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SOFTWARE BUSINESS MODEL DETERMINANTS OF PERFORMANCE – INSIGHTS FROM GERMANY

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Abstract

While a long tradition of research has analyzed many determinants of firm performance, the impact of business models has become an entity of recent and growing interest. Though business models are defined as multifaceted concepts, previous empirical studies often apply narrow concept definitions by focusing on aggregated business model classes or few firm characteristics only. In this paper, we address this research gap by analyzing the impact of a comprehensive business model concept on firm performance. For that we focus on an industry of information goods: the software industry. We collect data from Germany via a large scale industry survey. The results show that various business model characteristics impact perceived, realized, and target firm performance. The interpretation of each significant variable provides insights into positive and negative characteristics of software business models. These findings suggest that a broad set of business model characteristics needs to be considered when evaluating business model performance. This cross-disciplinary analysis from a strategic management and information systems perspective provides insights into characteristics and performance of software business models.

Keywords: business models, performance, software industry, information goods

1 Introduction

Business models are of rising importance and are frequently referred to by practitioners in business talks, annual reports, and newspaper articles. The term business model emerged during the mid-1990s, driven partly by the shift from traditional to electronic business. Business models have since been of major interest to scholars in management and information systems (IS) research (Burkhart et al. 2011). Conceptual and empirical work continues to accumulate and the rising importance of business models as a research stream is reflected in the growing number of publications in recent years.

The business model research stream addresses various aspects of business models such as theoretical foundations, definitions, conceptualizations as well as classifications, and performance implications. Despite a growing number of studies, empirical evaluations are lagging behind conceptual research. Empirical research is emerging but still small in numbers. Nevertheless, business models are accepted as unit of analysis in organizational and entrepreneurship research (Lambert and Davidson, 2012). Also, first results provide empirical evidence to support the existence of relationships between business models and firm success (Zott and Amit, 2008).

In this light, business models provide a promising research field of firm performance drivers. In their literature review, Lambert and Davidson (2012) summarize empirical business model studies and reveal publications exploring the impact of business models on enterprise performance. Notably, studies usually analyze business model concepts that are rather narrow in scope. For instance, two often cited studies (Malone et al., 2006; Zott and Amit, 2008) limit their analysis to two business model characteristics, type of product and rights sold as well as efficiency- and novelty-centered business models, respectively. While a narrow business model concept facilitates the study design and data collection, these studies may fall short in reflecting the comprehensive nature of business models.

To increase the practical relevance of business model research and to provide meaningful conclusions, several studies use industry-specific operationalizations (Lambert and Davidson, 2012). Strategic management research also acknowledges that meaningful conclusions require an industry-specific set of variables (Mehra, 1996). One reason is that industry-specific variables are more meaningful in delineating firms. Another reason is that researchers require deep knowledge of the particular industry under study. Especially, the software sector representing an industry of information goods seems to be a promising ground for research. The economic relevance of the software industry is gradually increasing as emphasized by the success and growth of software firms such as Google and Facebook. Being a dynamic industry, particular business models and innovations thereof are often cited as key success factors (Rajala, 2009). The importance of business model analyses also relates to the fact that the software industry is characterized by specific economic characteristics that distinguish it from other sectors (Buxmann et al., 2012). These characteristics refer to the properties of software products (e.g. ease of replication) and markets (e.g. network effects). Software business models should hence build upon these specific characteristics.

To date, only few studies have analyzed business model performance in the software industry. While Zott and Amit (2008) and Grover and Saeed (2004) mainly focus on Internet firms, other authors explicitly focus on software firms (Rajala, 2009; Valtakoski and Rönkkö, 2010; Schief et al., 2012; Engelhardt, 2004). Nevertheless, these studies, again, do not apply a comprehensive business model concept. It hence remains unclear which business model characteristics determine software firm performance.

With this paper, we contribute to the empirical business model research stream by analyzing a comprehensive and industry-specific business model concept. Accordingly our research question is:

Which business model characteristics determine the performance of software firms?

We use a detailed business model framework specific to the software industry. Based on a survey of German software firms in the year 2012, we obtain detailed business model and performance

information of 94 firms. Our regression analyses identify multiple determinants of performance and indicate that a comprehensive industry-specific business model concept builds a valuable foundation to determine firm performance. We hope that this paper will contribute to the empirical research on business models. Further, we would like to encourage researchers to broaden their perspective when analyzing the multifaceted concept of business models. Practitioners will find the business model characteristics and their implications useful in decision-making process.

