Business Process Management in German Institutions of Higher Education: The Case of Jade University of Applied Science

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Abstract

(a) **Situation faced**: Faced with challenges like heterogeneous processes across three campuses, a campus management system that was not up to date, and loss of knowledge because of demographic changes and undocumented, inconsistent processes, Jade University of Applied Science implemented a campus-management system developed by HIS. This system includes an integrated reference model for processes that are related to campus management. The university wanted to use common standards and needed a guide based on best practices. Implementing business process management (BPM) provides an opportunity to document, standardize, and centralize processes across their campus locations.

(b) **Action taken**: Implementation of the campus management system and reference processes was structured in steps that can be described using a BPM lifecycle model: (I) initialization, (II) process identification, (III) process discovery, (IV) process analysis, (V) process redesign, (VI) process implementation, and (VII) process monitoring. Each of these steps is directly related to using the HISinOne reference model to obtain recommendations based on best practices.

(c) **Results achieved**: Both expected and unexpected results were obtained from implementing the campus management system: (I) the standardization of processes across three campus locations was improved

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by (II) adopting best practices, and internal workshops to standardize processes (III) strengthened Jade University's overall team spirit. In general, (IV) individual barriers to using process models and process documentation were reduced, and a BPM-supportive culture was developed such that some departments have begun to document other processes and to consider the implementation of a broader BPM department.

(d) **Lessons learned**: Five primary lessons were learned during the project: (I) orienting to existing solutions like process reference models supports the initialization of new projects, and (II) standardization limits the involved stakeholders' creativity. In addition, (III) guidelines for consistently documenting the implementation's progress are important to easily provide relevant information to all stakeholders at all times, (IV) integrating relevant stakeholders into the process enables the standards across different locations to be determined, and (V) limited project resources must be taken into account in order to plan suitable and feasible actions.

1 Introduction

Business Process Management (BPM) is increasingly used to improve companies' operations (e.g., Malinova and Mendling 2015), but constantly increasing competitiveness has led to its becoming more important in fields like education. Process-oriented information systems could be implemented to facilitate the efficient management of such institutions' resources (Bob-Jones et al. 2008). Information systems (IS), such as campus management systems, can illustrate students' entire educational lifecycle, from application to ex-matriculation (Sprenger et al. 2010). A study in campus management indicates that about 50% of the involved institutions see implementing a campus management system as not just an IT project but as a project for the entire organizational structure (Ernst & Young 2012). Hence, the aim of this case study is to report *how BPM and IS are used in the education sector*, specifically at Jade University of Applied Science.

Because of challenges related to such issues as being competitive, protecting knowledge, standardizing work operations, and being sufficiently digital and modern for students, Jade University needed a campus management system that would support *documenting and standardizing processes across three campus locations. The system in use was out of date, and the provider would soon stop supporting it*.

Because campus structures are complex and Jade had no documentation of its processes, the determination of relevant processes for implementing a campus IS was to be based on best practices. HISinOne is an established campus management system that provides preconfigured process-oriented settings based on a process reference model. The system is used by about 50 German universities (HISinOne 2016). Reference models, which (usually) describe the best practices in a specific domain, can be

reused and adapted to other contexts (e.g., vom Brocke 2007; Fettke and Loos 2003; Rosemann and van der Aalst 2007). They also provide benefits like efficiency and effectiveness in respect to costs, time, quality, and risks (Becker et al. 2007).

Implementing a new campus management system was the institution's biggest (IT) project and the first that related to BPM. Several departments, including the centralized IT department, were involved, and a project team was created. A professional project management were established that consisted of two employees to manage the project and two other employees to execute the daily work.

The next section uses the BPM context framework (vom Brocke et al. 2015) to provide details about the situation Jade University and its project management team faced. Then Sect. 3 describes the actions taken by adapting Dumas et al.'s (2013) life cycle model. Finally, based on the archived results (Sect. 4), we outline the lessons learned from the project (Sect. 5).

