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# Do Investors Recognize Information Technology As A Strategic Asset? A Longitudinal Analysis Of Changes In Ownership Structure And IT Capability

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# **DO INVESTORS RECOGNIZE INFORMATION TECHNOLOGY AS A STRATEGIC ASSET? A LONGITUDINAL ANALYSIS OF CHANGES IN OWNERSHIP STRUCTURE AND IT CAPABILITY**

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## **Abstract**

*IT capability is known to increase financial performance and affects strategic topics like vertical integration and competitive action. It is seen as a strategic although intangible asset and receives a lot of interest in research and practice. Recent studies show that this organizational asset is developed over time and needs continuous investment to be built. Long-term oriented investors value strategic assets as they are essential drivers for firms' long-term success and survival. Hence, compared to other companies in the same industry, a higher ratio of long-term oriented investors in a firm's ownership structure should reflect a firm's ability to create strategic assets. Based on archival data from 2000 to 2009 we investigate the interplay of a firm's IT capability and its ownership structure. We find that superior IT capability is related to a high ratio of long-term oriented investors. Further, empirical analysis shows that changes in IT capability induce adjustments in the ownership structure. This study contributes to the body of literature on the business value of IT by studying the capital market effects of IT capability. Practical implications and areas of further research are outlined.*

*Keywords: IT Capability, Institutional Investors, Firm Ownership.*

## 1 Introduction

Today, IT is seen as a distinguishing key performance driver of firms and is an important element of strategic considerations. Correspondingly, IT expenditure accounts for large and constantly increasing parts of firms' annual investment budgets. These investments are related to high expectations regarding future benefits IT is supposed to deliver. As a consequence, research investigated the role of IT in achieving competitive advantage. Studies show that IT per se does not drive value creation, but the ability of firms to transform IT expenditures into an organizational IT capability does. In particular, this ability of firms to deploy IT-based resources together with complementary organizational resources (Melville et al., 2004) gain a lot of interest.

IT capability is seen as an enterprise-wide capability to leverage skills and resources (Bharadwaj et al., 1999). The effect of IT capability was underpinned by a study presented by Bharadwaj (2000) who discovered that superior IT capability was associated with significantly higher profit ratios. In subsequent years, researchers extended the body of knowledge by showing that IT capability affects firms' ability to innovate (Gordon and Tarafdar, 2007), financial performance (Santhanam and Hartono, 2003; Stoel and Muhanna, 2009), and competitive advantage (Bhatt and Grover, 2005; Dehning and Stratopoulos, 2003). Thus, research on IT capability consistently highlights IT capability as a strategic asset and its relevance for competitive manoeuvres.

Strategic assets are valued especially by investors and consequently covered in the finance and accounting literature. In general, long-term oriented investors are attracted by strategic assets because of their interest in continuous and steady growth of their investments. This effect is demonstrated by studies that, for example, show investor reactions in response to research and development (R&D) activities (Cormier et al., 2009; Daniel and Titman, 2006; Jiang, 2010). Particularly, studies reveal that investors with longer investment horizons are attracted by corporate activities directed towards the development of strategic assets. These actions enable future firm success and more important desired revenue streams (Lin and Lee, 2004; Loibl and Hira, 2009). At the same time, short-term oriented investors also react when observing investments into strategic assets because continuous investments into these assets typically inhere risks in such a way that revenues and stock prices decrease in the short-term. Consequently, continuous investments into strategic assets lead to a shift in a firm's ownership structure towards long-term oriented investors (see Bushee (1998) for an example of R&D-related investments).

To sum up, the strategic role of IT capability is a central tenet in IS research for years. Several studies determine the positive effects of IT on accounting- and market-based performance measures but also on intermediate variables such as organizational agility. Results from academic research provide various arguments for CIOs to put IT on the corporate agenda. On the other hand, finance and accounting research provides insights that long-term oriented investors favor firms that develop and strategically invest into organizational assets and thereby generate future prospects. However, although there is an increasing interest in IS research regarding the strategic value of IT and an interest in what determines a firm's ownership structure in finance and accounting literature, the interplay between IT as strategic asset in terms of IT capability and a firm's ownership structure is rather unexplored. We strive to fill in this gap, especially with a focus on the development and differences over time, namely if changes in a firm's level of IT capability, e.g., from average to superior, invoke changes in its ownership structure. We therefore formulate the following research question:

*What is the relationship between the development of IT capability and firm ownership over time?*

This research question is addressed by integrating different sources of archival data. Information on IT capability for the last decade is retrieved from InformationWeek (cf. Bharadwaj, 2000; Santhanam and Hartono, 2003). This data is combined with ownership structures derived from a financial database provided by Thomson Reuters. To investigate the longitudinal relationship we apply a mixed-design analysis of variance (also known as a split-plot ANOVA).