The remainder of this paper is organized as follows. The next section derives the hypotheses of our study. The third section describes the method employed to select the sample of software firms, to conduct the survey, and to derive the dependent and independent variables. Next, we outline the descriptive results of our study. The fifth section then discusses our findings and derives implications for researchers and practitioners. The final section concludes the paper by presenting limitations and avenues for further research.

2 Hypotheses Development

The analysis of business model performance highly relates to the research on determinants of firm performance. The latter have been of long and continuous interest to many researchers and research fields (Capon et al., 1990). It has been shown that firm performance is affected at three levels: industries, intra-industry groups, and firms (Short et al., 2007). Multiple studies have shown that the firm level has the highest impact (Mehra, 1996; Short et al., 2007; McGahan and Porter, 1997). Consequently, a firm's discretionary strategic choices have been found to be the main determinants of firm performance.

Following strategic management researchers, two main perspectives can be taken to explain how business models affect firm performance: the market- and the resource-based view (Mehra, 1996). The market-based approach suggests that industry structure forces firm conduct (Bain, 1956). In that view, industry structures determine firm performance. However, it has been found that intra-industry groupings exist which vary in performance (Hunt, 1972). Strategic group researchers have since then focused on finding intra-industry variations along strategic dimensions such as scope and resource deployment. The resource-based approach advocates that firms gain competitive advantage through unique resources and capabilities (Barney, 1991). "Thus, it may be inferred that systematic differences exist between firms as a result of 'strategic' resource choices, i.e., decisions to invest in building resource bundles which are often difficult and costly to imitate" (Mehra, 1996). The market- and resource-based approaches are complementary and taken together they explain performance effects. According to Casadesus-Masanell and Ricart (2010) business models integrate the activity-based and resource-based perspectives and facilitate the identification of sources of competitiveness. The resource- and the market-based view hence provide a theoretical explanation for the impact of business model characteristics on firm performance.

Performance is known to be multifaceted and thus difficult to capture with a single measure. In response, most studies in strategic management research use multiple measures to capture different aspects of firm performance (Short et al., 2007). Perceived and realized performance are two different aspects that can be captured with different measures (Zott and Amit, 2008). Perceived performance reflects subjective expectations regarding firm performance. For instance, market-based measures reflect the stock market expectations regarding future, long-term cash flows to shareholders. In turn, realized performance reflects objective, past firm performance. For instance, accounting-based measures use historical data of past, short-term, realized firm profitability. Finally, business models are also expected to have a lagged impact on future firm performance. In this light, the target performance of a firm builds a further interesting success measure representing the future potential of a certain business model. Accordingly, in this paper, we hypothesize that business models have an impact on firm performance:

- H1: Perceived performance varies systematically with differences in business model characteristics.
- H2: Realized performance varies systematically with differences in business model characteristics.
- H3: Target performance varies systematically with differences in business model characteristics.

3 Data and Method

In this study a comprehensive business model concept is used which comprises a broad set of variables specific to software firms. No secondary sources are available for most of this data because their measurement requires deep knowledge of the software industry, the respective firms, and their products. We thus conducted a survey among German firms to collect this detailed data. This section outlines our sample as well as the survey method, the (independent) business model variables, the (dependent) performance variables, and the hypotheses testing methods.

3.1 Sample and survey method

The primary data for this study was collected from a large-scale survey of software firms in Germany. Our sample was drawn from the Bureau van Dijk Orbis database. We selected the sample based on standard industry classification (SIC) codes, selecting firms whose primary three-digit SIC code is 737. The vast majority of firms belongs to the SIC codes 7371, 7372, or 7373, which have been used in previous studies of the software industry (Léger and Quach, 2009). We reviewed this set of firms and excluded all companies without an email or website address. Then, we combined entities that were actually just one firm (e.g. corporations with subsidiaries or holding firms) based on a comparison of their email and website addresses as well as entity names. Finally, we crawled contact email addresses where only a website address was available and we removed firms from our sample where no email address could be retrieved. After completion of these steps, the total contact list included 21,583 firms.

