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How to build responsive service processes in German banks: the role of process documentation and the myth of automation

Laura Johanna Oberle
Chair of Service Operations Management, University of Mannheim, Mannheim, Germany

Abstract

Purpose – This multi-method paper investigates the impact factors of process responsiveness, operationalized as process duration, in the bread-and-butter business of German banks, i.e. the private mortgage loan application evaluation process. The tested predictors refer to process design, process execution, business process management (BPM)'s relevance and information technology (IT) support.

Design/methodology/approach – In a sequential research design, a total of 296 useable responses of 1,228 contacted German banks are collected using a questionnaire built from both industry insights gained through 43 expert interviews and theoretical knowledge. Ordinary least squares (OLS) regression is used to determine the relevant impact factors and moderation effects, and a theoretical framework is proposed.

Findings – Proper process documentation moderated by bank size is most influential for process speed, and smaller banks benefit more from it. Automation appears to have a prolonging effect on the process. Although surprising, this finding may be explained through correlation analysis of the data and studies on the Solow' paradox in the literature.

Research limitations/implications – The models only partially explain process responsiveness. A moderate adjusted R^2 and several interaction effects indicate the complexity of the presented research question. Still, several hypotheses can be confirmed, leading back to the roots of process improvement and the long-lasting question of the binary impact nature of automation.

Originality/value – Valuable insights for both researchers in service operations and bank practitioners are outlined, shedding light onto responsiveness as still empirically under-researched operational capability. Thereby, the authors also contribute to the superior question of strategic fit.

Keywords Multi-method, Business process management, Responsiveness, Process capabilities, Documentation, Automation

Paper type Research paper

1. Introduction

In today's fast-moving world, customer expectations become more time-sensitive. Responsiveness is one of the most important service quality dimensions, as well as reliability (Mehta and Durvasula, 1998; Iberahim *et al.*, 2016). In banking, trust and reliability are exclusion criteria when customers choose a bank. To increase the existing customers' service experience beyond these minimum requirements, banks must aim for fast and convenient financial services, which are shown to be an important impact factor of customer satisfaction with a bank (Paul *et al.*, 2016).

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Both literature and industry reports indicate the relevance of responsiveness in banking (see, e.g. Oppewal and Vriens, 2000) and in the private mortgage loan application evaluation process (PAEP) in particular. Besides the approval rate of a loan application, a relevant factor for customers is the response time of the bank. In people-based services like loans, responsiveness is more important than in facility or equipment-based services (Lee *et al.*, 2000). Higher expectations of responsiveness exist for less interactive services or higher labor intensity (Dotchin and Oakland, 1994). Attention to passage of time is heightened when the end or goal is near, especially for people who invested more into the process (Hui *et al.*, 1998). This anticipatory model applies to the PAEP as the customer waits for the paper processing by the bank after accepting the bank's offer. Likewise, a study among US citizen shows a sharp decrease in satisfaction for each day customers have to wait after inquiring a potential lender (Power, 2018). For personal loans in the UK, speed and ease of application are important, as well as the right terms and conditions like interest rates, credit volume, or duration (Financial Conduct Authority, 2018). Speed and flexibility are also some of the main reasons why people choose peer-to-peer lending instead of traditional bank services (Nesta, 2014). A study on online mortgages finds that 52% of respondents are attracted to innovative offers due to a faster process (zeb, 2021). Despite these clear market trends and customer needs, the status quo is often unsatisfactory, as, e.g. the global bank customer satisfaction survey mentions waiting times as potential area of improvement (Statista, 2021). Fortunately, banks themselves have noticed the urge to improve in their time-related performance (Heckl, 2010).

We focus on the private mortgage loans, which is the bread-and-butter business of most banks at the core of their operations. This process offers sufficient similarity in activities and procedural steps across different banks due to legal regulations. Yet, the execution differs, showing moderate heterogeneity. The bank has full control over this internal process, whose duration represents pure waiting time for the customer. Hence, deviations in this highly-regulated and closely-scrutinized process are not based on what banks do, but rather on how they do it, making this process a great example for standardized (mass) service processes.

This paper aims at determining the impact factors of responsiveness operationalized as process duration of German banks' PAEP. In this multi-method study, we first build theory, which is then quantitatively tested by a large-scale survey. Our research thereby contributes to the superior question of strategic fit and how to achieve a certain level of process capability in a broader sense, i.e. after deciding on responsiveness as competitive priority to focus on, the process capabilities to improve this competitive priority must be determined. In this regard, we provide valuable recommendations both for banks to improve the PAEP's performance with regard to responsiveness, as well as for researchers in services in general. Further, contributing to theory, the proposed framework can be transferred to other application cases.

While research acknowledges the importance of responsiveness, it should focus on how to increase responsiveness (Santos Bernardes and Hanna, 2009), and provide an empirical validation of the assumed relation between a process' structure and performance (Balasubramanian and Gupta, 2005). The existing literature on this specific banking process is mostly concerned with scorecard optimization or scoring decision automation, which is however not sufficient for a holistic process improvement. A lower level analysis as provided in this work addresses the heterogeneity issue in service operations (Safizadeh *et al.*, 2003), answers the call for empirical validation by the literature, and includes process design factors in the performance analysis, which Frei and Harker (1999b) claim that every study on the efficiency of service providers must do.

The paper is structured as follows. Chapter 2 presents the first study to qualitatively develop a framework, which builds upon interviews and existing literature, and guides the research hypotheses (H). Chapter 3 presents the quantitative study to test the proposed predictors, including the methodology and the results. Chapter 4 discusses the findings and implications, before a conclusion is drawn and future research potential is mentioned in Chapter 5.

