013). It is made up of five maturity levels and 30 capability areas that are called process areas. In comparison to most models it gives clear instructions on which process areas have to be improved in order to reach the next maturity level (Roeglinger et al. 2012). In this study the aim is to measure BPM maturity and investigate the relationship with innovation. Therefore, a model that is descriptive and only measures maturity will suffice. For this research the BPM maturity model by Ravesteyn et al. (2012) is used (see Fig. 1). In this model the maturity levels are not linear, i.e. it is not necessary for an organization to "complete" a maturity level in order to reach another. Instead, the model recognizes that organizations will perform over all levels simultaneously, merely at different quality. This better reflects to dynamics of organizational change and addresses criticism on other BPM models (Pöppelbuss et al. 2011).

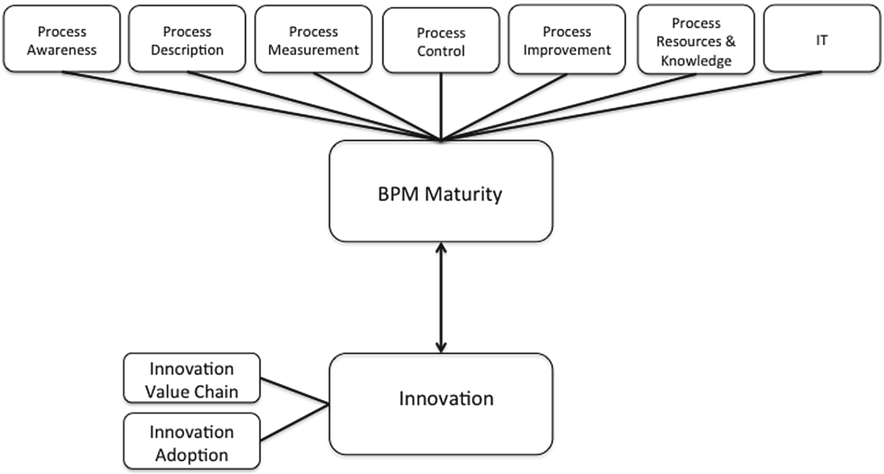

Fig. 1. Conceptual model.

2.3 The Conceptual Model and Hypothesis

To study the relation between BPM maturity and innovation and in accordance to above literature review the research framework for this study builds on a total of three conceptual models of the core elements of BPM maturity and innovation (see Fig. 1). The various constructs from the conceptual model are derived from the BPM maturity model suggested by Ravesteyn et al. (2012), the Innovation Value Chain by Hansen and Birkinshaw (2007) and Innovation Adoption as conceptualized by Tan and Teo (2000).

The BPM maturity construct in the conceptual model is divided in to the seven dimensions of business process management that resemble the BPM-lifecycle (process awareness, process description, process measurements, process control, and process improvement) and the supporting dimensions 'process resources and knowledge' and 'IT usage', as described in De Waal et al. (2017). For each dimension several BPM capabilities have been defined (in total 37).

The Innovation construct is conceptualized in seven items that measure the Innovation Value Chain, which according to Hansen and Birkinshaw (2007) consists of the phases Idea Generation, Idea Conversion and Idea Diffusion. Furthermore, six items measure Innovation Adoption, this includes items relating to Attitude to Innovation (Relative Advantage and Risk), Subjective Norms (Customers and Competitors) and Perceived Behavioral Controls (Self-Efficacy and Facilitating Conditions) (Tan and Teo 2000).

3 Research Methodology

This section describes the procedure to collect data and the outcomes of the validation of the BPM Maturity and Innovation scales. For the analysis the collected data was transferred to SPSS 23 for factor analysis, descriptive statistics, correlation analysis and regression analysis.

3.1 Data Collection

As described above the conceptual model for this research is based on a comprehensive literature study on the concepts of BPM maturity and Innovation both individually and in combination. Subsequently, quantitative data was gathered in four European multinational organizations and analysed statistically. For this a questionnaire was developed that consisted of 55 questions related to the core elements of the conceptual model namely BPM maturity (37 items) and innovation (13 items) as well as five general questions to capture supporting variables such as size, sector, and knowledge and experience in BPM. The questions on BPM maturity follow the BPM dimensions described in Ravesteyn et al. (2012). The respondents selected the degree to which they agreed or disagreed with the given statements according a five-point Likert scale (1 = fully disagree, 5 = fully agree).

