Association for Information Systems
AIS Electronic Library (AISeL)

BLED 2016 Proceedings | BLED Proceedings

2016

Using the Delphi Method to Identify Hospital-Specific Business Process Management Capabilities in The Netherlands

Joris Mens
HU University of Applied Sciences Utrecht, The Netherlands, joris.mens@hu.nl

Pascal Ravesteyn
HU University of Applied Sciences Utrecht, The Netherlands, pascal.ravesteijn@hu.nl

29th Bled eConference

Digital Economy

June 19 - 22, 2016; Bled, Slovenia

Using the Delphi Method to Identify Hospital-Specific Business Process Management Capabilities in The Netherlands

Joris Mens, Pascal Ravesteyn

HU University of Applied Sciences Utrecht, The Netherlands

joris.mens@hu.nl, pascal.ravesteijn@hu.nl

Abstract

Business Process Management (BPM) is an important discipline for organisations that are desiring quality improvement. Many models for assessing, comparing and improving the maturity of organisational BPM are found in literature. An effective BPM Maturity Model should contain a validated set of capability areas specific to the application domain. We attempt to fill a gap by providing a model specific to the hospital industry. This paper presents the first phase in the development of such a model. For this we use the Delphi Method, a multi-round technique for collecting rich data and gaining consensus among a panel of experts. Based on the opinions provided by experts in hospitals and academia in The Netherlands, we identify relevant and domain-specific capabilities for improving BPM maturity in the Dutch hospital industry. Hospitals are characterised by complex, multidisciplinary processes. Our findings reflect that capabilities related to people and organisational culture are most important for achieving BPM maturity.

Keywords: bpm, maturity, hospitals, healthcare, process management, Delphi method

1 Introduction

Business Process Management (BPM) is a discipline that aims to "support business processes using methods, techniques, and software to design, enact, control, and analyse operational processes involving humans, organisations, applications, documents and other sources of information" (Weske, 2012). 'BPM maturity' is a concept used to indicate the stage of development of BPM practices. The word mature is defined as "having reached the most advanced stage in a process" or "being fully grown or developed". Within BPM, it is understood that processes have lifecycles and can be improved throughout time (McCormack et al., 2009). Improving processes and process management practices therefore leads to higher maturity, or so-called BPM maturity. BPM maturity can be assessed, improved and benchmarked using Business Process Maturity Models (BPMMs) (De Bruin, Freeze, Kulkarni, & Rosemann, 2005). A BPMM usually defines a number of maturity levels, with specific capabilities for each level. These capabilities tell us how well the organisation performs a certain competence in relation to business process management.

BPM is seen as a holistic principle to which many organisational aspects contribute. Examples of high-level capabilities influencing maturity are the alignment of organisational strategy to its operational processes, a culture of continuous improvement and the use of IT systems for supporting processes (Rosemann & De Bruin, 2004, 2005a). A wide array of BPMMs are found in literature. Some are designed for general use while others are aimed at specific domains. In this paper, we establish that existing BPMMs do not meet the specific needs of the hospital industry. The hospitals assessed in this paper face industry-specific challenges and are characterized by low to average BPM maturity. Some key challenges facing these hospitals are the aging population, rising costs and increasingly complex care pathways. The variety of specialisations and therapies is rising , while patients demand services of higher quality and shorter waiting times (Øvretveit, 2000). In response to requirements imposed by the government and accreditation bodies, hospitals must integrate their information systems to better coordinate healthcare processes. Information systems in the hospital sector are underdeveloped when compared to other sectors (Helfert, 2009), particularly in terms of low technological sophistication and integration sophistication (Paré & Sicotte, 2001). Lack of funds, failure to recognize IT as a key stakeholder in hospital decisions and the implementation of Electronic Heath Records (EHRs) are shown to be some of the top IT management issues in hospitals (Jaana, Tamim, Paré, & Teitelbaum, 2011). Thus, a BPM Maturity Model for hospitals may assist in improving BPM maturity and help to tackle these challenges, thereby improving the overall quality of healthcare.