2. Conceptual background and theory development

2.1 Responsiveness

As part of various measurement scales for service quality, responsiveness is defined as an organization's willingness to provide fast and prompt services (Parasuraman *et al.*, 1988; Bebko and Garg, 1995). It is one of the dimensions proposed in Parasuraman *et al.*'s (1988) SERVQUAL framework, which is still predominantly used to measure service quality (Ladhari, 2009). Time is among the most valuable and scarce customer resources, which is also an important aspect of convenience (Theoharakis and Hooley, 2003; Berry *et al.*, 2002). Responsiveness is thus associated with customer satisfaction (Lassar *et al.*, 2000; Paul *et al.*, 2016), loyalty (Ladhari *et al.*, 2011), service quality and process performance, the latter of which is in turn linked to general firm performance (Frei and Harker, 1999a; Frei *et al.*, 1999).

Consequently, responsive service processes can create a competitive advantage. The resource-based view argues that certain resources or capabilities possessed and sustained by a firm can create a competitive advantage (Barney, 1991). In the long-run, the competitive advantage is only sustained if resources are not expanded freely or imitated by other firms (Barney, 2001; Peteraf, 1993). Process capabilities, as the ones needed for responsiveness, are inelastic to some degree as they are developed over a longer period of time. Hence, this paper's investigation builds upon the resource-based view to identify the relevant impact factors of process responsiveness.

The research question further aligns well with the concept of time-based competition, which proclaims a time compression in all stages of the service creation and delivery to create a source of competitive advantage (Hum and Sim, 1996). In manufacturing, these time-based tactics cannot only increase efficiency, but also indicate when customization best takes place given certain upstream and downstream buffer capacities, while still competing on time (Bozarth and Chapman, 1996). As services deliver both an experience and an outcome, not all service industries should compete on time, as the customer can also highly appreciate the time spent for the service provision or may even pay for a certain time duration. However, this is not the case for loan application evaluation.

Responsiveness is commonly operationalized as waiting time or servicing speed. The notion of time is repeatedly found in the definition of responsiveness in operations management literature (Santos Bernardes and Hanna, 2009), and measurement items of different studies show similarities in the time-relatedness (Parasuraman *et al.*, 1988; Mehta and Durvasula, 1998; Theoharakis and Hooley, 2003; Ley *et al.*, 2012; Bahia and Nantel, 2000). Consequently, responsiveness can appropriately be analyzed by measuring process speed or process duration.

2.2 Qualitative framework of impact factors for responsiveness

Process duration is a common process performance metric (Balasubramanian and Gupta, 2005) and different studies look at this factor as part of an overall process performance model (Chimhamhiwa *et al.*, 2009, van Looy and Shafagatova, 2016). Yet, we aim at determining impact factors of the time-related process performance, excluding other common performance measures like cost, quality or flexibility (van Looy and Shafagatova, 2016; Balasubramanian and Gupta, 2005).

A first qualitative study allows to build the theoretical framework for the subsequent quantitative study. We therefore conducted 43 informal interviews between April and November 2020 with industry and process experts to gain a deep understanding of the PAEP and to determine which impact factors named by the literature are of most interest and relevance in practice. The telephone or web conference interviews lasted between 30 and 60 minutes, and included as total of 30 industry experts from banks or consultancies for financial services, and six business process management (BPM) experts with links to financial services. The interviews were conducted in German.

Overall, the interviews confirm the relevance of the research and especially of responsiveness in this service. An industry expert clarified that on the one hand, the

"faster bank gets better customers, achieves higher margins, and makes more business". On the other hand, customers feel insecure until they receive the final contract. The PAEP is seen as somewhat standardized, yet banks differ significantly in their process execution.

Based on both existing literature and the interview results, we propose the following framework of predictors of responsiveness. The derived predictors belong to four dimensions: process design, process execution, BPM relevance, and information technology (IT) environment, as shown in Figure 1. The paper takes the perspective of the bank, despite the customer being a co-producer in this service. We opt to include the customer-induced variance in form of the number of securities that need to be checked. The interviews suggest this as primary influencing factor on process duration, over which the bank has limited control only. Next, we analyze each of the proposed predictors individually and substantiate the interview results with existing literature to define research hypotheses for study 2.

2.2.1 Bank characteristics. The responding banks can be characterized by their size and their affiliation, both used as control variables. The industry consists of three groups, namely the private banks, cooperative banks, and savings banks. In the interviews, group affiliation was often mentioned as an influencing factor of a bank's infrastructure, IT systems, and processes. Private banks are commonly assumed to be faster in the files processing, while cooperative and savings banks are known for their very customized offers. Given the trade-off between customization and responsiveness (McCutcheon *et al.*, 1994), group affiliation should be controlled for. Hence, we hypothesize.

H1a. There is a relationship between group affiliation and process duration.

A larger bank size implies more potential capital investments in process improvement or automation measures, so an impact on the independent variable seems plausible. An interviewee pointed out that size can influence processes and working patterns. Consequently, to determine the true impact of the dependent variables, bank size is included as control variable (Klarmann and Feurer, 2018). We hypothesize.

H1b. There is a negative relationship between bank size and process duration.

2.2.2 Process design factors. Process design choices, like the degree of standardization or automation, may impact the performance. For example, one interviewee from a service provider to whom banks can outsource the PAEP revealed to us that they focus heavily on standardization and automation to operate as efficiently and fast as possible. Retail loans, characterized as mass services, are already heavily automated and standardized. The development in this less complex loan type definitely leads the way for the more complex private mortgage loans.

