Utility vs. Efforts of Business Process Modeling

An Exploratory Survey in the Financial Sector

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1 Introduction

Process modeling and documentation is a way to capture the implicit process knowledge of an organization and document it explicitly in a (semi-)formal way. Models can be used e.g. as a basis for decisions on IT investments, reorganizations or the selection and implementation of information systems. They describe the logical sequence of activities in a business process, the resulting products, required resources and data, as well as organizational units (Lindsay et al. 2003).

Researchers have developed many modeling languages for the formal representation of business processes since the arrival of business information systems. Most of these models are based on concepts found in Petri nets, which can be seen as an ancestor. Some prominent offspring are the UML activity diagram, the Business Process Modeling Notation (BPMN) or event-driven process chains (EPC).

According to Hung (2006), business process management (BPM) as a field of study is still in its infancy although there is a vast amount of studies for its usage in various sectors and industries. An effect of the popularity of process orientation, which can be noted in organizational practice, is that high efforts are being spent on the creation of business process models for the documentation and analysis of business processes (Mendling et al. 2009).

Banking studies indicate that there is currently a high need for extensively analyzing business processes for multiple purposes, especially performance issues (Cocheo and Harris 2005, Papastathopoulou et al. 2001). Reasons for low performance of banks are long holding times of documents, a high diversity in processes, complex contract and product structures, as well as loops in processes. Various

media breaks and the administrative exposure of customer-oriented employees are further reasons for ineffectiveness (Rederer 2007). As a result, more than 70% of German banks intended to apply process modeling and reorganization in 2007 (Spath et al. 2007). This intention has become even more important due to the financial crisis.

Many banks aim at industrializing banking processes (Wilken et al. 2008). Hence, the need to model, document and analyze the process landscapes of banks is omnipresent. Analysis purposes in banks include the optimization of business processes, compliance of processes with legal rules, management of (operative) risks in the process landscape, human resource requirements planning according to necessary capacities and skills for executing processes and product costing according to the process-oriented allocation of costs (Becker et al. 2009b).

Although there are studies about the general usage of process models in banks (Drake et al. 2009) or the need for reorganization (Spath et al. 2008, Hess and Schuller 2005), there is hardly any empirical research on the efforts and utility of business process modeling in the financial sector. Hence, we present an exploratory survey that explores and interprets the state of the art and the utility and efforts of process modeling in banks.

2   Research design and data basis

Our study was designed as an exploratory survey to examine relationships between the efforts and utility of process modeling in the banking industry. The purpose is to become more familiar with a topic and to test preliminary concepts about it (Pinsonneault and Kraemer 1992). As such, we wanted to gain new information about the usage and use of process modeling in banks to generate a deeper understanding of the topic for further studies and modeling language developments.

Based on an intensive literature review in conjunction with several discussions with modeling and domain experts in the banking industry (both from BPM departments in banks as well as BPM consultancies), we came up with an initial set of questions. Basically, our questions were based on a general life cycle of business models (see figure 1, for further discussions cf. Becker et al. 2009). Within the survey, we addressed the steps of process documentation that created effort without significant utility creation, but also the steps that derived value from process models. Regarding efforts, the creation and validation of process models, as well as the updating of process models within the life cycle, do not create value by themselves, but cause much effort and hence costs. In contrary, the analysis of process models may cause value to a bank, because it enables a bank to identify problems in the organization and to improve its processes. As a consequence, process models will be adjusted and the new processes will be implemented in order to improve models and business processes. Furthermore, it is even possible to use process models without reorganizing processes. For instance, employees may use the models as a type of work documentation or as an operative handbook or even for

checking compliance of processes with law and internal regulations. Hence, we see the creational steps of modeling as the "effort only" part of business modeling and the analysis, improvement and application steps as the beneficial part of modeling. As a result, we wanted to gain a deeper understanding of the ratio of both sides of the medal. Our focus was on exploring the effort vs. utility ratio of process modeling initiatives.