2 Situation Faced

Based on challenges like an obsolete campus management system, heterogeneous processes across three campus locations, loss of knowledge because of demographic changes, and the need for digitalized and documented processes, Jade University decided to implement HISinOne and the integrated software reference model. Jade wanted to use common standards and needed a guide based on best practices and saw the implementation of the system and a BPM as an opportunity to document and standardize its processes.

We describe the characteristics of our case first because one critical principle for successful BPM is context awareness (vom Brocke et al. 2014). In describing them, we use the *BPM Context Framework*, which presents the contextual factors of a BPM project (vom Brocke et al. 2015). Our assessments in defining these factors are based on our own project experiences, interviews with experts (particularly the head of BPM at Jade University), analysis of documents, and analysis of conceptual project papers (Table 1).

Goal-Dimension Jade University sought to *improve* aspects of its processes, such as (a) managing and protecting internal knowledge, (b) standardizing processes across all campus locations, and (c) orienting to the best practices relating to campus management (system) processes.

Jade wanted to focus on *(a) managing current knowledge to ensure that future generations have access to that knowledge*, particularly because of demographic changes. In addition, Jade wanted to make the knowledge more transparent and accessible to all employees and campus locations. Hence, one of the essential objectives was *(b) standardizing these processes* across all locations and departments, for which Jade needed a consistent BPM. Moreover, Jade wanted the implemented standards to be based on *(c) best practices and recommendations* for using a campus management system. Initially, Jade focused on implementing processes that were related to campus management because of limited project

Table 1 Contextual factors (vom Brocke et al. 2015)

Dimension	*Characteristic*	*Characteristic value*		
Goal	Focus	Exploitation (Improvement, Compliance)		Exploration (Innovation)
Process	Knowledge-intensity	Low	Medium	High
	Creativity	Low	Medium	High
	Interdependence	Low	Medium	High
	Variability	Low	Medium	High
Organization	Scope	Intra		Inter
	Industry	Product	Service	Product & Service
	Size	Start-up	Small/Medium	Large
	Culture	Highly supportive of BPM	Medium supportive of BPM	Non-supportive of BPM
	Resources	Low	Medium	High
Environment	Competitiveness	Low	Medium	High
	Uncertainty	Low	Medium	High

Note: Gray cells represent the results of our case study

resources, so the focus on goals like optimizing processes and developing actions for the organizational structure were also limited.

Furthermore, Jade's employees expected *(d) full documented guidance* on how they should do their work. There were no goals related to monitoring archives, measurements, or controlling, such as analyzing times and costs.

Overall, Jade intended to implement processes and preconfigured settings in the standard software using the HISinOne recommendations to reduce the project delays that often accompany the development of new tasks.

Process Dimension In general, universities like Jade University that have multiple campus locations have heterogeneous types of processes that are not distinctly assignable to a specific characteristic value. For example, the *knowledge intensity* of the processes considered varies widely. Most of the processes are complex, requiring training for up to 2 years because understanding and executing these processes requires knowledge. There are also some simple processes (e.g., administrative work) that are not difficult to understand and execute.

The level of processes' *creativity* ranges widely. Simple processes like stamping letters go side by side with processes of medium difficulty (e.g., managing applications) and highly creative work (e.g., building examination regulations and managing courses). Many of the processes in the campus management system are highly *interdependent*, with processes and flows linked to previous or subsequent processes, but starting and ending points are defined precisely and connectable via integrated interfaces. These processes' *variability*, however, is low because there

are usually only a few small changes in each process over time, except for some irregular legal terms.

Organization Dimension Jade University, established in 2009, has three campus locations, one each in Wilhelmshaven, Oldenburg, and Elsfeth (Germany). The *scope* of this BPM project embraces the processes that are related to campus management in each of the campus locations, as well as those that occur in all three locations. Implementing HISinOne (including the reference model) is the biggest (and first) project related to the field of BPM undertaken by this institution. Therefore, a project team was created and a professional project management was established.