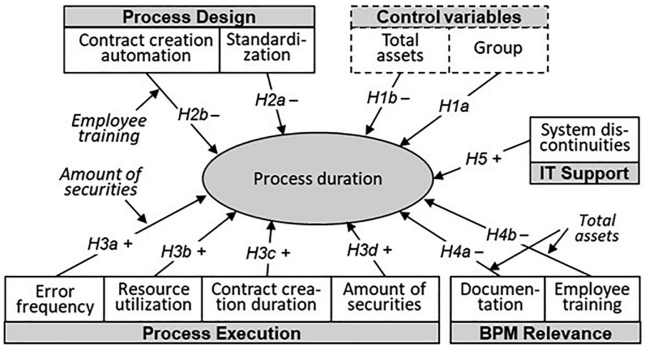

Figure 1.
Research framework with the hypothesized predictors of process duration

The PAEP is currently undergoing standardization and digitalization pressure to increase efficiency (Sokolovsky, 2005). Shostack (1987) defines standardization as low divergence and little freedom allowed in the process step. Business process standardization has been empirically proven to beneficially impact performance in form of cost, speed and quality, especially in service firms (Münstermann *et al.*, 2010). Jayaram and Vickery (2000) find that standardization is the most influential enabler to increase process speed and time-to-delivery. As activities and sub-activities are simplified, standardization triggers a reduction of cycle time (Jayaram and Vickery, 1998). Furthermore, quality increases through less process variability (Ungan, 2006).

On the other hand, the lack of standardization can have adverse effects. Process variation engenders heterogeneity and deviation in process execution due to variability, which hurts process speed and its financial performance (Frei *et al.*, 1999). Yet, standardization can sometimes be undesirable, as it is an opponent of customization and flexibility, both of which are necessary to tailor services to individual customer needs. As a result, service providers must carefully determine when to accommodate customization and when to reduce it (Frei, 2006). In the PAEP, customization is done during the offer creation prior to the application processing, so we consequently hypothesize.

H2a. There is a negative relationship between standardization and process duration.

Automation appears to be an obvious impact factor of process speed and a commonly used improvement measure, which was confirmed by various interviewees. A high degree of automation in a process reduces its error proneness and flexibility (Hill and Brown, 2007). Benefits of automation include cost reduction, process speed increases, and productivity improvements (Aguirre and Rodriguez, 2017). Repeatability and predictability can also be increased (Fung, 2013), which is important in financial services. Fung (2013) suggests requirements for process automation, including a high volume of transactions that are of high value, limited exceptions, clear decomposition into process steps, and frequent system accesses. The PAEP is rule-based and involves routine tasks with deterministic outcomes, which makes it suitable for automation. In this regard, special attention must be drawn to the fourth step of the credit application evaluation process, which most easily allows for automation. Generally, the PAEP consists of four steps, namely (1) incoming control for completeness of documents, (2) check of affordability of interest payments by applicant, which is often also done before the PAEP starts, (3) valuation of securities backing the loan, and 4) the contract creation. Yet, precipitant automation decisions without considering the full process or context can lead to unsatisfactory results (Säfsten *et al.*, 2007). A certain degree of BPM expertise and employee training can hence be expected. Following practice insights, automation can most easily be realized in this fourth step, so we hypothesize.

H2b. There is a negative relationship between contract creation automation and process duration. This relationship is moderated by employee training.

2.2.3 Process execution factors. While design factors form the groundwork of any process, the execution further impacts the performance, e.g. through utilization, errors, task times, or effort requirements.

Resource utilization is derived from the required processing time for the incoming cases and available resource capacity, i.e. arrival rate and mean processing time determine the utilization (see, e.g. Moss and Wen, 1999). Resource utilization is thereby directly linked to process throughput (Balasubramanian and Gupta, 2005), which in turn influences operational efficiency. Adequate resource utilization levels are hard to determine as it depends on the specific process and its variability. While a continuous flow maximizes the utilization and minimizes down-time (Safizadeh and Ritzman, 1997), a too high utilization can result in bottlenecks, which impede a faster flow. Multiple interviewees highlighted that the available capacity must be taken into account. In order to account for the number of applications which

are to be processed by the available capacity, utilization is the right measure to consider. A process expert clarified that in the PAEP, all cases must be checked for completeness first before the processing by the specialist starts. From this, it can be assumed that delays at this activity affect all cases, so we hypothesize.

H3a. There is a positive relationship between resource utilization at the incoming check and process duration.

Rework occurs when incomplete documents are handed over. This causes significant delays, as the missing information must be requested from the consultant or even the customer himself. In many of the interviews, incomplete files are named as the primary cause for errors and rework, which in turn extend the processing times. The resulting low process reliability diminishes the output quality (Balasubramanian and Gupta, 2005). From both a cost and time perspective, rework should be avoided, e.g. through monitoring (Kohlbacher and Gruenwald, 2011; Armistead, 1996). As customers compare the process outputs to the desired outcomes, greater control of the service provider during execution reduces process variations and potential rework, which both cause variations in lead time (Swink and Hegarty, 1998). Clearly, complex cases are more vulnerable to errors. In the PAEP, the complexity of a case can be derived from the number of securities. Consequently, we hypothesize.

H3b. There is a positive relationship between error frequency and process duration, moderated by the number of securities.

Cycle time consists of idle time and work time. Naturally, if employees spend more time on the task or if the case lies still for some time longer, the process duration increases. As the contract creation's degree of automation is hypothesized to impact process duration, the activity duration of this fourth step should also be analyzed. As a PAEP expert confirmed, the contract preparation demands some time as all information must be checked and potentially individual arrangements added. Thus, we hypothesize.

