

RESEARCH IN PROGRESS

## COMPARISON OF BPM MATURITY AND PERFORMANCE OF THE DUTCH DEPARTMENT OF DEFENCE WITH OTHER SECTORS

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**Abstract** This study investigates the Business Process Management (BPM) maturity and process performance of the Dutch Department of Defence (DDoD). Like any other organisation, defence departments use BPM to manage their daily business processes. Despite using BPM, the organisation has never undertaken the initiative to analyse its BPM Maturity level and process performance. This paper presents the first results of such a study and compares this to similar military organisations, non-profit organisations and other organisations in the private sector. The DDoD BPM Maturity index score of 2.66 is similar to that of peer organisations. The study provides some suggestions for research and practical implications for further Business Process Maturity development of the DDoD organisation.

**Keywords:**

business  
process  
management,  
BPM  
maturity,  
department of  
defence,  
process  
performance.

## 1 Introduction

The Dutch Department of Defence (DDoD) is an organisation that has used Business Process Management (BPM) for decades to manage business processes. Nevertheless, differences are seen in how various parts of the organisation implement BPM in practice. The DDoD has regular audits by the Netherlands Court of Audit (Auditdienst Rijk, 2020) and the Dutch Safety Board in case of severe safety breaches or incidents (OVV, 2017). Some of the reports of those audit agencies state that the DDoD has well-written and documented processes, rules and (safety) procedures. Nonetheless, there has been a breach of those because they were not followed thoroughly or monitored (Moen & Norman, 2009); the inquiries could not clarify why, when and how procedures or processes were ignored.

Based on the above, this paper's objective is to study the actual level of BPM Maturity and Performance of the DDoD. Therefore, the research question we pose is: **'how do the BPM Maturity and process performance of the Dutch Department of Defence compare to similar organisations and those from other sectors?'** . The remainder of this paper is structured as follows: in the next chapter, we discuss the literature on the concept of Business Process Management (BPM) in the context of our study, followed by the research method in chapter 3. Chapter 4 continues with the results, and the paper concludes with Conclusions, implications, limitations and further research in Chapter 5.

## 2 Theoretical Background

We adopted the integrated BPM model from Ravesteyn et al. (2012) for this research. This model has been validated and used for analysing the BPM Maturity of various Dutch organisations (Ongena & Ravesteyn, 2020). The data collected by the application of this model provides us with the unique opportunity to compare with a broad range of organisations that were analysed for multiple years (Exalto-Sijbrands, Maris, & Ravesteyn, 2016; Janssen, Nendels, Smit, & Ravesteyn, 2015; Ravesteyn et al., 2012). The questionnaire of this BPM model covers topics such as the level of awareness there is regarding BPM within the organisation; how processes are measured and managed; what level of knowledge and resources is available to initiate BPM projects; the use of technology in BPM projects; the overall maturity of BPM; and the performance of the organisational processes.

## **2.1 Business process management maturity**

Prior research shows that BPM Maturity Models help to improve process performance (Davenport & Short, 1990; de Bruin, Rosemann, Freeze, & Kulkarni, 2005; Fisher, 2004). The BPM community agrees that any activity to achieve BPM Maturity improvement benefits process performance (Ravesteijn & et al., 2012). However, opinions differ on the capabilities that need to be developed to improve process performance and achieve a higher BPM Maturity and which contextual factors are involved (Ravesteijn & Batenburg, 2010; Schmiedel, Recker, & vom Brocke, 2020). Furthermore, there is disagreement on how process performance should be measured (Ravesteijn et al., 2012) and on the optimal BPM, Maturity model to measure the maturity of managing business processes (Niehaves, Plattfaut, & Becker, 2013; Niehaves et al., 2013).

## **2.2 BPM within the public sector**

Santana et al. (2011) see a difference between public and private organisations in the adoption, application and motivation of the implementation of BPM. One possible explanation is that public organisations are not profit-oriented. Furthermore, these organisations have to deal with an outdated IT landscape and a rigid bureaucracy (Syed et al., 2018). In contrast to public institutions, private organisations strive for cost efficiency. Value creation and meeting customer needs are central to them. Most governments rarely benchmark their process performance. Nor are they known as early adopters of new technologies and methodologies such as BPM because (continuous) innovation does not always have their highest priority. Politics and regulations often determine their change agenda. The lack of attention by governments for BPM is confirmed by Syed et al. (2018) and Niehaves et al. (2013), who did not find many studies on BPM initiatives in the public sector.