In this paper we attempt to identify the relevant capabilities for a hospital-specific BPMM. The Delphi method is used to gather consensus on these capabilities among a panel of experts. In the following sections, we describe the Delphi method and its use in developing domain-specific BPMMs. We then describe the set-up of our case study using the Delphi method and present the results for healthcare-specific capabilities relevant for BPM maturity.

2 Literature Review

The complexity of process management in hospitals lies in its large variety of medical specialisations (Mans, Schonenberg, Song, van der Aalst, & Bakker, 2009). Patients may require the care of different medical specialists throughout their care process. This is also called the care pathway. A patient's care pathway can be highly variable and runs through different hospital departments. This proves to be a challenge, since data relating to the patient may be recorded inconsistently between specialists or stored in separate information systems (Mans, van der Aalst, Vanwersch, & Moleman, 2013). The complexities of healthcare processes introduce a risk of errors and unnecessary waiting times. Patients with the same diagnosis may encounter different waiting times in their process and the reasons for this are not always known (Mans et al., 2009). Earlier research shows a correlation between BPM maturity and process performance (Ravesteyn, Zoet, Spekschoor, & Loggen, 2012). Thus it follows that the improvement of BPM maturity and related capabilities may improve the process performance and quality of care in hospitals.

To identify the possibilities for improvement, we must first assess the current state of BPM maturity in hospitals. Previously collected data from over 1000 organisations shows that the Dutch healthcare and public sector score lowest when compared to other sectors (Luyckx, 2012).

The difference in maturity is significant when compared to the highest-scoring financial and automotive sectors. Luyckx (Luyckx, 2010) also identifies that hospitals are complex organisations that need to align their processes externally with other organisations (general practitioners, insurance companies) as well internally, between departments. Performance indicators and a proper reporting structure must be implemented to safeguard quality. Luyckx (Luyckx, 2010) concludes that one of the main obstacles of BPM maturity in hospitals is the unique organisational structure: Doctors are the main decision makers within their individual departments. It is further suggested that doctors and business/IT departments within the hospital must work together on BPM decision making in order to improve BPM maturity. For the reason of developing a practically relevant model, the Delphi study will include experts with sufficient experience in healthcare. The following paragraphs describe the elements of conducting such a study, as gathered from literature.

The Delphi method is a type of study used to gather a consensual opinion from a panel of experts on a complex subject (Dalkey, Brown, & Cochan, 1969). This is done using multiple rounds of anonymised surveys. Multiple-round techniques lead to richer and more refined data than single-round techniques (Yousuf, 2007). The Delphi method prescribes that respondents remain anonymous to one another to reduce group pressures and stimulate creativity (Hsu & Sandford, 2007). For this reason, electronic distribution of surveys or individual telephone interviews are the preferred channels for conducting the study. The data collected in a round is anonymised by the researcher for use in the next round. In this respect, the Delphi method is very different from the focus group method where direct interaction between participants is encouraged. However, both the Delphi method and focus groups allow for the use of a smaller group of respondents than is the case in traditional quantitative survey-based research. This is because in a Delphi study, the focus is on the quality and richness of the collected data rather than the sample size.

The Delphi method is set up in such a way that the respondents may progress from widely-diverging opinions in the first round and converge towards consensus in the final round. For this reason, the emphasis is on collecting qualitative data in the first round and quantitative data in subsequent rounds. In the first round, the researcher may employ open-ended questions to allow for the collection of any opinions the participant may have. In subsequent rounds, the opinions are anonymised and ranked numerically by participants. By converging towards quantitative surveys, the level of consensus can be expressed statistically. A Delphi study encompasses a minimum of three rounds. More rounds may be instated in case the desired level of consensus is not yet achieved.