H3c. There is a positive relationship between contract creation duration and process duration.

Private mortgage loan applications differ in few factors, one of them being the number of securities involved in backing the loan. In the third step of the PAEP, each security has to be checked in detail. While customers profit from including an additional security to reduce the risk and hence the interest rate in the bank's offer, banks must spend more time on their check. Everything else being equal, an increase in securities leads to an increase in working time. One interviewee said, "The creditworthiness check should be performed before securities are checked, because the effort related to security checking must be worth it." Based on this argumentation, we hypothesize.

H3d. There is a positive relationship between number of securities and process duration.

2.2.4 BPM relevance and IT support. Proper BPM, including process documentation or training, and the consistent use of technology and data are other factors potentially influencing a process' throughput time.

Several process notations allow organizations to transparently map the individual process steps with the involved resources and IT systems. Process documentation serves as an indicator of BPM maturity (Hammer, 2007). In the interviews, BPM experts emphasized that any process redesign or improvement builds upon properly documented processes. Mapping the individual steps results in a scrutinized review of the whole process, thereby leading to an elimination of unnecessary steps or handoffs, which triggers an improvement in efficiency (Denton, 1995; Keller, 1999; Siha and Saad, 2008; Moattar *et al.*, 2022). This improvement is further supported by the documentation inherent standardization (Ungan, 2006). From practice, it is commonly

known that an organization's size influences the extensiveness and mere existence of process documentation, as larger organizations require the transparency from documentation, e.g. due to more process-internal handovers. It is reasonable to hypothesize.

H4a. There is a negative relationship between process documentation and process duration, moderated by bank size.

Continuous improvement measures are part of the BPM cycle and increase performance (Hammer, 2010; Vera and Zapata, 2022). Employee training plays an important, yet often neglected role in BPM. Differences in employees' skills and experience can cause variations in process output due to differences in case handling (Ungan, 2006). Training can ensure that employees are all consistent in their work, promoting best practices among the team. As pointed out in an interview, training can be one measure to reduce errors and to continuously improve the process. Another interviewee stated, "there are two quality issues in this service: the quality of the project, which should be financed, and the quality of the agent", i.e. the employee. Likewise, Theoharakis and Hooley (2003) show that employees' commitment to learning affects planning flexibility, which consequently positively impacts responsiveness measured as speed of delivery. As size affects the level of BPM maturity, it also influences the investments in employee training. Thus, we hypothesize.

H4b. There is a negative relationship between employee training and process duration. This relationship is moderated by bank size.

A bank's process execution is supported by IT applications and systems. One interviewee mentioned dataflow and the format of the data as crucial factors, meanwhile another highlighted that electric credit files enabling seamless dataflows are a key differentiator between banks. One expert stated, "the importance of continuous data usage, not only the prevalently cited automation". As more IT applications are involved, employees must frequently switch between applications and even input data twice. These system discontinuities cause rework and prolong activity times through non-value-adding work. Hence, the literature recommends ensuring a consistent use of technology across activities and processes (Frei *et al.*, 2000). Consequently, we hypothesize.

H5. There is a positive relationship between system discontinuities and process duration.

3. Quantitative investigation of the impact factors' effects

3.1 Sample and data collection

The data for the second study is collected by means of a self-administered survey. The target respondents are bank specialists, who are the key informants. The German survey was sent to all 1,228 German banks, which at the time were considered credit institutes according to §1 of the German Credit Service Act, i.e. the population serves as sampling frame for representativeness (Wagner and Kemmerling, 2010). The survey was promoted via various online channels, offering a benchmarking and summary of the findings in exchange for participation.

We analyzed 15 responses for our pre-test to evaluate the items' clarity and conciseness (DeVellis, 2003), and to again confirm the relevance of the topic. In total, we collected 345 responses from the 1,228 contacted banks (28.1%), whereof 296 responses are useable. The time and consistency-related outliers include five banks which outsourced the process, three speeders, 38 banks failing at the consistency check, and three banks whose answers lead to utilizations above 100%. Speeders are identified by using both DEG and RSI (Leiner, 2019); yet, this constraint is rather relaxed as specialists either have the information in their heads or take time to consult their monitoring tools to answer adequately. Consistency is checked using boxplots for confidence intervals at one and five percent levels (Wang *et al.*, 2019) and the Hample filter (Pearson, 2002), while the Rosner's test (Rosner, 1985) does not deliver satisfactory results.

The non-response bias is assessed by comparing early to late respondents for all survey items, as late respondents are seen as similar to non-respondents (Kano *et al.*, 2008; Armstrong and Overton, 1977; Wagner and Kemmerling, 2010). Using Pearson's Chi-squared test with simulated p-value (2000 reps), no bias in the used variables is found ($p < 0.05$). Yet, a small sampling bias is detected (six and eight percent difference between invite and answer distribution) for one category of each of the two control variables, which is uncritical given that we control for it. Also, non-respondents' group association follows the same distribution as the invite distribution, so non-response bias can definitely be precluded.

Using only survey data, common method variance bias is possible, but unlikely given the benchmarking as motivational factor to answer truthful. The ability factor is addressed by asking key informants, and independent and dependent variable are in separate question blocks (Podsakoff *et al.*, 2012), whose investigated relationship is not revealed (Podsakoff *et al.*, 2003). In addition to that, we assure confidentiality and anonymity to reduce a potential response bias.