After several pilot interviews with banking experts, we constructed a final online questionnaire, comprising 75 questions and also including fields for comments on almost all questions so that we could be sure that no answer possibilities were forgotten and possible misinterpretations could be reduced.
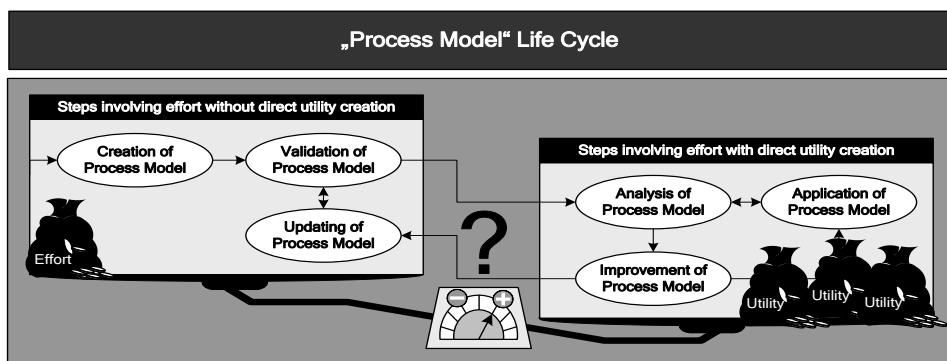

Figure 1: Life cycle of a process model

We implemented several paths through our web-based survey in order to not lose participants because of not suitable questions. On average, the answering of the questions took about 15 minutes. The study was conducted in July 2008. Since we had access to the complete database of a well-known international consulting company with a major focus on financial sector consulting and high quality customer profile data, we were able to invite all of their 1219 employee contacts in German banks, 655 in Austrian banks and 593 contacts in Swiss banks. Although our potential number of probands seemed quite large, it turned out that we only had a response rate of 4%. We assume that this was due to several reasons among which were: (a) we used e-mail invitations and not all e-mails could be delivered correctly and some employees were on vacation meanwhile, and (b) we could not filter the initial database in advance for employees with the necessary background knowledge on process modeling and activities concerning this in their banks. Nevertheless, 97 modeling experts from at least 74 small-, medium-sized and large banks covering all three countries participated in our online survey. In order to ensure, that these probands were experts in the field of business process modeling, we asked for their participation in actual modeling projects in their banks and also asked for feedback on their job positions and corresponding departments in the participating banks they represented.

As we wanted to analyze the efforts and utility of process modeling for banks we had to filter the 97 questionnaires to include only banks that have already done process modeling, leaving us with 72 questionnaires to study. In addition, some banks participated with multiple experts and some banks did not provide us with their institutional name. Since we wanted to analyze banks and not bank experts, we had to consolidate the 72 questionnaires to include only one instance of each bank. Two banks had participated with two experts and another two banks had participated with three experts. Therefore, ten questionnaires had to be consolidated to four questionnaires reducing our overall number of questionnaires to 66. Another six questionnaires from bank experts, which did not provide us with information on the institution they represented, had to be omitted from our study, since we could not be sure that they were not already represented by at least one other expert questionnaire. Overall, 60 consolidated questionnaires from 60 banks for our exploratory analysis remained.

3   Data collection and presentation

3.1 Data collection

To measure the two dimensions effort and utility of business process modeling in banks, we filtered 18 constructs from our set of 75 questions, which we could directly map to either effort or utility phases, as presented in our process model life cycle model (see figure 1). Ten of these questions could be mapped to phases which primarily result in effort, whereas eight of these questions could be mapped to phases, which enable or produce utility from process modeling activities. For each of these questions we then defined the categories low, medium and high (for low, medium and high effort or utility) depending upon the possible answer possibilities each question supplied. The questions for each dimension, the categories for each question and the gathered data are described in detail in the following.

In addition, we used a scoring model to define an overall score for each question. We did this to calculate to which percentage all banks together had invested the maximum possible effort on their process modeling initiatives, as well as gained the maximum possible benefits (referred to as utility) from their process models. We defined a match with the low category as 1 scoring point, the medium category as 2 scoring points and the high category as 3 scoring points. The score value for each question was then defined as follows: ((number of banks matching a low score) x 1 + (number of banks matching a medium score) x 2 + (number of banks matching a high score) x 3) / ((number of analyzed banks) x (number of questions analyzed)). In order to scale the score between 0% and 100% we had to first subtract 1 from the score value to scale the score down to a possible minimum of 0% and we then had to divide the remaining score value by 2 to scale the score to a possible maximum of 100%. We then calculated an overall effort score

and an overall utility score. We used these to position each bank in a two-dimensional coordinate system, representing each bank's effort-utility-ratio.