The data was collected as part of internships by master students of Innovation in European Business in the academic years of 2015 and 2016. All data was collected by means of a questionnaire, which was shared with employees at the companies of the internships. In most organisations data collection was conducted via an online survey with mandatory questions. The link to the questionnaire was sent via email. The survey could only be completed when all questions were answered. In one large organization the data was collected on paper instead of online. In this sample a total of 33 questionnaires were handed in, however six questionnaires were aborted midway. These questionnaires have proven to be unusable as too many questions were left unanswered, resulting in 27 valid responses from that company.

The total data set amounts to 143 respondents, obtained from the four large, multinational companies. The respondents have different business functions within their organizations, ranging from IT, marketing and sales through to procurement and quality management, amongst others. The variable size was classified by the question: approximately how many employees are there in your company? In accordance with often cited research, large is arbitrarily defined as a minimum of 5,000 employees (Porter 1963). An overview of the complete data set of the large companies can be found in Table 1.

Table 1. Overview of data set large companies (N = 143).

Company	Headquarter	Sector	Sample size
1	Ireland	IT	55
2	Ireland	Utilities	27
3	Austria	Jewellery manufacturing	33
4	Belgium	Fast moving consumer goods	28

3.2 Measurement and Validation

The validity of the scales was tested by means of a factor analysis in SPSS 23 with varimax rotation to maximize the dispersion of loadings within factors. Therefore, it tries to load smaller number of variables highly on each factor, resulting in more interpretable clusters of factors (Field 2013). This approach simplifies the interpretation of factors and is thus chosen for the scope of this research. Principal Component Analysis (PCA) with varimax rotation of the 37 items of BPM maturity resulted in a seven-factor solution, accounting for 64.6% of the overall variance. Although this analysis shows that the seven dimensions of BPM maturity are represented in seven rotated factors, some items have a low factor loading. After removing seven of these items, the PCA with varimax rotation resulted again in a seven-factor solution, accounting for 69.0% of the overall variance. This supports the seven dimensions of the conceptual model of this study.

Similarly, for the innovation part of the conceptual model, a PCA with varimax rotation on the 13 items, resulted in a three-factor, accounting for 56.0% of the overall variance. The results demonstrated that the seven items loading moderate to first factor (Innovation Value Chain), four items loading moderately to highly with the second factor (Innovation Adoption without Perceived Behavioural Control) and two items correlating with the concept of Perceived Behavioural Control. Because the factor loadings were relatively high and the concepts of Innovation Value Chain and Innovation Adoption have been tested and verified in previous studies (Smit 2015; Tan and Teo 2000), no adjustments were made to the scales for the purpose of this study.

To further test the reliability of the constructs in the conceptual model a reliability test was conducted for each dimension. The results are presented in Table 2. As can be seen, the factor loadings were between 0.851 and 0.499, which can be considered as being significant (Hair et al. 1998). The reliability of the scales was confirmed by

Table 2. Factor analysis and reliability of BPM maturity and innovation scales (N = 143).

Dimension	Number of items	Own value	Explained variance	Factor loading (Max.)	Factor loading (Min.)	Cronbach's alpha
Process awareness	3	1.23	4.1	.807	.499	.765
Process description	5	3.26	10.9	.782	.520	.871
Process measurement	4	1.39	4.6	.813	.565	.825
Process control	3	1.05	3.5	.766	.183	.730
Process improvement	5	1.84	6.1	.736	.605	.806
Process resources	3	1.06	3.5	.756	.686	.786
Process IT tools	7	10.88	36.3	.851	.653	.907
Innovation value chain	7	3.37	48.2	.793	.577	.817
Innovation adoption	6	2.63	43.8	.764	.561	.738

Cronbach's alpha value of 0.907 to 0.730. In accordance with the study of Kline, a Cronbach's alpha coefficient above 0.7 is interpreted to imply a reliability of the scales (Kline 2000; Urdan 2011). The seven dimensions of BPM maturity and the two constructs that make up Innovation have an alpha coefficient of 0.863 resp. 0.623. This suggests the dimensions used to measure each construct have a relatively high and moderate internal consistency.