3.2 Measures and variables

Due to the variables' little to none latent-construct characteristics, the questionnaire relies on single items, which are applicable for objective and concrete measurements (Rossiter, 2002; Diamantopoulos *et al.*, 2012). For the dependent variable, *process duration* (PD), respondents stated the average throughput time including any lay times of the complete evaluation process starting with the incoming application until the creation of ready-to-sign contracts. The duration is measured in half-day intervals from 0.5 days to larger than 7 days.

Bank size is measured in the bank's *total assets* (TA), divided into six categories. *Group affiliation* (GA) includes private, cooperative, and savings banks. The *number of securities* (SEC) is measured as the number of securities to back the loan. *Contract creation automation* (AUT) is measured on a scale from 0% to 100%. *Standardization* (STAND) is the average of the four standardization degrees of the four process steps, i.e. incoming check, affordability check, security valuation, and contract creation. *Resource utilization* (UTIL) is measured by the logarithmic transformation of the implied utilization (UT), calculated as the time required to do all the work divided by the time available for this work, i.e. UTIL = log(UT/(1-UT)). *Error frequency* (ERR) is also measured in percentages The *activity duration of contract creation* (CCD) is measured in minutes using a 15-point scale in 5-minute periods. *System discontinuities in IT applications* (APP) is measured as the number of applications used. *Documentation* (DOCU) is a binary variable. *Employee training's past importance* (TRAIN) is measured on a 7-point Likert scale. Table 1 shows the descriptive statistics for all variables, including mean (M) and standard deviation (SD) if applicable.

3.3 Results

The analysis is run on standardized variables. Using ordinary least squares (OLS) regression, Model 1 includes only the direct effects. Then, the interaction terms are added in Model 2 to evaluate the indirect effects in isolation. We thus estimate the following two models:

Model 1 (controls and direct effects only):

$$PD_i = b_0 + \sum_{k=1}^{3} b_{1,k}\, GA_{k,i} + \sum_{l=1}^{6} b_{2,l}\, TA_{l,i} + b_3\, STAND_i^2 + b_4\, AUT_i + b_5\, UTIL_i + b_6\, ERR_i + b_7\, CCD_i + b_8\, SEC_i + b_9\, DOCU_i + b_{10}\, TRAIN_i + b_{11}\, APP_i + \varepsilon_i$$

Variables	Items	M	SD
Process duration (15-point scale in half-day periods)	1	7.3	3.86
Number of securities (number of securities)	1	1.52	0.57
Contract creation automation (percentage slider)	1	69.96	26.17
Standardization (average index of four percentage sliders)	4	83.61	13.89
Resource utilization (calculated measure)		0.2	0.18
Error frequency (percentage slider)	1	36.76	21.65
Contract creation duration (15-point scale in minutes)	1	40.91	19.81
Employee training (7-point Likert scale)	1	5.39	1.25
System discontinuities (number of used IT applications)	1	2.22	1.29

Binary variables	Yes	No
Documentation	251	45

Categorical control variables		Frequency
Group	Cooperative banks	208
	Savings banks	74
	Private banks	14
Total Assets	<500 million Euro	80
	600 million to 1 billion Euro	35
	1.1 to 1.5 billion Euro	35
	1.6 to 10 billion Euro	136
	10.1 to 50 billion Euro	16
	>50.1 billion Euro	4

Table 1.
Descriptive statistics for all variables

Model 2 (full model):

$$PD_i = b_0 + \sum_{k=1}^{3} b_{1,k}\, GA_{k,i} + \sum_{l=1}^{6} b_{2,l}\, TA_{l,i} + b_3\, STAND_i^2 + b_4\, AUT_i + b_5\, UTIL_i + b_6\, ERR_i + b_7\, CCD_i + b_8\, SEC_i + b_9\, DOCU_i + b_{10}\, TRAIN_i + b_{11}\, APP_i + b_{12}\, AUT_i * TRAIN_i + b_{13}\, ERR_i * SEC_i + \sum_{l=1}^{6} b_{14,l}\, TA_{l,i} * DOCU_i + \sum_{l=1}^{6} b_{15,l}\, TA_{l,i} * TRAIN_i + \varepsilon_i$$

Table 2 shows no indications of multicollinearity in Model 1 with a variance inflation factor below the common threshold (maximum: 2.4). Both models are statistically significant ($p < 0.001$). Table 3 reports the corresponding results. Model 2 explains 22.6% of the variance of PD, including a slight but significant increase ($p < 0.001$) from Model 1.

Concerning the control variables, H1a on group affiliation is not supported, neither for savings banks ($b_{1,2} = -0.308$, $p = 0.592$) nor for private banks ($b_{1,3} = -0.362$, $p = 0.764$). For H1b on size, only the category of 10.1–50 billion Euro in total assets (TA_5) is slightly statistically significant ($b_{2,5} = 2.042$, $p < 0.1$). Yet, the identified relationship is not negative as expected. For TA_2 ($b_{2,2} = 0.502$, $p = 0.512$), TA_3 ($b_{2,3} = 0.004$, $p = 0.995$), TA_4 ($b_{2,4} = 0.682$, $p = 0.291$), and TA_6 ($b_{2,6} = 0.895$, $p = 0.670$), the effects are not significant.