Jade University is a *small to medium-sized* institution of higher education, with 500 employees and 180 professors across six faculties: architecture, civil engineering, engineering sciences, maritime management, business sciences, and management/information/technology. It offers 37 bachelor's degrees and eleven master's degrees and has about 8000 students (Jade University 2016).

The *industry/sector* can be defined as service because Jade offers educational services. Because of the importance of this implementation, Jade hired two employees to manage the project and two additional employees to execute the daily work. However, very limited *resources* were available, especially considering the complexity and the objective of the project.

At the beginning of the project, the limited expertise in BPM that was available was a risk factor (Rosemann and vom Brocke 2015). Most employees were open-minded and supportive of BPM, but there were some skeptics who were only moderately supportive. In general, the *culture* was characterized by employees who were highly and medium supportive of BPM. Some departments documented their processes in mixed and inconsistent forms, such as checklists, text, and sequence diagrams, and some employees did not even know what a flowchart is. Hence, one issue was to create acceptance, a BPM-supportive culture, and expertise.

Environment Dimension BPM is becoming important for Jade University because of the rising *competitiveness* that makes it essential that the university be up to date and interesting to applicants and researchers. The level of *uncertainty* in this sector is low.

3 Action Taken

BPM can be understood as all of the management tasks that are related to business processes. BPM-related tasks are often described as a lifecycle model that is based on general plan-do-check-act models (Malinova and Mendling 2015). Because of complex structures in campus management systems and processes, Jade University needed guidelines and references for how processes could be undertaken or executed. For this reason, they decided to get an orientation by using the HISinOne

reference model and the recommended HIS approach to how related processes can be implemented in universities.

The HIS approach to implementing processes is based on guidelines like BPM lifecycle models (e.g., Dumas et al. 2013), domain-specific requirements, and experiences. We use Dumas et al.'s (2013) framework for describing the steps taken in our case (Fig. 1) This framework has six main steps: *process identification*, *process discovery*, *process analysis*, *process redesign*, *process implementation*, and *monitoring/controlling*.

Our description adapts these steps and complements them by adding project-specific actions like *(a) initialization* and *(b) interdependency between process analysis and process redesign*. Jade University had to create an environment that allows BPM to be implemented, which included hiring professional staff. There was also a loop between analysis and redesign and some discussions and workshops regarding standardizing processes that did not lead to a result because of insufficient information or expertise. The project team had to reanalyze these cases in detail before the next step, redesign, could be taken.

Initialization A project team and project management were established to support implementing the campus management system and the BPM. These people sought to improve performance by, for example, educating all stakeholders (Rosemann and vom Brocke 2015) and creating a BPM-supportive culture. HIS also conducted an

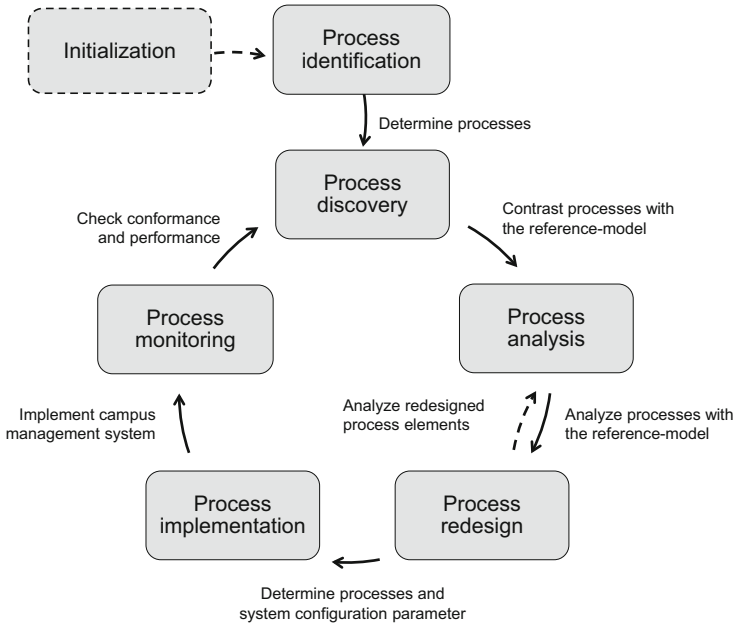

Fig. 1 Overview of action taken (Dumas et al. 2013). Note: *Dotted lines* and *boxes* represent additional steps and flows

initial workshop to determine how process management should be integrated into the university, and based on this workshop, HIS designed training concepts that were customized according to the requirements of the individual employees involved and the university's needs.