The survey was implemented following a modified version of the tailored survey design method (Dillman, 2000). The survey was conducted in German and English. The original questionnaire was designed in English and then translated to German using an adapted back-translate procedure (Brislin, 1970). The data collection process was conducted through a web questionnaire. A link to the survey was sent to all firms via email. Several approaches were taken to convince the informant of the importance of the survey. Most importantly, we promised to provide firm-specific evaluations to the respondents as an incentive to respond.

The data collection process began by sending out the survey to 21,583 firms on 9th May 2012 and a second batch of reminder emails was sent on 4th June 2012. The total number of responses was 524. Full answers were required because many relevant questions were placed at the end of the survey and we found full answers to be more reliable in general. Further, we eliminated clerical errors and outliers by using five standard deviations as a threshold. In total, 94 full answers qualified for our analyses.

Whereas the response rate may seem comparably low, the reasons can easily be explained: We mostly contacted firms through their general email addresses. We further found many of the email addresses to be inactive (ca. 15 percent). Furthermore, several respondents stated that they do not want to be included in the survey. Others reported that they do not perceive themselves as software firms. Both types were persistently removed from our contact database but not counted as respondents to our survey. We admit that the representativeness of our data is hence limited; however, our sample comprises a wide range of firms. The number of employees ranges from 1 to 55.750 with a median of 10 emphasizing the number of small and midsize software businesses. With respect to firm age, the oldest sample firm was founded in 1972 and the most recent ones in 2011. The median firm age is 12.

3.2 Business Model Variables

We analyze 20 software business model characteristics based on the concept proposed by Schief and Buxmann (2012). It is derived from non-industry-specific business model conceptualizations (Morris et al., 2005; Osterwalder, 2004) and adjusted for the software industry based on its economic properties (Engelhardt, 2004; Buxmann et al., 2012; Messerschmitt and Szyperski, 2005). The concept has been validated in praxis through expert interviews (Schief and Buxmann, 2012), workshops and trade fairs (<http://www.bmbf.de/de/6000.php>). It contains 20 characteristics grouped into 5 categories: strategy, revenues, upstream, downstream, and usage. While the following list provides a brief description of each characteristic, Table 1 reports the operationalization of the respective variables.

1. Group: Strategy
 - Investment Horizon: We investigate a firm's growth attitude as strategic time horizon.
 - Unique Selling Proposition: We analyze the importance of differentiation strategies.
 - Software Stack Layer: We differentiate the type of software based on its system layer.
 - Value Chain Strategy: We investigate the importance of software development as key value chain activity.
2. Group: Revenues
 - License Model: The license model relates to the legal regulations associated with the software solutions.
 - Pricing Model: We analyze the structure of payment flows as important software pricing parameters.
 - Sales Volume: We explore relative sales volume by asking for a firm's market share.
 - Revenue Source: We examine, if the revenues mainly stem from services or products.
3. Group: Upstream
 - Technical Platform: We investigate, if the products are designed to run on traditional platforms such as desktop or laptop computers.
 - Implementation: We analyze the implementation effort for a software solution.
 - Localization: We explore the degree of German firms' internationalization.
 - Degree of Standardization: We differentiate between customer-specific and standard software.
4. Group: Downstream
 - Channel: We discriminate between direct or indirect sales channels.
 - Target Industries: We evaluate, if a few or a broad set of industries is addressed.
 - Target Customer: We distinguish between private consumers and business customers.
 - Target User: We explore the type of user a software solution is designed for.
5. Group: Usage
 - Operating Model: We differentiate between on-premise and on-demand offerings.
 - Support Model: We ask for the nature of support issues.
 - Maintenance Model: We refer to the frequency of software releases.
 - Replacement Strategy: We analyze the number of available product releases at a time.