3.2 Data presentation: efforts of process models

Regarding the effort comparison, we identified ten core questions characterizing the efforts of BPM activities in banks during the process model life cycle phases of creation, validation and updating (cf. table 1). For the first block of questions, relating to model creation, we analyzed the modeling purposes ("why?"), breadth and depth ("what?"), model creators ("who?") and used modeling tools ("how?").

Why: For the modeling purpose 16 possible reasons were presented, which we divided into three categories according to our pilot interview experts: basic reasons with basic data gathering (e.g. process documentation), advanced reasons with more data modeling and thus requiring more modeling effort (e.g. process standardization, coaching of staff and therefore, very detailed process descriptions) and expert reasons with very detailed and specific information modeling (e.g. IT-integration, reduction of media breaks). If a bank chose at least one expert reason its effort was classified as a high effort (63%). If a bank only chose basic or advanced reasons its effort was classified as a medium effort (2%) and if it only created process models for basic reasons it was classified with a low effort (35%).

What: Regarding the modeling breadth, we asked in how many different areas (back office, middle office and front office) a bank modeled its processes. If all three were chosen, we classified a high effort (63%), if two were chosen, we classified a medium effort (18%), and if one was chosen (usually back office as it includes mostly routine work), we classified a low effort (18%). Going into more detail on the bandwidth of the modeling effort, we asked how much percent of the complete process landscape of the participant's bank had already been documented in the form of process models. 28% of the participating banks had modeled more than 66% of their process landscape, while 38% of participants had modeled between 33% and 66% of their landscape, and 28% had modeled less than 33% of their landscape.

What: We then asked the participants regarding the modeling depth to reflect how much information in detail was modeled, as the amount of information modeled directly influences the modeling effort. We were interested if merely the pure workflow sequence (process view) was described (8%), or if one additional view (e.g. organizational view) was modeled (33%), or if all four typical views – process view, organizational view, resource view and business object / data view – were modeled (58%). In addition, we asked if further information was integrated into the process models. 43% stated that they annotated additional information (e.g. mainly risks, but also regulatory items and sometimes even strategy alignment), while 13% of the participants were not sure or did not give an answer and 43% stated that they did not include additional information in their process models.

Table 1: Data from 60 banks regarding "effort phases" and "utility phases"

Effort Phases	Low	Medium	High	Score
Model Creation				
"Why?" / Modeling Purposes: *For which purposes have process models been created?*	21	1	38	64%
"What?" / Modeling Breadth: *What has been modeled (back, middle, front office)?*	11	11	38	73%
"What?" / Modeling Breadth: *How much of the whole organization has been modeled in percent?*	20	23	17	48%
"What?" / Modeling Depth: *Which views have been modeled?*	5	20	35	75%
"What?" / Modeling Depth: *What further information was annotated in the process models?*	26	8	26	50%
"Who?" / Model Creators: *How many different groups of people were involved in modeling?*	2	1	57	96%
"How?" / Modeling Tool: *To what degree was a specialized software tool used for modeling?*	46	2	12	22%
Model Validation				
"Who?" / Model Validators: *Who validated the process models?*	30	28	2	27%
"How?" / Model Validation Tool: *To what extent was a software tool used for model validation?*	16	0	44	73%
Model Updating / Maintenance				
"How often?" / Model Updating Frequency: *Are models updated regularly?*	12	0	48	80%
Σ	189	94	317	61%