## **2.3 BPM within hierarchical organisations**

From BPM in the public sector, we move to BPM in hierarchical organisations like defence organisations. De Waal et al. (2017a) analysed the BPM Maturity and process performance of the Peruvian Air Force (PAF). The PAF changed from a functional business-driven organisation to a business process-oriented organisation. In 2014, senior leaders started this transition. Two years after the start, De Waal et

al. determined that the developments and the results were not significant and lagged behind the project goals.

Another project that showed a long project duration due to delay was the implementation of BPM at the German Department of Defence. Together with implementing an Enterprise Resource Planning (ERP), that project took ten years (Stein, 2011). It was partly due to the rigid hierarchical structure of the organisation. A further example of a slow BPM project is the Spanish Navy, where implementation took fourteen years (Escrigas Rodríguez, 2011). These change trajectories in both countries were accompanied by exceptionally long lead times. This was because of the rigid command structure and aversion to change.

## 2.4 Conceptual model

BPM Maturity Models are used to measure the BPM Maturity. The BPM Maturity Model chosen for this study measures maturity based on seven dimensions (Process awareness, Process description, Process measurement, Process management, Process improvement, Process resources and knowledge, and IT applications). The dimensions of the BPM Maturity construct are based on the Capability Maturity Model Integrated (CMM Development Team, 2010) and elements from various studies (de Bruin, Rosemann, Freeze, & Kulkarni, 2005; Rosemann, de Bruin, & Hueffner, 2004).

The meaning and number of associated questions per dimension are explained in Table 1.

The other main component, process performance, is shown in Table 2 and consists of 12 variables (Cost, Traceability, Efficiency, Lead Time, Customer Focus, Continuous Improvement, Quality, Measurability, Employee Satisfaction, Competitive Advantage, Flexibility, Understandability). The process performance dimensions are derived from studies conducted by Hüffner (2004) and van Rudden (2007).

Table 1: Description BPM Maturity dimensions. Source: Ravestejn et al. (2012)

Dimension	Description	No. of Items
Process awareness	Management realizes the importance of a process oriented organization and includes this in its strategy	4
Process description	Processes and related information within the organization are identified and captured in process descriptions	6
Measurement of processes	A system to measure and control processes is in place in order to be able to improve processes	5
Management of processes	Process owners are assigned within the organization whom are "horizontally" responsible for managing processes	5
Process improvement	The organization strives to continually improve processes and there is a system in place to enable this.	6
Process resources and knowledge	The organization has adequate resources (such as people with process knowledge) to create a "culture of process orientation"	4
Information Technology	The organization uses IT to design, simulate and execute processes, and to provide real-time measurement information (key performance indicators)	7

Table 2: Process performance characteristics. Source Ravestejn et al. (2012)

Process Performance Characteristic	Statement
Costs	The processes within the organization are executed against acceptable costs
Traceability	Processes within the organization are easily traceable (thus transparent)
Efficiency	Processes within the organization are efficient
Lead-time	The processes within the organization have an acceptable lead-time
Customer focus	Processes within the organization are customer centric
Continuous improvement	The processes within the organization are continuously being improved
Quality	The results delivered by processes within the organization are of good quality
Measurability	Processes within the organization are easily measurable
Employee satisfaction	Processes within the organization contribute to the employee satisfaction
Competitive advantage	The processes within the organization give our organization a competitive advantage
Flexibility	Processes within the organization can easily be changed
Comprehensibility	Processes within the organization can be understood by everybody

Measuring BPM Maturity and process performance helps us assess whether improving maturity positively impacts process performance. Maturity is indexed based on the same levels as the CMMI model: 1 – Initial; 2 – Managed; 3 – Defined; 4 – Quantitatively Managed; 5 – Optimising. The meaning of each level is explained in Table 3.