Strategy	Question in Survey	Scale	Minimum / 0	Maximum / 1
Investment Horizon Unique Selling Proposition	Growth is the most important objective of our firm. Estimate the importance of the following strategies to your firm. Importance and use of product- or service-related patents Branding and advertising as part of firm's marketing strategy/approach Be unique in our industry (e.g. with regard to the product, delivery system, or marketing) Which of the following best describes your firm's products (or products that your services aim at)?	5-point Likert scale 5-point scale 5-point scale 5-point scale 5-point scale	Strongly disagree Not important at all Not important at all Not important at all Software designed to help the user to perform specific tasks, e.g. ERP, accounting, office, media, games 0: other options	Strongly agree Very important Very important Very important Software designed to integrate information systems, e.g. operating systems, middleware, engineering, security, servers 1: "Yes, software development is a major activity"
Software Stack Layer	Does your firm develop software?	Bipolar	0: other options	1: "Proprietary licenses" or "All rights are transferred to our customers" Recurring payment, e.g. subscription >80%
Revenue	Which license type do you mainly use for your firm's software products? Which of the following best describes how your firm generates revenues? Please estimate the market share of your main product/service in the main market Which one of the following options best describes your business?	Bipolar 5-point scale 5-point scale Bipolar	0: other options Single payment, e.g. up-front <10% 0: other options	1: "Software product firm" or "Firm that manufactures devices that contain software (embedded software)"
Upstream	For which platforms does your firm to a significant degree develop software for in 2011? How would you rate the effort for installation, configuration, adjustment, and business process reengineering related to your main software product? How is your revenue distributed between the following geographic areas? "Germany": How well do the following statement describe your firm's main product/service? "Our product/service requires knowledge on technology interfaces specific to each customer"	Bipolar 5-point scale 0-100% 5-point Likert scale	0: other options low 0% Strongly disagree	1: "Desktop or laptop computers (e.g. Windows, Linux)" high 100% Strongly agree
Downstream	Which is the primary sales channel to sell your firm's products/services to the market? Please estimate the revenue share from products or services that are specific to a particular industry (e.g. banking, manufacturing, medical). How is your revenue distributed between the following customer segments? "Consumers": Who are the target end-users of your product/service?	Bipolar 5-point scale 0-100% Bipolar	0: "Indirect (using intermediaries, e.g. retailers)" <10% 0% 0: "Software developers"	1: "Direct (e.g. own sales department)" >80% 100% 1: "Non-software developers"
Usage	Which of the following two options best describes how your software product is mainly operated? In case your company provides support, which of the following statements best describes the support offering? How often per year do you provide new releases of your software? How many releases of the same product do you maintain in parallel in the marketplace?	5-point scale 5-point scale 5-point scale 3-point scale	On-premise (i.e. installation and execution on local systems) The nature of customer issues is rather predictable 1 (once a year) 1	On-demand (i.e. installation and execution on a central hosting platform supporting the access via Internet, e.g. SaaS) Each customer issue is rather individual 52 (weekly) 3 (3 or more)
Operating Model				
Support Model				
Maintenance Model				
Replacement Strategy				

Table 1. Operationalization of software business model characteristics.

3.3 Performance Variables

The purpose of our study is to measure perceived, realized, and target performance capturing three different aspects of firm performance. Empirical business model research has employed a wide range of different performance variables (Lambert and Davidson, 2012). The choice of variables depends on the applied study method, which is an industry survey in our case.

Perceived performance is often analyzed by market-based measures (e.g. Tobin's q), which had to be excluded from the start as our sample mostly comprises private firms. Instead, perceived performance was operationalized by asking the respondent: "How do you estimate the growth of your firm relative to your competitors?" on a five-point Likert scale (ranging from "much smaller" to "much higher").

For realized performance, researchers tend to investigate accounting data such as revenues. However, this kind of data was difficult to obtain in our study as many firms were reluctant to disclose this sensitive information. Thus, realized performance was approximated through growth in personnel numbers from year 2010 to 2011. While personnel growth may be biased (e.g. through outsourcing or size of firms), it can be considered a reasonable proxy of firm growth (Valtakoski and Rönkkö, 2010).

Target performance accounts for the possible time lag between business model decisions and performance implications. Strategic management often uses a lagged model and calculates strategies based on five-year periods (Short et al., 2007). Likewise to realized performance, we could not collect sufficient accounting data in our study. Thus, we calculated the difference in personnel number between year 2011 and the ideal (according to the firm management) personnel number in 2016. By that we approximate the future performance and account for the time lag between business model decisions and resulting performance implications.