Utility Phases	Low	Medium	High	Score
Model Analysis				
"Why?" / Analysis Purposes: *For which analysis purposes are models used?*	29	22	9	33%
"What?" / Analysis Breadth: *For which type of KPIs are data gathered?*	22	22	16	45%
"How often?" KPI Updating Frequency: *Are KPIs updated regularly?*	24	15	21	48%
"How often?" KPI Analysis Frequency: *Are KPIs used (analyzed) regularly?*	29	20	11	35%
Model Improvement / Optimization				
"Why?" / Optimization Purposes: *For which optimization purposes are models used?*	27	24	9	35%
"How?" / Automatic Optimization Detection: *Could optimization potentials be detected with the help of a software tool?*	32	26	2	25%
Model Application / Usage (simple / direct)				
"How?" / Application for Employee Training: *To what extent are employees trained with the help of process models?*	13	8	39	72%
"How?" / Application by Employees as Reference Manual: *To what extend do employees have access to the process models and are able to use them?*	20	0	40	67%
Σ	196	137	147	45%

Who: If many people are involved in process modeling, banks also need a lot of human resources (which in the end also produce costs). Asking which groups of people participated in the modeling activities, we got the following result set: in 95% of all cases modeling experts from the internal process management department as well as department specialists without modeling experience were involved. One bank (2%) relied on an external consultancy and two more banks only relied on their modeling experts from their process management department.

How: Regarding the use of a specialized modeling tool, 77% of the participants stated that they used a special tool, 3% were not sure and 20% did not use a special BPM tool, but used non-BPM tools such as Microsoft Word or Excel instead. Nevertheless, we found that this value is better compared to previous studies

(Hess and Schuller 2005), which have found that many companies preferred Microsoft Office tools in 2005 and only every second company used specialized tools like the ARIS platform from IDS Scheer in their business process reengineering projects.

The second block, relating to *model validation*, was covered by analyzing the model validators ("who?") and if or if not a validation tool was used ("how?").

Who: 50% of the participating banks did not invest highly in model validation as only one person (employee or manager) validated the models. This may not be surprising as 95% of the banks involved many different groups of people during initial model creation phase. 47% had a medium score since either both an employee and a manager or both an employee and another auditor were involved. Only 3% of the banks had a high score as three or more instances were responsible for model validation (modeling expert, expert from operating department, manager etc.).

How: 73% of the banks stated that they did not use a validation tool for their processes, indicating that if this was done it would have been done manually (high effort), whereas 27% used a specialized validation tool for their process models. We assume that either the modeling tools that were used did not support validation, or only supported syntactic validation, leaving semantic validation of the business processes (and thus checking that content described in the process models really described actual workflows as operated in the bank) without tool support.

The final block, relating to *model maintenance*, was covered by asking for the updating frequency of the process models ("how often?").

How often: 80% of all banks stated that they regularly check and update their process models dominating the remaining 20% of the banks, who stated that they did not do this on a regular basis.

Summing up, we observed a score reflecting a high effort (score value $\geq 60\%$) on 4 questions of the first block of modeling, a medium effort ($40\% \leq$ score value $< 60\%$) on two questions and a low effort (score value $< 40\%$) on one question. For the second block of validation we observed a high effort as well as a low effort once. For the third block of updating / maintenance we observed a very high effort score with respect to all banks. Aggregating all data for all 60 banks on all ten questions, 61% of the possible maximum effort on our scale was invested into process modeling, validation and maintenance.

3.3 Data presentation: utility of process models

Concerning the comparison of benefits, we identified eight core questions characterizing the benefits of BPM initiatives in banks during the process model life cycle phases of analysis, improvement and application (cf. table 1). For the first block of questions, relating to model analysis, we analyzed the analysis purposes ("why?"), breadth ("what?"), and KPI (key performance indicator) updating and analysis frequency ("how often?").

Why: We asked for seven analysis purposes including process benchmarking, analysis of organizational responsibilities, activity based costing, risk analysis and process flow analysis. Depending upon the number of analysis purposes categories were built: 0-2 purposes were categorized as a low benefit (48%), 3-5 were categorized as a medium benefit (37%) and 6-7 were categorized high benefit (15%).

What: Regarding analysis breadth, we asked which types of KPIs were gathered. Low benefit was detected if no KPIs were gathered (37%), and medium benefit was detected if either operational or strategic KPIs were gathered or KPIs regarding the process model usage (37%). The highest benefit was detected only if at least two or all three of these types of KPIs were detected (17%).