The general process of conducting a Delphi study is outlined as follows:

1. Problem definition: The researcher uses existing literature to frame the problem statement and provide structure to the first survey round.
2. Candidate Selection: A list of candidates for the expert panel is established on the basis of predetermined criteria. The experts are invited for participation in the Delphi study.
3. First Delphi Round: The first survey is distributed for the purpose of collecting opinions using open-ended survey items.

4. Second Delphi Round: The opinions from the first survey are summarised by the researcher into a list of statements. The summarised statements are presented in the second survey for the purpose or ranking or rating by the experts.
5. Third Delphi Round: The results of the second survey are summarised by the researcher. This shows which statements have the highest support from the expert panel. In the third survey, the experts indicate to what extent they agree with the majority opinion. Reasons may be provided for disagreeing with the majority opinion. The results of the third survey are summarised by the researcher.
6. Conclusion: When sufficient consensus is achieved, the final results are presented to the expert panel. Otherwise, a fourth survey may be initiated where reasons for disagreeing with the majority opinion are evaluated by the panel.

In the final round of the Delphi study, quantitative survey items are used to be able to derive statistical proof of consensus. For example, the researcher may consider consensus to be achieved when the majority opinion receives an average satisfaction rating of 8 on a scale of 10 from the experts. The level of desired consensus may be predetermined by the researcher.

Delphi studies have been used in earlier research to successfully gather data for the creation on a BPM maturity model (Rosemann & De Bruin, 2005b). The Delphi study is considered suitable for BPM research as it is a mature field, in which a sufficient collection of existing literature is available to frame the initial problem and identify gaps. In addition, mature fields have a sufficient number of experts that could serve as participants to the study. Literature identifies a number of benefits and challenges relating to the use of Delphi studies. The benefits are described as follows (Hsu & Sandford, 2007; Rosemann & De Bruin, 2005b; Yousuf, 2007):

- Multi-round setup enables the formation of consensus on a complex subject, using controlled feedback to reduce discord.
- Respondent anonymity may lead to the elicitation of more creative responses.
- Social pressures are eliminated by ensuring respondents do not directly communicate with each other.
- Surveys are administered via electronic means, making them more practical for eliciting data from geographically dispersed respondents.
- Consensus is tracked and measured in a statistical manner.

Challenges relating to Delphi studies are defined as follows (Hsu & Sandford, 2007; Rosemann & De Bruin, 2005b; Yousuf, 2007):

- A sufficient number of experts willing to commit to participation in multiple rounds is needed.
- The experts must allocate a significant amount of time to complete all rounds and may drop out due to survey fatigue.
- Waiting times are introduced, as the panel can only progress to the next round after the current round has finished.
- Response coding is vulnerable to the introduction of bias by the researcher.
- Coding the responses is time consuming and requires more effort as the number of participants increases.

Existing literature on the Delphi method does not impose specific minimum or maximum limits to the number of respondents that must be included in a Delphi study. Compared to traditional quantitative research, a smaller number of respondents is deemed acceptable since rich data is gathered from a targeted group of experts. In this regard, the necessary number of respondents should be compared to that of a focus group session.

A wide variety of BPM Maturity Models is available in literature. Because of the many types of maturity models, each with their own measurement instrument and design principles, it becomes difficult to specify what makes a maturity model useful and applicable in practice. Previous research has attempted to provide design principles or frameworks for the design of maturity models (Becker, Knackstedt, & Pöppelbuß, 2009; De Bruin et al., 2005; Pöppelbuß & Röglinger, 2011). Critics state that maturity models may be too rigid (not responsive to characteristics of the organisation and its environment) or oversimplified (try to provide a one-size-fits-all formula for success) (Pöppelbuß & Röglinger, 2011). Some of the basic design principles include a clear definition of the target audience, the method of application, the application domain and the intended respondents (De Bruin et al., 2005). Defining these principles helps to frame and design the Delphi study. Vice versa, the Delphi study allows us to identify agreed-upon capability factors that are relevant to and applicable within the chosen domain. By using the Delphi method for capability identification and clearly describing the research process, we attempt to overcome the limitations of some earlier models.