For the main effects for process design-related factors, we did not find any support for H2a ($b_3 = -0.198$, $p = 0.381$) on standardization. H2b suggests a negative relationship between automation of the last step and PD. However, the identified relationship is statistically significant ($b_4 = 0.817$, $p < 0.001$) and surprisingly positive, i.e. time-prolonging. The full model indicates that this relationship is moderated by employee training that intensifies the

Table 2. Bivariate correlations matrix for all variables except categorial control variables

Variables	(1)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) Process duration	1.000								
(4) Number of securities	0.099***	1.000							
(5) Contract creation automation	0.123***	0.022***	1.000						
(6) Standardization	−0.085**	−0.105***	0.064***	1.000					
(7) Resource utilization	0.168***	−0.004***	0.021***	0.021*	1.000				
(8) Error frequency	0.200***	0.053***	−0.129***	−0.103***	−0.089***	1.000			
(9) Documentation	0.102***	0.056***	−0.296***	−0.371†	−0.035***	0.160**	1.000		
(10) Employee training	−0.090***	0.005***	0.084***	0.134***	0.003***	0.007***	0.013***	1.000	
(11) System discontinuities	0.191***	0.020***	0.080***	0.068***	0.121***	0.090***	−0.023***	0.014***	1,000

Note(s): Pearson and Polyserial correlation coefficients are shown. $n = 296$. †$p < 0.10$, *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

Variables		Model 1			Model 2	
Intercept	7.893***	(0.677)	[6.561; 9.225]	6.782***	(0.819)	[5.169; 8.395]
Control dummies[a]						
Savings banks	−0.308	(0.572)	[−1.434; 0.819]	−0.515	(0.558)	[−1.611; 0.584]
Private banks	−0.362	(1.208)	[−2.741; 2.016]	−0.438	(1.208)	[−2.816; 1.941]
TA2	0.502	(0.764)	[−1.003; 2.006]	3.448*	(1.445)	[0.603; 6.293]
TA3	0.004	(0.767)	[−1.505; 1.514]	6.391*	(2.685)	[1.104; 11.677]
TA4	0.682	(0.644)	[−0.585; 1.949]	1.565	(1.271)	[−0.937; 4.066]
TA5	2.042†	(1.169)	[−0.260; 4.343]	1.564	(1.146)	[−0.692; 3.820]
TA6	0.895	(2.101)	[−3.224; 5.031]	−0.291	(2.539)	[−5.289; 4.708]
Main effects						
STAND[2]	−0.198	(0.225)	[−0.641; 0.246]	−0.149	(0.218)	[−0.579; 0.280]
CCD	0.589*	(0.227)	[0.142; 1.037]	0.509*	(0.221)	[0.074; 0.944]
AUT	0.817***	(0.229)	[0.365; 1.268]	0.827***	(0.224)	[0.385; 1.269]
SEC	0.273	(0.214)	[−0.148; 0.694]	0.312	(0.208)	[−0.098; 0.722]
DOCU[b]	−1.172†	(0.635)	[−2.423; 0.078]	0.429	(0.935)	[−1.411; 2.269]
log(UT/(1-UT))	0.764***	(0.224)	[0.324; 1.204]	0.831***	(0.217)	[0.403; 1.259]
TRAIN	−0.318	(0.216)	[−0.744; 0.108]	1.049*	(0.437)	[0.189; 1.909]
ERR	0.939***	(0.222)	[0.502; 1.375]	0.981***	(0.214)	[0.559; 1.402]
APP	0.360	(0.243)	[−0.118; 0.839]	0.385	(0.238)	[−0.083; 0.853]
Interaction effects						
ERR · SEC				−0.576**	(0.209)	[−0.987; −0.164]
TRAIN · TA2				−3.148**	(0.963)	[−5.045; −1.251]
TRAIN · TA3				−1.009	(0.727)	[−2.440; 0.422]
TRAIN · TA4				−1.802***	(0.531)	[−2.847; −0.757]
TRAIN · TA5				−1.366	(0.877)	[−3.092; 0.362]
TRAIN · TA6				0.330	(3.073)	[−5.720; 6.380]
AUT · TRAIN				0.449*	(0.214)	[0.027; 0.871]
DOCU · TA2				−3.435*	(1.658)	[−6.700; −0.170]
DOCU · TA3				−7.072*	(2.834)	[−12.651; −1.491]
DOCU · TA4				−1.323	(1.361)	[−4.001; 1.355]
DOCU · TA5				NA	(NA)	
DOCU · TA6				NA	(NA)	
Adj. R^2	0.156***			0.226***		
Δ adj. R^2				0.07***		

Note(s): $n = 296$. Non-categorical independent variables are standardized. Standard errors in parentheses. Bootstrapped (1,000 reps) 95%-confidence intervals in brackets. †$p < 0.10$, *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$. [a] "cooperative banks" and TA_1 are the respective baseline category. [b] "no documentation" served as baseline category

Table 3.
Regression results

impact of automation ($b_{12} = 0.449$, $p < 0.05$), as shown in Figure 2. This is somewhat in contradiction to our expectations.

Regarding process execution, Model 1 confirms both H3a on the impact of utilization ($b_5 = 0.764$, $p < 0.001$), as well as H3b on error frequency ($b_6 = 0.939$, $p < 0.001$). For this last variable, the full model additionally supports the moderating effect of the number of securities ($b_{13} = -0.576$, $p < 0.01$), indicating that an increase in securities reduces the negative effect of increasing error rate. While the results confirm H3c on the contract creation duration ($b_7 = 0.589$, $p < 0.05$), they indicate no support for H3d on the number of securities involved in the application ($b_8 = 0.273$, $p = 0.203$).