3.4 Hypotheses testing

Prior to hypothesis testing, all data was combined into one database. Actual data preparation and analysis was carried out using R statistic software. We checked all independent variables for multicollinearity by looking at the correlations between pairs of independent variables. The results are presented in Table 2. The maximal correlation was 0.43, with most correlations well below this value. We thus did not see any need to remove variables. We used standard ordinary least squares (OLS) regression to test all three hypotheses. All variables have been standardized in order to be able to compare the magnitude of the regression coefficients.

4 Results

4.1 Descriptive Statistics

In terms of strategy, the investment horizon (mean = 2.8) and unique selling proposition (3.1) tend to favor growth and differentiation strategies. The majority of firms develops application software (1.9) and judges software development a major activity (0.8). The revenue models are dominated by proprietary license models (0.8) and most firms achieve market shares up to 30% (2.0). Payment flows often consist of hybrid combinations (2.4) and firms tend to make more revenues with products than with services (0.6). The upstream variables indicate that most firms still serve personal computers as technical platform (0.8), address the German market (78%) and provide customized solutions to their customers (3.8). The average implementation effort is neither low nor high (2.6). The downstream characteristics are dominated by firms selling their products through direct channels (0.9) to end-users (0.9) of business customers (4.4% consumer) in specific industries (3.2). Looking at usage variables, most firms face customer specific support issues (3.4) and provide new releases every eight weeks (8). While the operating model (2.4) is evenly distributed, the replacement strategy indicates that most firms operate multiple parallel releases (2.3). Perceived performance is positively biased (3.3) and target performance (74.4) is higher than realized performance (30.1).

	Strategy				Revenue				Upstream				Downstream				Usage				Performance			
	Investment Horizon	Unique Selling Proposition	Software Stack Layer	Value Chain Strategy	License Model	Pricing Model	Sales Volume	Revenue Source	Technical Platform	Implementation	Localization	Degree of Standardization	Channel	Target Industries	Target Customer	Target User	Operating Model	Support Model	Maintenance Model	Replacement Strategy	Perceived Performance	Realized Performance	Target Performance	
Strategy	1	0.19	-0.05	0.07	0.23	0.08	0.11	0.16	-0.01	0.00	-0.09	-0.09	-0.19	0.30	0.00	-0.02	0.25	-0.22	0.03	-0.30	0.31	-0.07	-0.05	
		1	-0.01	0.08	0.16	0.02	0.28	0.22	0.02	0.03	-0.22	0.06	0.01	0.09	-0.08	0.03	-0.03	-0.17	-0.23	-0.10	0.42	0.19	0.22	
			1	-0.42	-0.07	0.09	0.12	-0.31	-0.16	0.17	0.06	0.11	0.28	-0.18	-0.05	-0.21	0.03	0.14	-0.10	0.03	-0.04	-0.07	-0.08	
				1	0.07	-0.06	-0.16	0.38	-0.04	-0.24	-0.21	-0.09	-0.20	0.11	0.03	-0.05	-0.04	-0.26	0.09	0.11	-0.06	0.05	0.06	
Revenue					1	-0.22	0.18	0.04	0.05	-0.13	-0.07	0.01	-0.03	0.13	-0.11	-0.04	-0.21	-0.05	-0.27	0.01	0.12	0.05	0.06	
						1	0.01	-0.07	-0.07	-0.07	0.01	0.06	-0.19	0.12	0.15	0.07	-0.43	-0.21	0.06	-0.07	0.00	-0.11	-0.11	
							1	0.08	0.07	0.16	-0.09	0.09	0.06	0.33	-0.09	0.00	-0.15	-0.03	-0.20	-0.02	0.24	0.00	0.01	
								1	-0.03	-0.06	-0.23	-0.11	-0.15	0.16	-0.07	-0.09	-0.08	-0.23	-0.22	0.00	0.16	0.09	0.10	
Upstream									1	0.12	0.00	-0.10	-0.06	0.03	0.09	0.04	-0.06	0.06	-0.12	-0.04	0.16	0.05	0.04	
										1	-0.09	0.37	0.20	0.12	-0.19	0.17	-0.05	0.18	-0.01	0.15	0.03	0.19	0.19	
											1	0.06	0.26	-0.15	-0.31	0.14	0.04	0.33	0.10	-0.27	-0.23	-0.24	-0.27	
												1	0.32	0.15	-0.31	0.20	-0.06	0.07	0.03	0.28	-0.02	0.10	0.10	
Downstr.													1	-0.09	-0.19	-0.02	-0.20	0.32	-0.19	-0.05	-0.10	0.05	0.05	
														1	-0.06	0.20	-0.05	-0.13	-0.04	-0.07	0.04	-0.17	-0.18	
															1	0.03	0.23	-0.13	-0.04	0.01	-0.11	-0.03	-0.03	
																1	0.06	0.03	0.05	-0.05	-0.07	0.03	0.04	
Usage																	1	-0.07	0.23	-0.04	0.15	-0.09	-0.10	
																		1	-0.08	0.05	-0.30	0.14	0.12	
																			1	-0.03	0.06	-0.05	-0.05	
																				1	-0.21	0.12	0.13	
Perfor.																					1	-0.02	0.00	
																						1	0.99	
																							1	
Descriptive Statistics																								
	mean	2.8	3.1	1.9	0.8	0.8	2.4	2	0.6	0.8	2.6	78	3.8	0.9	3.2	4.4	0.9	2.4	3.4	8	2.3	3.3	30.1	74.4
	median	3	3	1	1	1	2	2	1	1	3	90	4	1	3	0	1	2	3	4	2	3	1	8
	s.d.	1.3	0.7	1.3	0.4	0.4	1.4	1.2	0.5	0.4	1.3	28	1.4	0.4	1.6	15	0.3	1.6	1.2	15	0.7	0.9	241	452
	min	1	1.3	1	0	0	1	1	0	0	1	0	1	0	1	0	0	1	1	1	1	1	-5	-1
	max	5	4.7	5	1	1	5	5	1	1	5	100	5	1	5	100	1	5	5	52	3	5	2252	4235
	N	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	87	88	