3 Study Design

The study encompasses the application of the Delphi method in the hospital domain, for the purpose of identifying relevant capabilities for a BPM Maturity Model. A panel of participants was composed using pre-existing contacts from a research group at our institution. A minimum of five respondents was considered necessary for gathering sufficient variety in opinions. Contacting potential candidates resulted in a panel composed of six experts employed at Dutch hospitals and one academic researcher with prior experience in healthcare. The panel has an average of 11.7 years' experience (s = 10.7) in the healthcare industry, with a minimum of four years' experience.

Prior to starting the Delphi rounds, the six participants from practice were asked to rate the overall level of BPM Maturity of their organisations. This was done on the basis of the five levels of maturity defined in an established general-purpose model (Harmon, 2004). The model prescribes five distinct levels of organisational BPM Maturity: (1) Initial, (2) Repeatable, (3) Defined, (4) Managed, (5) Optimised. We also asked the participants to state their expected maturity level in five years. Two of the participants indicated currently being at level 2, while four participants indicated their organisation at level 3. All participants indicated an expected increase of one maturity level in the next five years. By using this quick assessment of self-perceived organisational maturity, we gain a general understanding of the characteristics of the sample.

We use a framework to define the necessary criteria for a Delphi study (Day & Bobeva, 2005). These criteria and the related characteristics form the starting point for conducting the study. These are listed in Table 1 below.

Criterion	**Characteristic**
Purpose of the study	Building
Number of rounds	Three
Participants	Homogeneous group
Mode of operation	Remote access
Anonymity	Full
Communication media	Internet, Telephone
Concurrency of rounds	Sequential set of rounds

Table 1 Characteristics of the Delphi study

The surveys used for data collection are distributed electronically. This facilitates the anonymous collection of data from geographically dispersed respondents. The participants are invited to the study via telephone, with additional details and instructions sent via e-mail. A period of three weeks is allotted to each round of the Delphi study to both ensure continuity of the study while allowing sufficient time for the experts to provide their response. Anonymous identifiers (ID codes) are used to track each participant in the study. This allows participants to see which responses belong to the same participant. The researcher uses these ID codes to keep track of the progress of each participant. Their true identities are known only to the researcher. An online survey platform is used that provides the functionality of setting pre-filled fields, so that ID codes can be attached to each survey individually.

The Delphi study was conducted in three rounds, which were set up as follows:

1. Round one: Collection of opinions on relevant capabilities for maturity in six factors derived from literature (Rosemann & Vom Brocke, 2010): Strategic Alignment, Governance, Methods, IT, People, Culture. Also rating each factors on a scale from one to ten
2. Round two: Rating each capability provided in a previous round on a scale from one to five.
3. Round three: Presenting an overall ranking of all capability, based on a weighted score based on the capability rating multiplied by the factor rating. Participants indicate a threshold value for relevant capabilities and rate their overall agreement with the findings.

The results of the Delphi study are described in the following section.

4 Results

At the end of the Delphi study, we arrive at a list of the most relevant capabilities that influence BPM maturity in hospitals. This list is based on the consensus achieved throughout the survey rounds by the participants involved in the study. During the survey rounds some participants were no longer willing or able to be involved in the study and therefore dropped out. Table 2 below shows the number of participants in each round.

	Practice	**Academia**
R1	6	1
R2	4	1
R3	3	1

Table 2 Number of participants in each round of the Delphi study

In the first round, participants rated their perceived importance of each of the six factors. Table 3 below shows the ratings given by the participants. Within each of the six factors, participants provided an open-ended answer with capabilities they deem important.