For BPM-related factors, both models show a negative impact of documentation on PD that is intensified for small banks, i.e. TA_2 ($b_{14,2} = -3.435$, $p < 0.05$) and TA_3 ($b_{14,3} = -7.072$, $p < 0.05$), supporting H4a at least partially. This moderating effect cannot be tested for large

banks (TA_5, TA_6), which all already have proper documentation. For TA_4, the moderation is not confirmed ($b_{14,4} = -1.323$, $p = 0.332$). The direct effect of training remains unknown, as H4b cannot be confirmed ($b_{10} = -0.318$, $p = 0.143$). Yet, there is a negative interaction effect of training and bank size, which is statistically significant for TA_2 ($b_{15,2} = -3.148$, $p < 0.01$) and TA_4 ($b_{15,4} = -1.803$, $p < 0.001$), but not for TA_3 ($b_{15,3} = 1.009$, $p = 0.166$), TA_5 ($b_{15,5} = 1.366$, $p = 0.121$) or TA_6 ($b_{15,6} = 0.33$, $p = 0.914$). These interaction effects are shown in Figure 3. Last, we cannot confirm H5 on IT-system disruptions ($b_{11} = 0.360$, $p = 0.139$).

4. Discussion

This paper aims at identifying the impact factors of process responsiveness, i.e. specifically the process duration of the PAEP. As some interviewees insinuated, we indeed notice a large heterogeneity in throughput time, which indicates that banks perform very differently in their competition on time, leaving much room for research. Various interviewees indicated that the analyzed process is currently attracting much attention given the pressure to increase efficiency and to raise the still low margins, which gives even more relevance to the findings presented hereinafter.

Out of the many interesting results revealed by our analysis, we focus on the most noteworthy ones. First, documenting processes has a beneficial effect on process speed, as in line with existing literature. Rohleder and Silver (1997), e.g. claim overcomplicated and unclear processes as waste, which is a symptom treatable by documentation. A follow-up interview with an industry expert confirmed the raising importance of process documentation, which underlines our results. While proper process documentation already exists in all larger banks (TA_4, TA_5) of our sample, as expected, small banks (TA_1, TA_2) can benefit significantly from investing in process mapping. Model 2 reports comparably impactful coefficients, highlighting the relevance of this moderation. Hence, we strongly

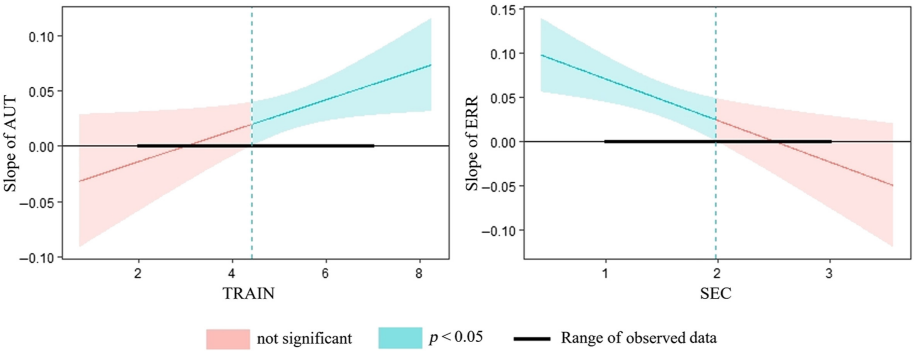

Figure 2.
Johnson-Neyman plots for the interaction effects of AUT and ERR (non-standardized)

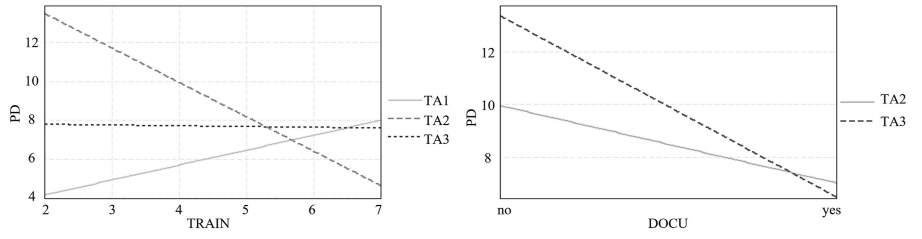

Figure 3.
Statistically significant interactions for TRAIN and DOCU (non-standardized)

recommend banks to invest in process documentation, thereby inherently and simultaneously increasing BPM maturity. While this applies in particular to small banks, the same holds in general for service providers, as process mapping increases transparency of process steps and responsibilities, enabling a smoother flow of cases through the service process. We refer the interested reader to Bandara *et al.* (2021) to consult success factors of process modeling projects.

Second, automation seems to prolong the overall process. Although this finding challenges existing knowledge at first sight, there is also additional evidence for this perspective, both from existing literature as well as our data. Säfsten *et al.* (2007) claim unsatisfying effects of precipitant automation and refer to the commonly known Solow paradox, which postulates that IT investments do not lead to productivity or efficiency increases. This phenomenon has been intensively studied, also in the banking industry, with inconclusive results (e.g. Beccalli, 2007). While there are claims of a revival of the paradox (Krishnan *et al.*, 2018), other studies indicate a negative net effect of information and communication technology (ICT) investments, as in Mallick and Ho (2008), who examine the coherent network effects to explain the Solow paradox in US banks.

To investigate this seemingly surprising result further, correlation analysis shows that automation and activity duration of contract creation are negatively correlated ($R = -0.23$, $p < 0.01$) in our data. As automation appears to increase the speed of the respective activity, it also correlates with a higher lay time ($R = 0.13$, $p < 0.05$), which could be a potential explanation. Besides inferential statistics, other industry observations can explain this finding. Given that the data capture a snapshot of the banks' current performance, there might be lags due to adjusting systems or benefits that have not materialized yet. Another explanation, as mentioned in a follow-up interview by an industry expert, is a capacity misfit through optimization, e.g. through automation. Such measures decrease the resource requirements. If capacity is, however, kept stable, employees may start to work slower as they now have more time, creating longer cycle times. The expert also mentioned that partial automation could lead to manual revisions or even adaptations by a bank employee if the contract is not created completely automatically. Moreover, AUT considers the last step in the process, which is the easiest task to automate. If AUT is hence linked to banks' intent to realize quick wins via automation, process innovation might not have been sufficiently attended to when automating precipitately. ICT investments are shown to only indirectly increase productivity via process innovation (Kijek and Kijek, 2019). Generally, if automation only mechanizes old ways of doing business, investing in IT delivers disappointing results (Hammer, 1990). From this, we carefully emphasize the importance of a holistic process optimization measure, considering the complete process instead of pursuing precipitant contract creation automation measures.