Our research contributes to the literature on the business value of IT as well as on finance and accounting literature by relating firms' IT capability to their ownership structure. Whereas prior research primarily focused on firm-level outcomes of IT capability, we investigate capital market implications. Especially, we demonstrate that superior IT capability is related to an ownership structure characterized by a high ratio of long-term oriented investors. Further, we provide evidence that changes in the level of IT capability are linked to changes in the ownership structure. For finance and accounting research, the interplay between IT capability and ownership structure highlights the necessity to disclose IT-related information more rigorously, as it is for example the case in the healthcare industry (cf. Kohli et al., 2012). For practitioners, especially CIOs and IT management, we present further evidence of IT as a factor considered by capital markets. Prior research for example shows the impact of IT on bond ratings (Kim and Mithas, 2011). This research extends evidence on the strategic role of IT in attracting financial means and reducing costs of capital (Lev, 2001).

The remainder of this paper is organized as follows. The next section describes the theoretical background of our research, followed by the development of the research model. The section on methodology details the process of data selection and analytical choices. Subsequently, the results are presented, followed by a concluding discussion, managerial implications, and areas of further research.

## **2 Theoretical Background**

### **2.1 IT Capability**

Early research documents the necessity to transform IT investments into assets and resources. Their organizational employment eventually results in business value (Soh and Markus, 1995). Accordingly, research started to investigate the mechanisms that allow firms to leverage their IT investments to create assets that determine the effectiveness and efficiency of firms. Prior research considered technical assets such as IT infrastructure (Broadbent et al., 1999), managerial IT skills (Mata et al., 1995), and business-IT relationships (Ross et al., 1996). Besides the identification of IT assets, research also reveals that IT generates competitive value if it leverages business resources, thus drawing on the argument of complementarity (Powell and Dent-Micallef, 1997).

Building on these insights, subsequent research developed a multidimensional construct encompassing the ability of firms to leverage IT investments and create IT assets aligned with business resources. Consequently, Bharadwaj (2000, p. 171) defines this so called IT capability as the "ability to mobilize and deploy IT-based resources in combination or copresent with other resources and capabilities".

Empirical research investigates the relationship between IT capability and effects on business value. Focusing on accounting-based performance, Bharadwaj (2000) links the organizational IT capability to various performance measures such as Return on Assets and shows that firms possessing a superior IT capability outperform poorly equipped competitors. Whereas Bharadwaj (2000) applied a matching approach to compare superior IT capability firms to carefully selected control firms, Santhanam and Hartono (2003) extend her approach by comparing superior IT capability firms to the industry average. Results of the two studies are similar and document the performance benefits of firms with superior IT capability compared to direct competitors. Besides studies covering firm performance measures, recent research empirically verifies the positive association between IT capability and outcomes such as competitive advantage (Bhatt and Grover, 2005; Dehning and Stratopoulos, 2003), higher abilities to innovate (Gordon and Tarafdar, 2007), higher market valuations (Masli et al., 2011; Muhanna and Stoel, 2010), and relational value (Rai et al., 2012). These studies typically investigate IT capability as an intangible and strategic asset and reveal various benefits a firm can derive. Adapting the approach of Webster and Watson (2002), the following Table 1 presents a concept matrix that summarizes recent studies.

Articles	Concepts				
	Accounting-based Performance	Market-based Performance	Competitive Advantage	Innovation	Other outcomes
Ross et al. (1996)			x		
Bharadwaj (2000)	x				
Santhanam and Hartono (2003)	x				
Dehning and Stratopoulos (2003)			x		
Aral and Weill (2007)	x	x		x	
Gordon and Tarafdar (2007)				x	
Wang and Alam (2007)		x			x
Muhanna and Stoel (2010)	x	x			
Masli et al. (2011)	x	x			
Rai et al. (2012)					x

Table 1. Concept matrix of IT capability research

## 2.2 Firm Ownership

In the early times, founders and their descendants predominantly owned and managed firms and thus had a dual role. Due to capital requirements, firms opened up and sold shares to outsiders who became shareholders of the firm. These outside owners, also called investors, started to exert influence on firms' management to protect their investment and to ensure their return on investment. In many firms, especially in publicly traded firms, this development led to a split into owners on the one hand and employed managers on the other hand that did not hold noteworthy percentages of shares. The so called separation of ownership and control (Berle and Means, 1932).

Owners deviate in terms of several characteristics. While before the 1980s predominantly private owners prevailed in the U.S., nowadays institutional investors<sup>1</sup> represent the largest group. In the beginning, public pension funds constituted the first group of institutional investors. These funds exert influence on a firm's management by submitting official shareholder proposals, not publicly revealed management talks, and press releases to influence management decisions (Gillan and Starks, 2007). Institutional owners started to actively monitor and influence management's activities of companies they have invested into. This investor activism is characteristic for institutional investors and is also applied by newer types of institutional investors such as private equity funds and hedge funds. Nowadays, institutional investors dominate the financial markets and account for over 70% of total equity holdings (Gillan and Starks, 2007). They represent the most important group of investors that companies are looking for or are confronted with.