Factor	**Avg. score out of 10**	**Std. dev.**
People	9.14	1.60
Culture	8.86	1.27
Governance	8.57	0.90
Strategic Alignment	8.29	1.90
IT	7.57	0.69
Methods	6.86	0.90

Table 3 Factor ratings (average out of 10)

In the second round, all collected capabilities were rated for importance by the respondents, on a scale from one to five. The capability ratings were multiplied with the factor rating (seen in Table 3) to arrive at a weighted score for each capability. The weighted score is on a scale from 1 to 50. The distribution of weighted capability scores is shown in Figure 1. The capabilities are colour-coded depending on the factor they belong to. This shows that cultural and people capabilities are generally the highest-scoring. Scores for governance, strategic alignment and IT capabilities are more dispersed. Methods capabilities score lowly overall.

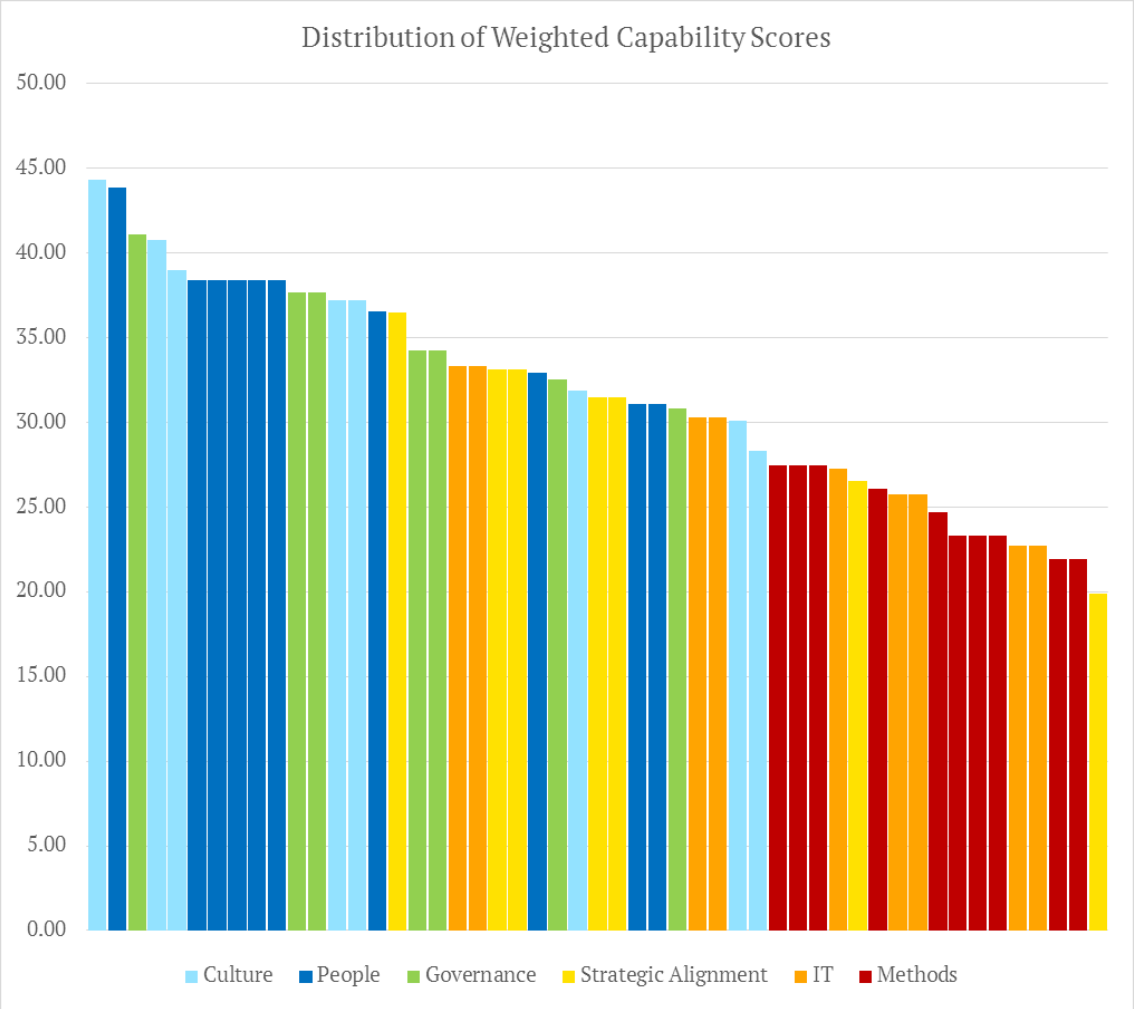

Figure 1 Distribution of weighted capability scores

In the third round of the Delphi study, participants were asked to provide an opinion on their agreement with the ranking of the entire set of capabilities. Also, they were asked to provide a threshold value for which capabilities should and should not be included in the final model. Based on the input, the threshold value was set at 30. Capabilities belonging to the methods factor are no longer included, since they all scored below 30. This results in a model with the most important capabilities across five factors. Table 4 shows the thirty-three included capabilities, grouped by factor and sorted by weighted score.

Factor	Capability	Capability Score	Weighted Score
People	Assigning Process Owners	4.8	43.87
	Availability of primary healthcare staff	4.2	38.39
	Knowledge sharing	4.2	38.39

	Training in describing and optimising healthcare processes	4.2	38.39
	Training in KPI-based steering	4.2	38.39
	Using pilot projects to foster participation	4.2	38.39
	Clarifying the importance of the individual in the process chain	4.0	36.56
	Training in combining line management and process management	3.6	32.90
	Flat organisational structure	3.4	31.08
	Freedom and responsibility to internalize processes	3.4	31.08
Culture	Management Commitment	5.0	44.30
	Involvement of Healthcare Professionals in Process Improvement	4.6	40.76
	Intrinsically motivated improvement culture and management style	4.4	38.98