Table 3: CMMI levels. Source: Poulin (2003)

Level	Characteristics
1. Initial	The process is informal and largely improvised, and performance is unpredictable.
2. Managed	A process is defined within the scope of each undertaking (e.g. task, work package, enhancement, project). Focus is placed on stabilizing the approach used to carry out the work associated with each individual undertaking. This approach may substantially differ for each undertaking, even within a given category, and this is acceptable at maturity level 2.
3. Defined	An organizational process is in place and consequently, the emphasis is directed at defining such a process from the best practices implemented in connection with past and current undertakings. The resulting process is then adapted to the needs of each new undertaking. Maturity level 3 also stresses the establishment and use of a repository in connection with future work, in which the data gathered as part of performing the work is consolidated.
4. Quantitatively Managed	The process defined at maturity level 3 is instrumented, quantified and characterized statistically, and the focus is placed on controlling the process outputs with respect to statistical parameters. When enough information has been gathered on the process, its outputs can be monitored in order to determine whether or not they are under control, in the sense that the measurements that characterize them fall within the allocated ranges for the categories of undertakings in the organization.
5. Optimizing	The quantitative data is used to improve the process by tightening the control parameters established at maturity level 4, in order to improve productivity and reduce costs. The causes of random variations observed with collected measurements are investigated in order to determine if they can be removed or reduced, which would result in a more accurate planning, more efficient execution, better products and a more capable process. Continuous improvement becomes a way of life in order to satisfy the business objectives of the organization.

As shown in Figure 1 on the next page, the multidimensional conceptual model comprises two main components: BPM Maturity and Process Performance (process performance).

The research question aims at comparing the situation at DDoD with other organisations. The quantitative part of the study focuses on surveying the BPM Maturity and process performance. The qualitative part (interviews) of our study complemented this approach.

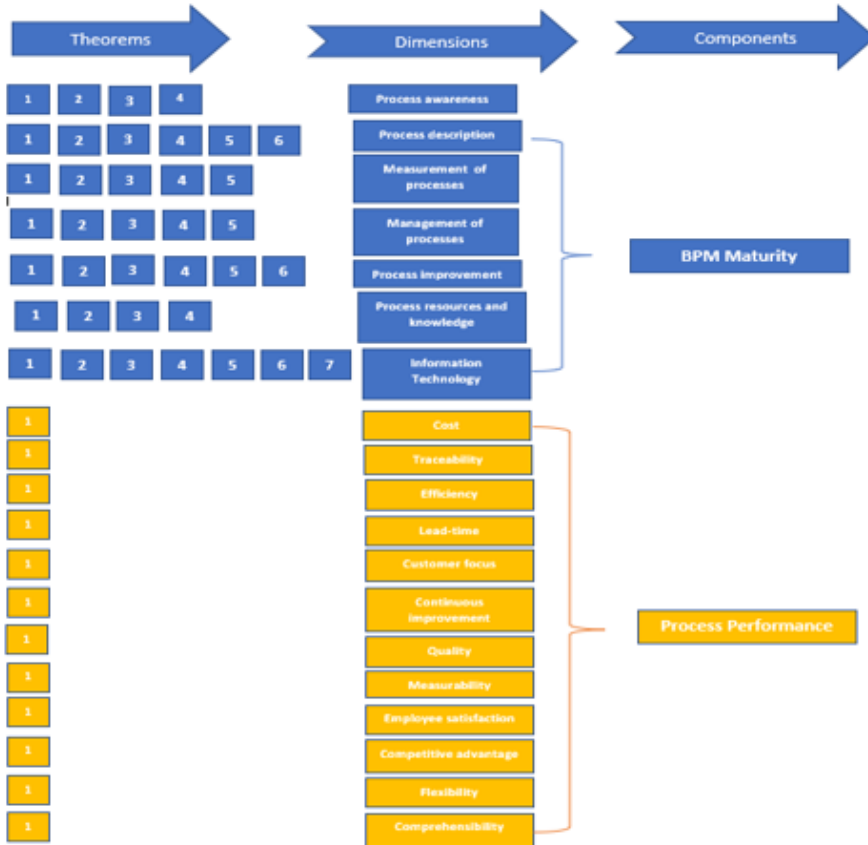


Figure 1: Conceptual Model

### 3 Research Method

#### 3.1 Data collection

We sent out the survey to selected personnel of the DDoD. Respondents were selected based on their roles in business processes such as IT, Purchasing, Operational Management, and Material Logistics. We used a validated questionnaire used in earlier studies using the same BPM Maturity model (De Waal, Maris, & Ravesteijn, 2017b; Ravesteijn et al., 2012).

The survey contained 49 questions on the main concepts, 37 questions are related to the seven dimensions to measure the level of BPM maturity, and 12 questions addressed the process performance. A Likert scale from 1 to 5 was used for each statement to indicate whether the participants strongly disagreed, strongly agreed, or stayed neutral. In addition, we asked three general questions about how knowledgeable the participants were about BPM. A total of 290 respondents started to fill in the survey, 135 of whom finished, giving a response rate of 16%.