Process Identification Jade determined the processes that would be used based on the best practices of the education sector so it put a strong focus on the reference model's suggested flows. Therefore, the identification of processes was based on the HISinOne reference model, which offers models described in the Unified Modeling Language (UML) for all processes that can be supported by the HISinOne campus management system. The reference model is structured in five levels, each with its own perspectives and details (Fig. 2).

The structure follows the object-oriented BPM (OOBPM) approach (Oestereich 2003). In contrast to a holistic approach for major university processes (Petkovics et al. 2014), all levels are focused on campus management-related processes to cover the students' educational lifecycle. The process map (level I), which includes all campus management processes and is the starting point for the process identification, defines the modeling scope, such as application management, student management, or examination management. Level II uses UML use case diagrams, which are related to the elements of the process map. For each process area, the actors and their use cases are visualized so the process manager can identify relevant stakeholders. Level III structures the use cases into business processes, focusing on *what* has to be done to reach the process goals. Here, no executing actors are modeled because the sequence of actions is the focus. This level is often used to structure workshops and discussions. Each of the actions of the business process is described in detail by a workflow in level IV, which focuses on *how* the actions will be done and assigns the defined actors of the use case diagram to actions. According to the OOBPM, there is a link from workflow to system processes, so level V shows which actions the system can support (level V),

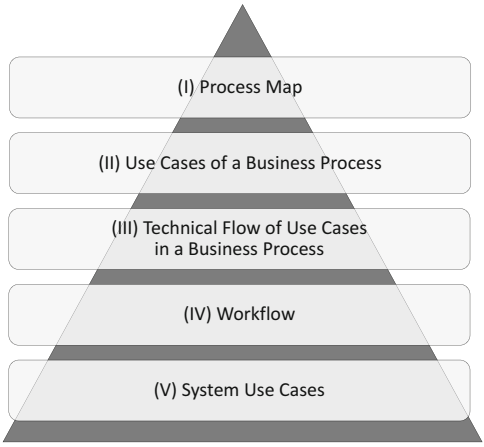

Fig. 2 Five levels of the HISinOne reference model (Bührig 2011)

based on which, workshops with specialists and relevant stakeholders of the university can be conducted. The stakeholders describe their daily work, and the processes link to the system configuration.

Process Discovery Derived from the determined objectives (Sect. 2) the project team had to define maximally efficient actions because resources were limited. In order to achieve the high standards that are related to best practices, the project team decided not to identify and document the current state of their own processes, so the discovery started without a current overview. Instead, the documentation of individual processes was done only in special cases that needed further analysis in order to be implemented.

The implementation of the software and the identification of processes occurred step by step analogous to HISinOne's software products. After defining each process area, the process management team determined the relevant processes based on the reference model and discussed relevant processes with accountable stakeholders in interviews and workshops. Some employees and departments already had a few rudimentary (flow) diagrams of or textual information about their workflows, although these tended to be heterogeneous and to focus on an individual employee's perspective. In order to create generalized processes for all three campus locations, all stakeholders involved discussed the processes and determined what they should be together.

Process Analysis The process analysis step is workshop-oriented. In these workshops, the Jade University's process manager discussed the reference processes with the relevant stakeholders, taking three primary questions into account: Do the processes map to our current operational sequences? What needs to be improved? What should be changed? As a result of the workshops, process models of the reference model were annotated with Jade's individualized requirements. Then these models were sent to the HIS specialists who prepare the redesign phase. Using the reference model, the process modelers began building models on existing, best practice processes. This work could not have been done by a process manager who was working on the project part-time. Another benefit of the workshops was that all relevant stakeholders were familiar with the reference processes.