	Assigning a process management ambassador within management or the board	4.2	37.21
	Creating awareness of current issues	4.2	37.21
	Culture elements from LEAN	3.6	31.90
	Open culture	3.4	30.12
Governance	Specification of tasks & responsibilities	4.8	41.14
	Use of outcome indicators	4.4	37.71
	Setting goals	4.4	37.71
	Governance based on soft skills (collaboration, behaviour, accountability)	4.0	34.28
	Prioritizing process management for high-risk business goals	4.0	34.28
	Agreeing on following process descriptions	3.8	32.57
	Frequent evaluation of progress in process management initiatives	3.6	30.85
	Providing insight into the value chain	4.4	36.48

Strategic Alignment	Process Improvement Business Cases	4.0	33.16
	Process Management Goals in organisational mission, vision and strategy	4.0	33.16
	Patient Reported Outcome Measures (PROM)	3.8	31.50
	Accreditation Standards (NIAZ, JCI)	3.8	31.50
IT	Use of BI Tools / KPI dashboard	4.4	33.31
	Securing process models in a digital quality management system	4.4	33.31
	Connecting process descriptions with working procedures	4.0	30.28
	EHRs for supporting the primary process	4.0	30.28

Table 4 Capabilities included in the proposed BPM Maturity Model for hospitals

5 Conclusions & Discussion

Considering the results of the Delphi study, we clearly see the human-related factors jump out (People & Culture). Participants agreed that hospitals are very people-driven organisations. Involvement and commitment of management executives as well as primary personnel (healthcare professionals) is paramount to achieving continuous process improvement. We also notice the need for soft skills such as knowledge sharing and intrinsic motivation.

When including the results of the Governance and Strategic Alignment factors, we notice that participants indicate a necessary shift towards process-based thinking. Traditionally, departments within hospitals are functionally divided. The results show that responsibilities must shift towards the process level in order to properly manage processes. Many of the hospitals included in the panel are taking steps to define the value of each activity in the process and thereby gaining insight into their value chain. This requires organisations to clearly define what exactly constitutes value for the patient.