How often: Since a higher KPI updating frequency reflects the banks' need for frequent analysis, which result in a benefit (for example used for steering business processes or detecting bottlenecks), we asked if KPIs were updated regularly or not. 40% never updated their KPIs and were thus classified as having a low benefit, 25% updated their KPIs irregularly and 35% updated their KPIs regularly.

The second block, relating to *model improvement / optimization*, was covered by analyzing the optimization goals ("why?") and if or if not a tool was used that could assist in detecting optimization potentials ("how?").

Why: We asked for seven optimization purposes including the reduction of media breaks, uncovering of cost saving potentials esp. through efficient resource planning and unveiling of process weaknesses spanning multiple departments. Depending upon the number of improvement purposes categories were built: 0-2 purposes were categorized as a low benefit (45%), 3-5 were categorized as a medium benefit (40%) and 6-7 were categorized high benefit (15%).

How: In addition, we asked if optimization potentials could be detected with the help of a software tool. 53% answered that this was not possible and thus the benefit was low due to necessary tedious manual labor. 43% either did not know if this was possible or could only compare their process models with best practice process models, which we classified as a medium benefit. Only 3% stated that it was possible to automatically detect weaknesses with their used software tools, which resulted in the highest possible benefit, since optimization potentials could easily be discovered without investing a lot more manual work.

The final block, relating to model application, was covered by asking if the process models where used for training of employees or even by employees themselves as a reference manual ("how?").

How: Regarding the direct use of process models, we asked the participants if these were used for employee trainings. 22% of the banks did not use them for training, resulting in a low benefit score. 13% did not know if this was done, wherefore we classified them with a medium score. 65% stated that process models were used to train employees for their job, resulting in a high benefit.

How: We also asked if employees could access the process models to use them as a reference manual. 33% stated that employees did not have access to them and

thus could not use them, whereas 67% stated that employees had access to them and used them as a reference manual.

Summing up, we only observed a high score value and thus benefit for two questions. However, these only measured simple application of the process models in the context of employee trainings and for reference purposes. Medium model analysis benefits were only observed for two questions and the other two questions resulted in low benefits according to the calculated score values. Model improvement / optimization, which should yield a very high benefit to banks, only resulted in a low benefit for both questions studied. Once again, aggregating all data for all 60 banks on all eight questions, only 45% of the possible maximum benefit on our scale was captured by the banks.

3.4 Data presentation: effort-utility-ratios

Comparing the effort-utility-ratios of the sum of all banks, we found that the banks invested 61% of the maximum possible efforts, which they could make according to our scoring dimension "effort", but only got a return of 45% of the maximum possible benefit, according to our defined dimension of "utility". This results in an effort-utility-ratio of 1,36. Although this ratio needs to be judged very carefully (taking into account the underlying constructs), it could be interpreted in the way that the 60 banks participating in our study invested 36% more on the effort side than they actually got back as a possible benefit from their business process modeling effort. In conjunction with this idea, each individual bank's position, according to our effort and utility scores, can be seen in figure 2.

4   Data analysis, interpretation, validation and critical discussion of limitations

To find out what caused the surprisingly negative effort-utility-ratio we made an in-depth data analysis searching for factors that highly correlated with our measured effort-utility-ratio. We contrasted our findings with further data from the original set of 75 questions, choosing those which could possibly explain, why so many banks invested comparatively much effort without gaining at least equal utility. Among possible explanations, we analyzed the major aspects software used, modeling methods used, costs of modeling, validation and maintenance and the utility enabled by process analysis capabilities:

   a) the usage of individual (enhanced) modeling methods compared to standard modeling methods (without any enhancements)
   b) the satisfaction with the cost-effectiveness of creating business process models (modeling and validation) with respect to a certain used process modeling method
   c) the satisfaction with the cost-benefit-ratio of process model maintenance with respect to a certain used process modeling method

d) and the satisfaction with analysis possibilities offered by the used process modeling method

The first three factors could only explain why banks could be classified as having a bad effort-utility-ratio, but they could not explain why certain banks could also have a good effort-utility-ratio. For example, the usage of standard modeling methods or individually adapted modeling methods did not yield any significant impact on the effort-utility-ratio. Seven banks, using an individually adapted notation, and ten banks, using a standard method, were classified with a good effort-utility-ratio; on the other hand ten banks, using an individually adapted notation, and 31 banks, using a standard notation, were also classified as having a bad effort-utility ratio. This is interesting, since we assumed that the use of individually adapted methods for business process modeling and analysis in banks should clearly enable banks to get a good effort-utility-ratio, as opposed to just using standardized modeling methods without any modifications for the specific needs of the bank.