When looking at the effect of automation, the moderation effect should be considered as well. The Johnson-Neyman interval confirms a significant slope of automation when TRAIN>4.42 ($p < 0.05$), i.e. when a medium to high relevance is attributed to training. Yet, as the moderator measures the importance of training in the past, we do not know if training actually took place or if it included automation. We only conclude that efforts in automation, which may include training measures, do not fully translate into increases in process performance.

Third, error-induced delays or process disruptions appear to be less severe for complex cases with more involved securities, judging from the interaction effect. While this at first sight points towards a potentially positive impact of higher customer involvement in complex cases, the Johnson-Neyman interval reports significance of this interaction only when SEC<2 ($p < 0.05$). Thus, this correction factor is only proven for easy cases with one security, which fits to the common expectation that errors in easy cases are solved more quickly. Generally, errors hurt the process performance and should be avoided.

Forth, we see a speed-increasing correction factor for training in small banks with a noticeable effect size. Yet, this cannot be fully evaluated as the true direct effect of training remains unknown.

Last, there are some hypotheses we cannot confirm. Especially the impacts of IT landscape and potential system discontinuities remain unknown. Group association and group-specific IT infrastructure are often given as excuses by banks for not being able to surpass certain obstacles and, given our indecisive results, should therefore be analyzed further in the future.

In conclusion, judging by the respective absolute value of the coefficients, documentation appears as a highly important and very impactful influencing factor of process responsiveness. In general, the results from this banking example of a mass service can be transferred to other mass service processes with equally limited customer interaction, which puts special focus on the waiting time endured by customers.

5. Conclusion

This paper sheds some light onto the impact factors of process responsiveness, which is linked to cycle time and ultimately to a service provider's efficiency. From a customer perspective, the lack of responisveness manifests itself as waiting time. Substantiated by literature, 43 expert interviews allowed the creation of a framework, which subsequently is tested in a quantitative study. Based on 296 useable survey responses, the direct effects of two control and nine independent variables, as well as four related interaction terms on PD of the PAEP are investigated using OLS regression. Model 1 indicates a negative relationship of process documentation and PD, while utilization, error rate, contract creation duration and contract creation automation are each positively related to PD. Model 2 confirms the moderating effect of some bank sizes for both documentation and training, as well as the interaction of number of securities and error rate, and of automation and training. Recommendations for banks and service providers are derived, highlighting the especially impactful and beneficial effect of process documentation on process speed.

We hence add on existing theory by qualitatively deriving a framework for the impact factors of responsiveness and by quantitatively testing the proposed predictors. We further address the superior question of strategic fit and provide answers on how to achieve a certain level of process capability in a broader sense. After all, high-performing firms have a better alignment between the operations strategy and operational activities than low-performers (Prajogo and McDermott, 2008). This work also provides valuable recommendations both for banks to improve their process' performance with regard to responsiveness, as well as for researchers in services, since the existing literature still lacks a holistic analysis of process improvement measures.

Several managerial implications can be derived. First, proper process documentation should be attributed the necessary attention. From the expert interviews, we know that documentation is often perceived as not paying off, yet our results prove otherwise, especially for small organizations. We hence recommend using this knowledge to enhance transparency of the process through process mapping. Second, smaller organizations seem to also benefit more from training, despite the direct effect of training remaining unknown. Smaller service providers can take advantage of this knowledge. Third, our results indicate that managers can also leverage the simplicity bonus in the effect of errors, which punishes complex cases more. Especially errors like missing information might be reduced through appropriate measures. Fourth, we recommend managers to closely monitor resource utilization, which is hard to manage in service operations with fluctuating demand. Fifth, our analysis suggests that process automation should be pursued as a holistic process improvement initiative, revisiting Hammer's (1990) paradigm: "don't automate, obliterate".

The moderate adjusted R^2 of 0.226 and the existence of four interaction effects illustrate the complexity of this paper's research question, as the comprehensive model only partially explains process responsiveness. Nevertheless, we can confirm several hypotheses, which extend the current literature and provide valuable insights for practitioners and banks on how to improve the loan application process or any other service process in terms of responsiveness.

Future research can build upon these findings to further investigate the impact factors and to complement the findings of this survey, e.g. in another setting or by using another methodology to capture some additional potential predictors outside the focus of our research design, which is limited to this application case's most interesting factors. The German culture is known for valuing documentation as means for standardization, yet this might not be the case in other cultures. Given the multitude of propositions from the literature, the theoretical framework can also be further refined. While we judge the chosen process as a representative service process, this analysis could also be transferred to another service industry or to a process with more customer interaction. Lastly, the identified effects of automation call for further scrutinized research to investigate the underlying reasons in detail, as literature on potential side effects of automation is still limited. Although some studies indicate negative effects of investments in ICT, others praise automation, so the scientific evidence is still inconclusive.

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Corresponding author
Laura Johanna Oberle can be contacted at: laura.oberle@uni-mannheim.de