The final two factors, IT and Methods, were rated relatively lowly. Participants agreed that these factors are supporting in nature, and should 'follow' the measures taken on other levels. Due to differing organisational characteristics, it is not possible to clearly rank a specific method or type of information technology as being the most suitable. This explains the relatively low ratings in these factors. We conclude that hospitals must select IT and Methods that best serve their strategic needs for process improvement as well as fit their organisational characteristics. In the IT factor, there was more consensus in regards to the use of business intelligence tools and electronic health records (EHRs). However, in the Methods factor, there was no sufficient consensus since Methods are deemed very situational. For this reason, the included capabilities no longer include the Methods factor and are therefore method-agnostic.

A possible limitation of this study is its limited sample size in a very specific domain. All participants came from institutions located in The Netherlands. Political, economic or demographic variables may influence the healthcare processes in other nations differently. In future research, we intend to generalise the model by testing its validity in other markets. Another caveat is the fact that the hospitals included in this study exhibit averagely developed BPM capabilities (maturity level 2 or 3). This may skew the findings towards capabilities most relevant for this level of maturity, as we have no data on hospitals with higher maturity levels. Through broader application of the model in Dutch and international markets, in institutions with different levels of maturity, we will attempt to gain a deeper understanding of the capabilities and how their maturity is improved.

Opportunities for future research include further development of the maturity model using the identified capabilities. This will require the establishment of maturity levels or stages against which an organisation can be measured. Furthermore, the actual measurement instrument must be developed and tested prior to deployment in the domain. Currently, the identified capabilities are purely descriptive. It is not yet known which interventions will lead to a higher level of maturity for a specific capability. Further applying and developing the model may eventually lead to a prescriptive model, which does not only help to assess maturity but also supports improvement.

This research paper identified relevant capabilities for improving BPM Maturity. This was done using the Delphi method, so that consensus could be established among a panel of experts. By applying the Delphi method and clearly describing the process, we attempted to overcome the limitations of some earlier models. We also aimed to fill a gap by identifying hospital-specific capabilities that are not yet captured in existing BPM Maturity Models.

References

Becker, J., Knackstedt, R., & Pöppelbuß, J. (2009). Developing Maturity Models for IT Management. *Business & Information Systems Engineering*, *1*(3), 213–222. http://doi.org/10.1007/s12599-009-0044-5

Dalkey, N. C., Brown, B. B., & Cochan, S. (1969). *The Delphi Method: An Experimental Study of Group Opinion*. *The RAND Corporation*. Santa Monica. Retrieved from http://www.rand.org/pubs/research_memoranda/RM5888/

Day, J., & Bobeva, M. (2005). A generic toolkit for the successful management of delphi studies. *Electronic Journal of Business Research Methods*, *3*(2), 103–116.

De Bruin, T., Freeze, R., Kulkarni, U., & Rosemann, M. (2005). Understanding the main phases of developing a maturity assessment model. In *ACIS 2005 Proceedings* (p. Paper 109). Retrieved from http://eprints.qut.edu.au/25152/

Harmon, P. (2004). Evaluating an Organization's Business Process Maturity. *BPTrends*, *2*(3). Retrieved from http://www.bptrends.com/publicationfiles/03-04 NL Eval BP Maturity - Harmon.pdf

Helfert, M. (2009). Challenges of business processes management in healthcare. *Business*

Process Management Journal, *15*(6), 937–952. http://doi.org/10.1108/14637150911003793

Hsu, C., & Sandford, B. (2007). The delphi technique: making sense of consensus. *Practical Assessment, Research & Evaluation*, *12*(10), 1–8. http://doi.org/10.1016/S0169-2070(99)00018-7

Jaana, M., Tamim, H., Paré, G., & Teitelbaum, M. (2011). Key IT management issues in hospitals: Results of a Delphi study in Canada. *International Journal of Medical Informatics*, *80*(12), 828–840. http://doi.org/10.1016/j.ijmedinf.2011.07.004

Luyckx, F. (2010). Why does the healthcare industry has the lowest BPM maturity? Retrieved January 24, 2016, from http://www.ariscommunity.com/users/frlu/2010-05-23-why-does-healthcare-industry-has-lowest-bpm-maturity

Luyckx, F. (2012). *Enterprise BPM Roadmap Assessment*.