Table 2. Pearson correlations and descriptive statistics.

4.2 Regression Analyses

The regression analyses results are presented in Table 3. We calculate one model for each dependent variable. We derive the following conclusions with respect to our hypotheses. We find support for H1 (significant impact of business model variables on perceived performance) in Model 1. Overall this set of variables explains 30 percent of the variance in the firms’ growth estimates compared to competitors (at $p < 0.001$). In terms of strategy, firms following a differentiation strategy as unique selling proposition report superior growth rates. In contrast, firms mainly relying on software development as key activity report lower growth results. With respect to revenue variables, it remains unclear, if these characteristics impact the perceived growth of software firms as in our sample no significant findings can be reported. For upstream characteristics, companies perceive stronger performance by offering their solutions compatible to personal computers. Moreover, firms that address the German market only report inferior growth rates. In terms of downstream characteristics, companies perceive higher growth when addressing business customers instead of private consumers. Characteristics relevant during the usage of software solutions provide further significant results. Firms report positive growth results when offering on demand solutions, facing rather predictable customer issues, and when maintaining fewer parallel releases in the marketplace.

In Model 2 we find moderate support for H2 (significant impact of business model variables on realized performance). Overall this set of variables explains 16 percent of the variance in the firms’ growth in personnel over the last twelve months (at $p < 0.05$). With respect to strategy and upstream characteristics, no significant results can be reported. For revenue, the license model shows that firms using open source license models report superior growth. In terms of downstream characteristics,

firms offering solutions that are not specific to a particular industry outperform peers in personnel growth. During usage, again, firms maintaining fewer parallel releases in the marketplace grow faster.

Further, we find support for H3 (significant impact of business model variables on target performance) in Model 3. The overall model explains 28 percent of variation and is significant at $p < 0.01$. In terms of strategy, firms striving for a distinct growth strategy also target higher future growth rates. For revenue characteristics, firms applying a recurrent pricing model target higher future growth rates. With respect to upstream characteristics, firms offering standardized solutions expect higher personnel growth rates than their peers. In terms of downstream, again, companies target higher growth rates when addressing business customers instead of private consumers. In usage variables, a higher release frequency supports growth expectations.