From the Cronbachs alpha values between .803 and .932, all higher than .7 (Twigg, 2010, p.673), we can derive a high internal consistency of the BPM Maturity and process performance dimensions (see Table 4). The overall Cronbach's alpha of the BPM Maturity model is .929 (seven items;  $\alpha = .929$ ).

**Table 4: Reliability of BPM Maturity and Process Performance Scales (N = 135)**

Construct/ Dimension	Number of items	N	Cronbachs alfa	Cronbach's alpha if Items Deleted
<b>BPM Maturity</b>	<b>7</b>	135	.929	.937
Process Awareness	4	135	.803	.950
Process Description	6	135	.922	.944
Process Measurement	5	135	.895	.943
Process Control	5	135	.885	.940
Process Improvement	6	135	.897	.943
Process Resources	4	135	.831	.945
Process IT Tools	7	135	.914	.954
<b>Process Performance</b>	<b>12</b>	135	.932	.947

To validate the construct validity of the measurement of BPM Maturity, we carried out a Principal Component Analysis (PCA) which resulted in a factor solution with a value of 4.935—accounting for 70.50% of the explained variance. The Cronbach's alpha of .929 confirmed the reliability of the scale. Similarly, a PCA was performed to measure the validated process performance. This resulted in a one-factor solution with an eigenvalue of 6.950, accounting for 57.914% of the explained variance. The reliability of this scale is confirmed with a Cronbachs alpha .932.



To better understand the data collected from the survey, we shared the findings from the survey data with a group of respondents familiar with BPM activities at DDoD. In total, seven people were interviewed. The interviews were summarised and analysed. We also collected secondary data for analysis. The main goal was to gather more information and data on the BPM initiatives, capabilities improvement plans and projects that the DDoD undertakes to improve the BPM Maturity and process performance.

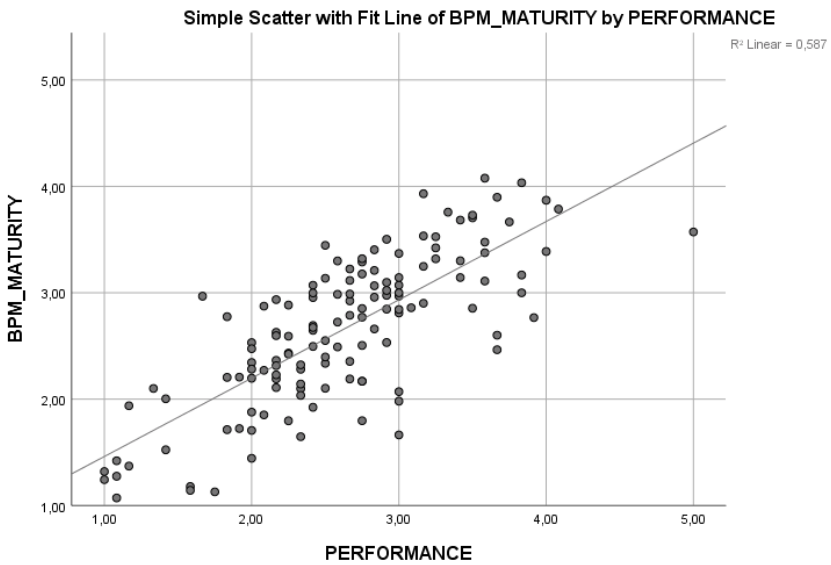
## **4 Results**

Previous studies have shown a relationship between process maturity and the process performance of an organisation (De Waal et al., 2017b; Ravesteijn et al., 2012; Ongena and Ravesteijn, 2019). This relationship was investigated using a single Pearson correlation analysis. The results of this analysis are presented in Table 5. Figure 2 illustrates that the BPM Maturity relates to Process Performance. The correlation coefficient (R) is positive (+1) and amounts to .766. The adjusted coefficient R<sup>2</sup> is .587. This means that: there is a positive relationship between BPM Maturity and process performance; BPM Maturity explains 59% of the variance in process performance. There is a strong correlation between BPM Maturity and process performance because the correlation coefficient is greater than 0.5. The regression with process performance as dependent variable and BPM Maturity as explanatory variable is significant:  $F(1,133) = 188,839$ ,  $p < .001$ . The regression coefficient of BPM Maturity is .797 and significant ( $t(133) = 13,742$ ;  $p < .001$ ). However, when looking at the multiple regression, the adjusted R<sup>2</sup> is .616. The individual BPM Maturity components explain 62% of the process performance. Finally, analysing the separate dimensions shows that Process Resources & Knowledge (.731) and Process Improvement (.723) have strong correlations to Process Performance. Regarding the Process Resources & Knowledge dimension, these findings support earlier studies that found this dimension paramount in improving process performance (De Waal et al., 2017b; Ongena and Ravesteijn, 2019).