Regarding the satisfaction with the non-recurring costs of initially modeling and validating, or even the satisfaction with continuous costs for process model maintenance and updating, we found out the following: banks that were satisfied with their non-recurring and continuous costs could not be found to have any correlation with the effort-utility-ratios calculated (9-10 were correctly classified as having a good effort-utility-ratio, whereas 14-15 were misclassified as having a bad effort-utility-ratio on each question). However, banks that were unsatisfied with their non-recurring costs or continuous costs were classified correctly as having a negative effort-utility ratio in most of the cases. Only four banks were misclassified on each of these two aspects, whereas 13-18 banks were classified correctly. We interpret that cost-effectiveness of creating process models or maintaining them is again a necessary precondition that influences the effort-utility-ratio to a certain extent, but not the main factor that describes the disparity in best performing and worst performing banks, regarding the outcome of process modeling initiatives.

Finally, by analyzing the satisfaction with analysis possibilities offered by the used process modeling method, we did indeed find the only factor that could explain when a bank would have a high chance of being classified as having a positive effort-utility-ratio with a reasonably high correlation (see figure 2).

This factor indeed turned out to be the strongest indicator we found, which could distinguish correctly between the calculated negative and even positive effort-utility-ratios. With the exception of three outliers and six only slightly negative effort-utility-ratios (>1), all banks that were satisfied with their internally perceived analysis possibilities (eleven banks) also had a positive effort-utility-ratio (<1). Those banks, which were dissatisfied with their effort-utility-ratios (25 banks), were also classified as having a negative overall effort-utility-ratio, except for two outliers. The remaining 15 banks, which were not able to give us feedback on the

satisfaction with analysis possibilities, were predominantly classified with negative overall effort-utility-ratios, with the exception of five banks.

From these further contrasting studies, we conclude that the existing methods to support business process modeling and analysis initiatives in banks may not be ideal. However, innovative and new methods, which actually focus on business process modeling on one side (for keeping costs low for example by allowing quick and easy modeling of only the relevant aspects) and on the other side those that focus on the analysis needs of banks (for example for the analysis of process costs, for manpower requirements planning or even for certain common weaknesses like media breaks), can positively influence the currently mostly negative effort-utility-ratios of process modeling initiatives found in banks. Combining both ease of modeling and analysis and integrating these aspects into the methods used and tools seems to be a promising approach. Especially if specialized BPM tools are used, that can fully build upon the language constructs of the implemented business process modeling and analysis method, we can imagine that effort-utility-ratios will improve significantly in banks.
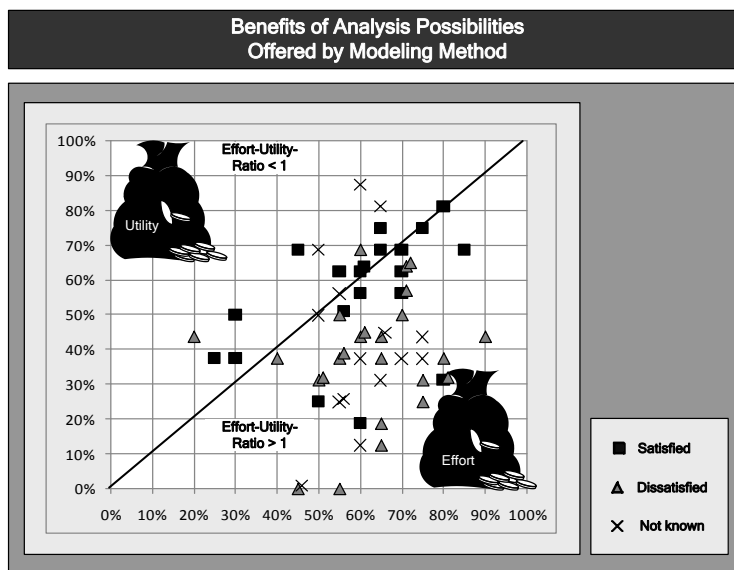