Process Redesign The process modeler, relevant stakeholders, and HIS specialists determined in collaborative workshops how the processes should be executed. For example, one of these workshops dealt with all of a process's sub-workflows (level III). Based on sequential implementation, this step is repeated for each process area mentioned in level I. Thus, process-related questions had to be clarified.

In the next step the participants discussed relevant system processes using a live demonstration of the campus management system. If any deviations occurred, they handled them by (I) adopting the deviation into the configuration of the system and documenting all fixed and coordinated steps in an additional business concept. If this approach was not possible, (II) they verified whether existing work practices

could be changed to fit the reference model, with adjustments to the organizational structure if necessary. In such cases, extra workshops were conducted to define new processes across the three locations. Finally, (III) software requirements were defined to adjust the software according to the individual university process.

For example, Fig. 3 shows a schematic representation of designing processes based on the reference model for campus management, including the original reference process given by HISinOne and the adjusted (individual) process model. Because new actions and eliminated actions are highlighted, the reader can identify changes at a glance. The three types of adjustments to a process are changes in responsibilities and re-assignment of actors to existing actions, eliminating unnecessary actions, and adding new steps.

The results of the process redesign were documented. An essential part of this document is the definition of the adjusted process model. This document is revised by the responsible committees and represents the basis for the following process implementation.

Process Implementation The implementation was realized with configurations of the HISinOne system based on individual specifics of Jade University. No static

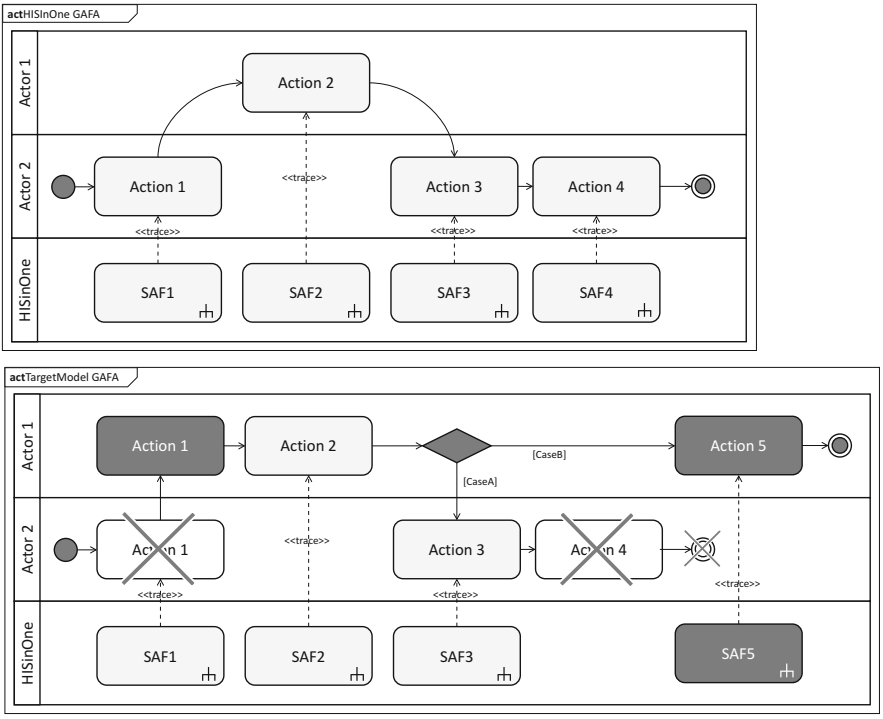

Fig. 3 Schematic representation of designing processes based on HISinOne. Note: *SAF* system use cases; *above* original reference model; *bottom* changed model; *dark gray* additional action; *light gray* reference action; *crossed* eliminated action

workflows were defined in order to allow for necessary flexibility in the daily work, so automatic adoption of the processes in the software was not possible. In fact, existing functions had to be configured, reports adapted, and the interface adjusted to allow for future executions of the processes. In the next step, the users were trained in using the software, and intensive quality management was carried out to test relevant software functions and the standardization of processes. If there were no further adjustments, the software went live and the processes were implemented.