**Table 5: Correlation between BPM Maturity dimensions and Process performance**

	Process Performance	Process Awareness	Process Description	Process Measurement	Process Control	Process Improvement	Process Resources	Process IT Tools	BPM Maturity
Process Performance	1.000	.599**	.661**	.650**	.672**	.723**	.731**	.460**	.766**
Process Awareness	.599**	1.000	.582**	.570**	.631**	.586**	.598**	.469**	.747**
Process Description	.661**	.582**	1.000	.806**	.768**	.735**	.654**	.504**	.866**
Process Measurement	.650**	.570**	.806**	1.000	.830**	.732**	.630**	.581**	.883**
Process Control	.672**	.631**	.768**	.830**	1.000	.797**	.735**	.630**	.923**
Process Improvement	.723**	.586**	.735**	.732**	.797**	1.000	.746**	.527**	.877**
Process Resources	.731**	.598**	.654**	.630**	.735**	.746**	1.000	.535**	.833**
Process IT Tools	.460**	.469**	.504**	.581**	.630**	.527**	.535**	1.000	.725**
BPM Maturity	.766**	.747**	.866**	.883**	.923**	.877**	.833**	.725**	1.000

\*\* Correlation is significant at the 0,01 level (2-tailed).



**Figure 2: Correlation between BPM Maturity and Process performance in scree plot**

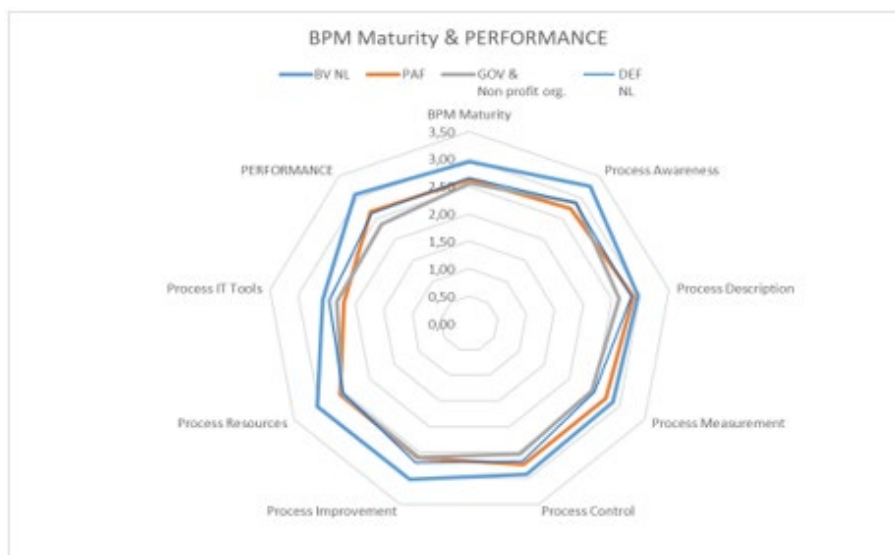
#### 4.2 BPM Maturity and Performance of the DDoD

To determine the BPM Maturity and process performance of the DDoD, only fully completed surveys (N = 135) were included.

Based on the survey analysis, the BPM Maturity index of DDoD is 2.66, and the process performance is 2.62 on a scale of 1 to 5. We calculated the average of the components of the BPM Maturity and process performance of the DDoD and compared these with data from other studies (Ongena and Ravesteyn, 2020).

We divided that data into four groups, namely, the private sector (BV NL), the Peruvian Air Force (PAF), (local and federal) governments and Non-profit organisations (GOV & Nonprofit), and the DDoD (DEF NL). These four groups we plotted in a spiderweb diagram (figure 3).