		Perceived Performance	Realized Performance	Target Performance
		Model 1	Model 2	Model 3
Constant		3.25 ***	0.32 ***	1.61 ***
Strategy	Investment Horizon	0.08	0.09	0.57 *
	Unique Selling Proposition	0.26 **	0.08	0.23
	Software Stack Layer	-0.05	-0.04	-0.20
	Value Chain Strategy	-0.19 †	0.04	-0.14
Revenue	License Model	0.04	-0.15 †	0.15
	Pricing Model	-0.10	0.01	0.41 †
	Sales Volume	0.14	-0.05	-0.33
	Revenue Source	0.08	0.05	-0.17
Upstream	Technical Platform	0.19 *	0.08	-0.16
	Implementation	-0.03	-0.02	-0.25
	Localization	-0.20 *	-0.06	-0.09
	Degree of Standardization	0.04	0.04	-0.63 *
Downstr.	Channel	0.04	0.05	0.19
	Targe Industries	-0.10	-0.16 *	-0.22
	Target Customer	-0.16 †	-0.06	-0.37 †
	Target User	-0.05	-0.13	0.33
Usage	Operating Model	0.18 †	0.13	0.26
	Support Model	-0.19 *	-0.03	0.15
	Maintenance Model	0.14	0.02	0.46 *
	Replacement Strategy	-0.17 †	-0.25 **	-0.07
R ²		0.45	0.36	0.45
Adj. R ²		0.30	0.16	0.28
df		73	65	66
F		3.01 ***	1.82 *	2.67 **

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$; † $p < 0.1$

Table 3. Multiple regression analyses results.

5 Discussion

5.1 Insights from Perceived Performance

Overall, the model quality and significance levels for perceived performance are higher than for realized and target performance. A rationale for this result may refer to the lower number of responses for the other two dependent variables. Interviewees seem to be more reluctant to disclose their number of employees compared to a qualitative statement about their perceived competitive growth. Therefore, Model 1 reports the highest number of significant parameters covering the largest sample. Nevertheless, it needs to be considered that the perceived growth variable is positively biased.

The magnitude of the regression coefficients variables varies, but no single coefficient clearly exceeds the others. Thus, there is no single dominant variable. Reflecting the results of Model 1, the following insights and rationales can be derived. The positive impact of differentiation strategies in terms of a unique selling proposition refers to the assumption that these firms are able to avoid fierce competition as it often happens in commodity product markets. A pure focus on software development seems counterproductive. A reason for that finding may refer to the growth potential in complementary

service business (e.g. Software-as-a-Service). The relevance of desktop computers as platform seems to be still high as it allows reaching a broad customer base. Software that does not support desktop computers neglects a still powerful platform that attracts a high number of users. Further, international sales seem to be favorable. Since most of the firms in our sample mainly yield revenues on the German markets, international revenues can be seen as an indicator for additional growth opportunities. Particularly international booming markets such as China offer higher growth rates than in Germany. Since software is a digital good that can be easily distributed globally, firms can leverage additional international markets. Besides, business customers seem to offer higher growth rates than private consumers. This can be explained by two characteristics. First, private users usually have a lower willingness to pay as they tend to be more willing to use open source solutions or use illegal copies to avoid costs. Secondly, consumer markets are particularly exposed to network effects (e.g. social media software). Except a few large players such as Google and Facebook, it seems to be particularly hard for small firms to reach a sufficient stake in software consumer markets. In addition, firms having already morphed to Software-as-a-Service offerings seem to perceive stronger growth rates. This underlines the importance of this expected trend in the software industry. With respect to the support model, standardized issues are favorable as they generate less support effort. Firms can thus handle more customers with existing workforce and use remaining resources for growth activities. Finally, it seems beneficial to offer fewer releases on the market as less effort for maintenance and support is needed. Particular software-as-a-service offerings may help to reduce the number of available releases as the software vendor can influence the migration of customers to new releases. On-premise vendors are usually challenged to upgrade their installed customer base and hence need to spend more resources on the maintenance of multiple releases.

5.2 Insights from Realized Performance

Overall, model quality and significance levels for realized performance are lower than for perceived and target performance. Presented results are hence not as meaningful and representative as the results on perceived growth. This may refer to the reluctance to disclose sensitive information and the lower response rate. We think that further variables may turn significant with a higher number of responses.