4 Findings and Discussion

To answer the research question on the relation between BPM maturity and innovation in large companies, a Pearson correlation analysis was performed on the 143 respondents from the four large organizations. The results of the test are depicted in Table 3. The findings show a moderate significant relation between respectively Innovation Value Chain (0.40) and BPM maturity and Innovation Adoption and BPM maturity (0.41). The relation between the overall Innovation construct and BPM maturity is slightly stronger than with the individual concepts but can still be interpreted as mere moderate (0.48), according to statistical research theory (Field 2013).

Table 3. Correlations between BPM maturity (dimensions) and innovation (dimensions) (**p < .01; *p < .05; N = 143).

	BPM Maturity	Process awareness	Process description	Process measurement	Process control	Process improvement	Process resources	Process tools
Innovation	,479**	,324**	,248**	,229**	,320**	,605**	,557**	,243**
Innovation value chain	,403**	,304**	,181**	,231**	,219**	,589**	,475**	0,138
Innovation adoption	,414**	,249**	,240**	0,160	,325**	,445**	,475**	,273**

To further analyse the relation between the concepts a (multiple) regression analysis is conducted with Innovation (dimensions) being the dependent variable and BPM maturity (dimensions) as the independent variable. The results are shown in Table 4. As is shown all the results of the multiple regression analysis were significant. The proportion of variance in Innovation that can be explained by BPM maturity amounts to 22,4%. Therefore, it can be concluded that in large companies BPM maturity has a positive effect on innovation. This finding is in line with previous studies (Benner and Tushman 2002; Dijkman et al. 2016). The analysis of the dimensions of BPM maturity does show that two dimensions are stronger predictors for innovation than the overall BPM maturity level. Process Improvement is the main predictor for Innovation Value Chain and Process Resources and Knowledge is the main predictor for Innovation Adoption.

If we compare these findings with the research of Ravesteyn et al. (2016) there are some interesting conclusions. Though the relation in this data set is significant and moderate, it does not show the strength of the relation found for the large enterprise of the research by Ravesteyn et al. which was 0.64. However, the relation found in this

Table 4. Multiple regression analysis between BPM maturity (dimensions) and innovation (dimensions) (N = 143).

Dependent variable	Predictor	Beta	p	Adjusted R^2	F	df	p
Innovation	BPM maturity	.48	.000	22,4	42,014	142	.000
Innovation	Process improvement	.42	.000	41,0	50,348	142	.000
	Process resources	.29	.001				
Innovation value chain	Process improvement	.48	.000	35,7	40,337	142	.000
	Process resources	.17	.047				
Innovation adoption	Process resources	.32	.001	25,1	24,788	142	.000
	Process improvement	.24	.010				

study is significantly stronger than the relation found for the SME and start-ups from the research of Ravesteyn et al. in 2016, which was negative and weak, respectively. Therefore, this seems to support previous findings that company size is related to the relation between BPM maturity and innovation (Ravesteyn et al. 2016; Tang et al. 2013).

5 Conclusion and Limitations

The objective of this study is to determine whether there is a relation between BPM maturity and innovation in large organizations. For this the following research question was formulated: *What is the relation between business process management maturity and Innovation in large companies?*

Based on analysis of the collected data of large organisations, it is possible to conclude that there is a moderate correlation between respectively the concept of the Innovation Value Chain (0,40) and BPM maturity, and Innovation Adoption (0,41) and BPM maturity. The correlation between the overall Innovation construct and BPM maturity is slightly stronger than with the individual concepts but can still be interpreted a mere moderate (0,48). The regression analysis that is conducted shows that the proportion of variance in innovation that can be explained by BPM maturity amounts to 22,4%. Together these analyses confirm that in large companies BPM maturity has a positive effect on innovation. However, this does not mean that investing in BPM capabilities to increase BPM maturity is also enough to increase the innovation capability of an organization.

To further understand the relationship between business process management and innovation more research is needed. One way to validate the findings is to estimate the conceptual model using SEM (Structural Equation Modelling). Second, we suggest to keep focusing on large organizations, as analysis of data collected at smaller organizations seems to suggest that the relationship between BPM maturity and Innovation is very weak. As this research only looked at profit organizations, future studies should also include large not for profit organizations such as governmental organizations. Furthermore, the impact of culture on the relation between BPM and innovation could also be considered as a topic of research.

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