Process Monitoring There was no explicit mechanism with which to measure, monitor, or control the project's performance, but the achievement of goals was rated using other methods. For example, the number of requests received in the student service center was analyzed, suggesting that new processes with more self-service functions reduced the number of requests. Moreover, regular feedback meetings with stakeholders were conducted to analyze the new processes and the use of the system. These meetings allowed the users to share experiences and issues, and some issues were considered in further steps of the implementation. Other issues served as starting points for the continued improvement. As part of the project, Jade established a department especially for BPM.

4 Results Achieved

Because there was no explicit mechanism with which to measure, monitor, or control the university's and its processes' performance, we focus on the qualitative statements of the experts involved. The initial objectives were related to knowledge management, standardization of processes across the campus locations, and application of best practices in campus management processes.

Ensuring Knowledge Management The first goal, ensuring knowledge management, can be rated as having been achieved. Jade University wanted to protect existing knowledge and to make it more transparent for the entire campus management and staff. At present, all processes that are relevant to the campus management system are documented, and a wide range of other knowledge across the campus locations is saved and accessible to the employees. Some departments have also started to describe their own processes in order to standardize them and make them more transparent to their colleagues.

Standardizing Processes The second issue was related to the standardization of processes across Jade's three campuses. This objective was definitely achieved, considerably improving the university's initial situation. Internal effects like consistent workflows and handling the campus IS have been positive, and external stakeholders have seen standardized applications for academic studies and applications for semesters on leave.

To show what kinds of improvements were achieved, we focus on the process for the application for a leave of absence as representative of the results. Before starting

the implementation of the new process, there was no standardized or explicitly described process. Jade used the HIS reference model to identify 17 actions. In workshops and discussions held to identify and analyze processes, Jade added six new, individual elements that related to, for example, the reregistration barrier and fees charged for a semester on leave. In these workshops with consultants, seven agreements were made and documented. Subsequent workshops were held to discuss processes across all three locations, and a standardized process was defined that is close to the one suggested in the reference model: Just two of the 17 actions were eliminated, and some comments were added that help to clarify individual requirements for specific actions. This example shows how the university adapted the processes of the reference model.

Adopting Best Practices for Higher Education This result overlaps with the third objective regarding achieving an orientation that is based on best practices for higher education. An essential result was achieved by the creation of an adapted process model for Jade's essential campus management processes. Furthermore, concepts for all software modules were created, and the process areas for application management and student administration were analyzed, redesigned, and implemented. The consequent use of the reference model and the discussion across the campus locations contributed to achieving this goal. In addition, the example of applying for a leave of absence shows how Jade adapted the processes of the reference model in order to obtain a standard that is closely related to the suggested best practice. Instead of changing many recommended actions, Jade changed only some organizational dimensions, such as mapping and relocating employees and operations.

Developing a BPM-Supportive Culture The acceptance of BPM was achieved, which has a strong impact on the success of a BPM project (e.g., Rosemann and vom Brocke 2015; Schmiedel et al. 2013). In general, barriers to using and dealing with process models were significantly reduced. The effects of the implementation as they related to the employees and users included greater acceptance of process models, which acceptance played an important role over time. Some departments began to document and standardize their own processes that were not related to the campus management system using the same approach. They started to "think in processes," and took the opportunity to save knowledge about their own and their colleagues' processes. However, four types of users were observed: (I) those who use process models voluntarily, and those who try to avoid process models because (II) they see no additional benefit in using them, (III) believe that they are already transparent in what they are doing, or (IV) fear that they will have a heavier workload because of the required documentation.

Improving Team Spirit According to Schmiedel et al. (2015), teamwork—particularly collaboration across functions—is an essential value that contributes to successful BPM. In our case, team spirit improved over time. Internal workshops and discussions to standardize processes across the campus locations strengthened

the entire university staff's team spirit. Despite the separate locations, the departments involved started to grow together and to be more unified; that is, they began to be "one university," rather than three locations of a university.