Reflecting the available results, the following conclusions can be derived. Firms following an open source strategy outperform closed source companies in personnel growth. Open source companies can leverage external workforce for product development and may hence be more agile. Besides, software firms addressing a broad set of industries report stronger growth rates. They can address a broader customer base and are not limited to the economic development of one or few industries. Finally, a lower number of releases seems to support personnel growth. Firms need to spend less effort for maintenance of multiple releases and can spend remaining resources on growth driving activities. While only three characteristics reveal significant results based on our current sample, they provide first insights on relevant characteristics for firm growth. Nevertheless, it needs to be considered that personnel growth only approximates real firm growth.

5.3 Insights from Target Performance

Overall, model quality and significance levels for target performance are close to the ones of perceived performance. However, Model 3 only reports five significant variables. Future expectations may hence be less precise. Moreover, the applied personnel growth measure is only one proxy for future growth.

Notably, the strongest effect is contributed by degree of standardization. Standard software seems to be the foundation for higher growth rates as customer specific software generates more efforts and less network effects. Furthermore, firms that emphasize a growth mindset commit higher growth targets. With respect to the revenue model, our results show that firms judge recurring pricing models as basis for future growth. This refers to the assumption that these pricing models are supposed to generate higher future revenues to the account of lower initial upfront payments. Besides, the target customer results are in line with Model 1 results on perceived performance. Again, willingness to pay seems to

be lower and network effects constitute a higher entry barrier in consumer markets. Finally, shorter release cycles seem to be beneficial for future growth ambitions. Firms following a more agile development and release strategy tend to be more innovative and reach a faster time to market.

5.4 Implications for Researchers

This paper contributes to the long tradition of performance research (Schmalensee, 1985). We also provide a link between the two fields strategic management and information systems research. Both fields are interlinked in their attempt to determine what drives firm performance. While our study provides first insights on software business models, further studies of digital goods industries should follow, just as pharmaceuticals or banks have turned out to be of constant interest in the strategy field.

In general, we think that our results support the overall importance of the business model concept as unit of analysis. Interestingly, the significant elements stem from different areas. This finding supports our assumption that business models are a multifaceted concept that cannot be limited to a single or few elements. While studies focusing on a narrow business model concept can usually achieve bigger sample sizes and hence greater statistical power, they are often limited in their comprehensiveness. The simultaneous study of competing business model characteristics allows deriving conclusions on their relative importance. For researchers, this is a first step to identify potentially important variables and to identify combinations of variables that make up successful business models.

For those variables that do not show any significance in our models, no conclusion can be derived. Given a bigger sample size in next year's study, insights about these variables can be expected. Also moderating effects between independent variables seem to be a promising field for further research. These effects could be revealed by conducting cluster analyses. Finally, the most important business model characteristics can be revealed and may thus build the foundation for future research activities.

5.5 Implications for Practitioners

This research also makes contributions that are relevant to decision makers in software firms. Our study offers useful insights for software firm managers who are understandably curious about which strategic configuration is most profitable. They get an overview on characteristics of a comprehensive and industry-specific business model concept and their impact on performance. It is important for managers to reflect their own firm characteristics and to compare them with competitors and partners. Nonetheless, our study can only provide a foundation for the normative question of how individual firms can exploit or modify their strategies to improve their performance.

6 Conclusion

While determinants of performance have been of long interest to many researchers, few empirical insights from business model research exist. In particular, most studies use rather narrow concept definitions, despite the acknowledged multifaceted nature of business models. In this paper, we analyze a comprehensive and industry-specific business model concept and its performance implications based on the data from a survey in Germany in the year 2012. With respect to our research question "Which business model characteristics determine the performance of software firms?" we can report significant results for 14 out of 20 variables under study. The variables cover all five proposed groups: strategy, revenues, upstream, downstream, and usage. Our results emphasize two main conclusions, the importance of the business model concept as unit of performance analysis and the multifaceted nature of business models.

Certainly, this study is subject to limitations. Our sample comprises many small private firms and we could only capture limited aspects of firm performance. For instance, we could not use accounting-based measures as we were not able to obtain this sensitive data to a sufficient degree. Besides, our conclusions are based on single data points and might well be affected by variations in single years.

Further research should focus on addressing these limitations. Given the need for more in-depth insights, a mixed method approach could be performed including a qualitative perspective. Further, the sample should be broadened, for instance to cover further geographic areas. In addition, additional performance measures should be examined. Repetitive analyses will allow longitudinal comparisons.

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