Figure 2: Satisfaction with benefits of analysis possibilities of process models due to used process modeling method(s)

A final analysis and validation of our data material underlined this conclusion. We found out that two thirds of all banks (41 banks) use standard business process modeling languages, whereas one third adapted standard methods or created their own business process modeling specifications (19 banks). This is interesting since this fact hints at our final conclusion that banks are not satisfied with the existing methods and are even willing to create their own methods due to a lack of

appropriate methods available. Accordingly, only 26% of the banks that have developed their own methods (five banks) wanted to cooperate with us in the future to create a new business process modeling language designed specifically for banks. However, 29% of all banks, using standardized business process modeling notations (e.g. BPMN, EPC etc.), in a follow-up survey question also stated that they would like to cooperate with us in the future to develop a new bank-specific process modeling notation with a special focus on the analyzability of process models. Summing these facts up, 31% of all banks participating in our survey have already developed their own modeling methods to meet their requirements (even though 26% of these banks are still not satisfied with their results) and another 20% of all banks, that currently used standardized modeling notations, are willing to develop a new business process modeling language just for banks. Thus more than half of all banks (51%) are looking for better alternatives for business process modeling and analysis.

5   Conclusion

With the ambition to improve empirical research on the efforts and utility of business process modeling in the banking sector and to find out what factors influence a positive effort-utility-ratio of process modeling initiatives, as well as to discover if existing approaches to process modeling languages serve banks right, we presented extensive data from an exploratory survey among 60 banks. Besides the presentation of our empirical data, we see our main contribution to the body of knowledge in the surprising findings we made concerning the importance and influence of specialized modeling and analysis methods, with respect to the calculated effort-utility-ratios of the process modeling efforts and utilities in the banking sector.

The most important findings from our data analysis and interpretation were the following: over two thirds of all banks studied have a negative effort-utility-ratio concerning their process modeling initiatives. More than half of the banks (51%) are dissatisfied with the current methods available for process modeling and analysis and either have started to create their own approaches or are willing to create new approaches together with the research community. The possibility to analyze business process models is the most important factor influencing a positive, as well as negative effort-utility-ratio. Since it significantly correlates with the effort-utility-ratio of process modeling initiatives, we propose that a special focus should be laid on constructing analyzable process models to meet the needs of banks.

Although we assume that our results from the study of 60 banks are generalizable, as we included all types of banks from three countries in our study, there are several limitations of our approach presented. First of all, the construction of our effort and utility dimensions was limited to the questions and data available from the underlying survey we used. Especially, the questions that were available for

analysis largely pointed at the process model creation phase (seven of ten questions) or pointed at the analysis phase (four of eight questions), which may have also biased our results and interpretation. In addition, our concept of defining the categories for each question and also the same scoring points for each low, medium and high category may have biased our data into a certain direction. As some questions were only "yes or no" questions we could not always differentiate between three categories also increasing the tendency to polarize our calculated score values. Finally, our suggested effort-utility-ratio may be biased since "effort", as it was measured in our study, may not have to directly correspond to an "equal amount" of "utility", as defined and detected in our study. In fact, maybe already 50% effort in terms of actual costs of a process modeling project may result in at least an equal or higher amount of (financial) benefit gained from such a project, e.g. due to identified and implemented cost savings potential in the underlying process landscape. Nevertheless, it is obvious that banks have spent a lot of effort in their modeling initiatives, but have not yet exploited all possible benefits that can be yielded from process models.

With regard to our study, we suggest to make specialized studies just focusing on the effort and utility and influencing factors with a special focus on the tools and methods used. Also, a greater participation of banks would be desirable to acquire statistically representative evidence of our exploratory findings, even though we have observed that the three countries we analyzed, and also the size of the institutions and their specifics, did not yield significantly different results.
With regard to our key findings, future studies should focus on analyzing the specific requirements of banks for process modeling and analysis methods (esp. business process modeling languages / notations), in order to engineer new methods that are specific for the banking sector and help to positively influence the negative effort-utility-ratios of business process modeling found in banks.

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