The benchmark shows that the BPM Maturity of the DDoD (DEF), the Peruvian Air Force (PAF) and of other governments (GOV & Non-Profit) are close to each other, i.e., at level 2, Managed. The private sector (BV NL) scores higher with level 3 which means many organisations have reached the Defined level of maturity.



**Figure 3: Spiderweb diagram benchmark.**

Benchmarking and ranking based on the BPM Maturity of all groups provide the following order: the first place is for the Private sector (BV-NL) with a Maturity of 2.95, the highest maturity of all. This score indicates level 3, Defined;

the second place is DDoD (DEF) with a Maturity of 2.66; the third place goes to the PAF with a Maturity of 2.63; the fourth place is for GOV & Non-Profit with a Maturity of 2.56.

After ranking the BPM Maturity of the groups, we compared and ranked the performance of all the groups. The ranking went as follows: the first place goes to the private companies with the highest score for process performance and an average of 3.08. This score is a level 3 (Defined); the second place goes to the PAF with a process performance of 2.66; the third place is for DDoD with a process performance of 2.62; the fourth place is for GOV & Non-Profit with a process performance of 2.37.

To get further insights into the outcomes of our study at DDoD, interviews were conducted. We found that all interviewees agreed that DDoD has the capabilities related to BPM Maturity level 1 (Initial). Many initiatives and improvement plans are underway independently at different levels and places within the organisation but are not coordinated top-down. BPM does not receive the same attention and seriousness as, for example, finance and purchasing, which are considered much more important.

BPM seems to be less prestigious; many see BPM as a 'necessary evil' because the DDoD rigidly handles processes. The DDoD organisation is more concerned with the judgment and recommendations of internal or external auditors and certification bodies rather than internal BPM Maturity development initiatives, an internal IT auditor stated. BPM improvement attempts are made at various places in the DDoD organisation, but they are not centrally managed and therefore are not attuned to each other. The interviewees have little faith that the BPM Maturity will ever develop beyond level 2. Some even questioned the current BPM Maturity at level 2 (Managed) derived from the quantitative study.

Secondary data collected from the DDoD intranet and databases showed that many initiatives and improvement processes are underway parallel, both decentral at the defence units and central at the defence staff. The DDoD has a vision of managing the organisation based on BPM. However, this vision is described on the strategy level and still requires translation to the practice of tactical and operational levels. Most (improvement) initiatives are initiated locally by the subdivisions without

direction or guidance from the central defence staff, corroborating the findings from the interviews. One subdivision has set up its own Process Management board. Finally, there is no complete big picture of all initiatives and BPM projects initiated at the DDoD to improve BPM Maturity.

## **5 Conclusions, implications, limitations and further research**

This study aimed to determine the BPM Maturity and Performance of the DDoD and where it stands when it is benchmarked with similar organisations and the private sector. Except for the group of private companies (BV NL) with a BPM Maturity leaning towards level 3 (Defined), all other organisations, sectors and groups from this study have a BPM Maturity ranging between 2.56 and 2.66.

With a BPM Maturity score of 2.66 (level 2 = Managed), the Dutch Department of Defence has a ranking not much deviating from other governmental and non-profit groups studies in The Netherlands and beyond. The index score is almost similar to another defence organisation, the Peruvian Airforce, analysed by De Waal et al. (2017a).

The practical contribution of this study is that it has provided the Dutch Department of Defence (DDoD) with the first measurement of its BPM Maturity and comparison with other organisations. The DDoD can assess their BPM Maturity development strategy informed by actual data and measurements. Furthermore, we found that public and non-profit organisations consistently score lower than private (commercial) organisations. As Santana et al. (2011) and Syed et al. (2018) already showed, there are many reasons why these types of organisations are different. Still, these organisations should look at the best practices provided by private organisations to learn how to improve their BPM capabilities to increase process performance.

We have attempted to analyse the BPM maturity of a hierarchical organisation with this study. We did not select the BPM Maturity and process performance at a process level., but analysed the BPM Maturity on an organisational (department) level. The current research design looks at the maturity of all business processes. In maturity and process performance, some business processes may be far ahead of others.

This study contributes to the knowledge of BPM maturity and Process performance benchmarking of hierarchal organisations. Additional surveys with a stratified selection of respondents from various subdivisions could improve the picture on a process level rather than an organisational level. Specifically, measurement of the BPM Maturity of critical processes (at process level), equipment management process, purchasing, and maintenance are insightful and of practical contribution.

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