5 Lessons Learned

This project provided some lessons learned that affected Jade University, the project team, and the campus management system provider, HIS, related to editing documentation, conducting workshops and interviews for designing process standards, and (mainly) applying the software reference model HISinOne. We can conclude that Jade University would choose the same approach for similar situations, such as implementing software and other processes by considering a reference model, but five lessons in particular stood out.

Orient to Existing Solutions vs. Starting from Scratch The integrated software reference model HISinOne helps universities to navigate through processes in complex structures, such as campus management. Based on this navigation, the process management team can consider their own processes and compare them to what is suggested as the best practice. Before this project started, Jade University had only a few types of documentation of processes in the form of textual description or simple flowcharts, so it needed a guide to help it navigate through the process areas and single processes. Orientation to the reference model gave it such an opportunity. The employees involved analyzed their processes and continuously asked themselves how do other institutions do it, what has to be improved, and which of their own process elements should not be changed. Without the reference model, process management on this level with the available resources would not have been possible. The reference processes mostly fit with to the university's processes or could be adjusted, but some single actions in the workflow and some details were the subject of intensive discussion. Good moderators and different formats for the workshops and documentation would help to support these discussions.

Maintain Awareness About Tradeoffs in Standardizing vs. Allowing Total Creativity Regarding Process Management In addition to positive effects, there were also some negative aspects of using process reference models. Some employees developed creative ideas about how their work should be done during workshops and discussions when defining processes. The reference model opened their minds to new suggestions because they were thinking of what was possible. Unfortunately, these suggestions were often too big because the available resources (e.g., software and manpower) were limited. In addition, the university's complex structures had to be respected. Therefore, in some situations the standards limited the users' creativity, and there was a conflict between the pattern and the structure of the campus and the university management system and new ideas for how to design processes. Some of the participants recommended introducing the campus

management system before introducing the reference model to minimize this effect. Following this recommendation, the employees could start to determine process ideas based on the system instead of the reference model.

Develop Guidelines for Consistently Documenting vs. Omitting this Step to Speed the Project This lesson learned deals with the improvement of documentation during the project. For future projects, the project team recommended reserving more time for continuous documentation of relevant information, such as realized changes, ongoing discussions, and the status of implementation steps. Because of the tight schedule, the project team focused on the process area that would be implemented next instead of using time to reflect on the results in documentations. Ongoing changes in the process areas that were already implemented were not completely documented. Participants suggested establishing a process management team at Jade University that is independent and accountable for their work.

Develop Concepts for Bringing People Together vs. Implementing BPM Without All Stakeholders A challenge as well as a significant opportunity for implementing BPM was bringing all the employees and users involved together. This involvement was helpful in standardizing processes across the three campus locations, which standardizations were based on best practices at each location. Conducting comprehensive workshops and discussions also contributed to the team spirit. Despite the spatial separation, the participants began to unify based on the collective agreement related to their processes during workshops as well as the implemented standards, which allowed them to do their work in a consistent way. Both internal and external appearances of the processes implemented became consistent.

Consider Limited Resources vs. Unplanned Conducting of Activities Another important lesson was to consider the available resources for the project. Although some steps, such as bringing together all relevant stakeholders, are helpful in achieving objectives, limited resources must be considered. Hence, the process management team suggested care in selecting methods (e.g., interviews and workshops) for determining processes because they can be time-consuming and expensive.

Comparability of this Case We compared our results and lessons with existing cases in the education sector. For example, Bührig et al. (2014) investigated the deployment, application, and impact of BPM approaches in the context of a process-oriented implementation of a campus management IS by conducting interviews with 37 experts from 16 German institutes of higher education. The Jade case fits well into the results of the other study, which showed that the implementation of a process-oriented IS leads to the establishment of process management in the domain of higher education. The use of the BPM lifecycle and the limitation to the BPM in the context of smaller institutes of higher education

can be seen in the Jade case, making it comparable to other BPM projects in the field of higher education.

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