Mans, R. S., Schonenberg, M. H., Song, M., van der Aalst, W. M. P., & Bakker, P. J. M. (2009). Application of Process Mining in Healthcare – A Case Study in a Dutch Hospital. In A. Fred, J. Filipe, & H. Gamboa (Eds.), *Biomedical Engineering Systems and Technologies* (Vol. 25, pp. 425–438). Springer Berlin Heidelberg. http://doi.org/10.1007/978-3-540-92219-3_32

Mans, R. S., van der Aalst, W. M. P., Vanwersch, R. J. B., & Moleman, A. J. (2013). Process Mining in Healthcare: Data Challenges When Answering Frequently Posed Questions. In R. Lenz, S. Miksch, M. Peleg, M. Reichert, D. Riaño, & A. ten Teije (Eds.), *Process Support and Knowledge Representation in Health Care* (pp. 140–153). Springer Berlin Heidelberg. http://doi.org/10.1007/978-3-642-36438-9_10

McCormack, K., Willems, J., Van Den Bergh, J., Deschoolmeester, D., Willaert, P., Štemberger, M. I., … Vlahovic, N. (2009). A global investigation of key turning points in business process maturity. *Business Process Management Journal*. http://doi.org/10.1108/14637150910987946

Øvretveit, J. (2000). Total quality management in European healthcare. *International Journal of Health Care Quality Assurance*, *13*(2), 74–80. http://doi.org/10.1108/09526860010319523

Paré, G., & Sicotte, C. (2001). Information technology sophistication in health care: An instrument validation study among Canadian hospitals. *International Journal of Medical Informatics*, *63*, 205–223. http://doi.org/10.1016/S1386-5056(01)00178-2

Pöppelbuß, J., & Röglinger, M. (2011). What makes a useful maturity model? A framework of general design principles for maturity models and its demonstration in business process management. In *ECIS 2011 Proceedings* (p. Paper28). Retrieved from http://www.fim-rc.de/Paperbibliothek/Veroeffentlicht/327/wi-327.pdf

Ravesteyn, P., Zoet, M., Spekschoor, J., & Loggen, R. (2012). Is There Dependence between Process Maturity and Process Performance? *Communications of the IIMA*, *12*(2), 65–80. Retrieved from http://www.questia.com/library/journal/1G1-335189055/is-there-dependence-between-process-maturity-and-process

Rosemann, M., & De Bruin, T. (2004). A Model for Business Process Management Maturity. In *ACIS 2004 Proceedings* (p. Paper 6). Retrieved from http://aisel.aisnet.org/acis2004/6

Rosemann, M., & De Bruin, T. (2005a). Application of a Holistic Model for Determining BPM Maturity. *BPTrends*, (February), 1–21.

Rosemann, M., & De Bruin, T. (2005b). Towards a business process management maturity model. In *ECIS 2005 Proceedings* (p. Paper 37). Retrieved from http://eprints.qut.edu.au/25194/

Rosemann, M., & Vom Brocke, J. (2010). The six core elements of business process management. In J. vom Brocke & M. Rosemann (Eds.), *Handbook on Business Process Management 1* (pp. 107–122). Springer-Verlag. http://doi.org/10.1007/978-3-642-00416-2

Weske, M. (2012). *Business Process Management: Concepts, Languages, Architectures* (2nd ed.). Berlin, Heidelberg: Springer Berlin Heidelberg. http://doi.org/10.1007/978-3-642-28616-2

Yousuf, M. I. (2007). Using experts' opinions through Delphi technique. *Practical Assessment, Research & Evaluation*, *12*(4), Available online: http://pareonline.net/getvn.asp? http://doi.org/May 2007