Investor behavior is for example characterized by (a) investor activism, i.e., how closely investors monitor companies and influence decision making, and (b) trading behavior. The trading behavior, i.e., whether an investor buys, holds, or sells shares, is the ultimate expression of an investor's assessment of a firm's assets, market value, and performance (Connelly et al., 2010; Gillan and Starks, 2007). One important characteristic influencing the trading behavior is the investment horizon of investors (Gaspar et al., 2005). In particular, dedicated owners with "large, long-term holdings, which are concentrated in only a few firms" (Bushee, 1998, p. 310f.) are specifically long-term oriented, i.e., they do not trade frequently. Those investors are interested in the long-term success of firms and have the ability to hold out (Gaspar et al., 2005).

<sup>1</sup> The SEC rule 13F defines institutional investors as those institutions that administer more than \$100 million in equity or whose holdings exceed \$200.000 in market value or 10.000 shares. Those institutions encompass insurance companies, banks, mutual funds, and pension funds that manage and invest money on behalf of others. Institutions holding shares for own interest, such as brokerage firms or arbitrageurs, fall not within the scope of Rule 13F [10, 52].

### 3 Research Model

As mentioned in the previous section, long-term oriented investors are more patient and do not pressure management to cut costs in favor of short-term earnings. The latter is typical for short-term oriented owners who influence the management to sacrifice expected earnings in the long-term and cut budgets to meet short-term earning goals and estimates (Bushee, 1998). Hence, short-term oriented investors do not value investments allocated to the development of strategic assets because they are risky, take time to render effects in the future and cost money at the present time (Ryan and Schneider, 2002). The opposite is true for long-term oriented investors. They focus on stable and sustainable development and are aware of business risks.

Furthermore, strategic assets, such as an IT or R&D capability, are often intangible and comprise management skills and human capital. Investors must have the ability to detect such intangible assets (Kimbrough, 2007) that are not reported in a balance sheet (Lev, 2001). Research shows that long-term investors developed sophisticated skills in monitoring and performing profound analysis (Bushee, 1998) that enable them to detect intangible assets. In other words, long-term oriented investors are interested in future prospects, value the development of strategic and intangible assets, and have the ability to detect and monitor them. On the other side, short-term oriented investors are interested in quarterly earnings and exploit their skills to predict the flow of earnings (Ke and Petroni, 2004). In sum, “short-term institutions are better at collecting and processing short-term information, while long-term institutions are better at collecting and processing long-term information” (Yan and Zhang, 2009, p. 894).

In terms of IT, Muhanna and Stoel (2010) in line with comparable prior research (e.g. Brynjolfsson and Hitt, 1996) show that IT investment per se does not affect firms’ market value while IT capability does. IT capability is an intangible asset that is path-dependent, takes time to develop, but in the end creates business value (Lim et al., 2012a). Developing and maintaining IT capability requires to constantly transform investments into assets by performing activities such as building a comprehensive IT infrastructure, integrating information systems into business processes, hiring technical IT skills, creating effective IT services, building relationships to the business, effectively managing IT, and supporting business personnel in using IT (Bharadwaj et al., 1999; Ross et al., 1996; Sambamurthy and Zmud, 1997). “Given the long lead times and costs entailed in the development and deployment of IT capabilities” (Tanriverdi et al., 2010, p. 833) firms have to invest continuously over time. Long-term oriented owners provide the required environment, orientation, and understanding.

Summarizing the argumentation regarding investors and IT capability, we therefore formulate the following hypothesis:

*H1: Firms possessing superior IT capability will be characterized by an ownership structure exhibiting a higher share of long-term oriented investors than other companies.*

Research provides evidence that intangible assets such as IT capability not only impact a firm’s market value (Saunders, 2010) but also strategic topics such as (1) environmental sensing capabilities and seizing actions (Sambamurthy et al., 2003), (2) flexibility e.g. to react and response adequately to environmental and competitive pressures (Pavlou and El Sawy, 2010), and (3) exploiting market opportunities (Chi et al., 2010). Joshi et al. (2010) show that a firm’s knowledge capabilities are fostered by supporting knowledge management initiatives and by “enable(ing) the creation, dissemination, and use of knowledge (...), thus greatly augmenting and enabling firms’ knowledge capabilities” (Joshi et al., 2010, p. 473). Hence, IS research revealed various performance effects and additional benefits that promote the strategic role of IT capability. Simply put, it should be a top management issue (Ravichandran et al., 2009). Furthermore, by lowering coordination costs markets and value chains have been reshaped (Ray et al., 2009).

From an industry perspective, recent research investigates whether IT is used rather strategically or operationally. Schein (1992) provides a categorization based on the strategic role IT plays. He

distinguishes automate, informate, and transform. Automate depicts a scenario where IT is used to increase efficiency and productivity by automation of procedures. Informate scenarios deal with providing information to managers for coordination and control (informate-up) and providing information to employees for analysis and coordination (informate-down). Transform depicts a scenario that is directed towards using IT for rearranging business processes or enabling new business models, for example. The automate category is coupled with a vision to use IT for cost-reduction purposes while transform is clearly linked to strategic purposes (Schein, 1992). Informate is more involved in control and coordination purposes and can be linked to transform and automate. In this respect, IS research came up with industry classifications into automate, informate, and transform-inclined industries (Banker et al., 2011; Chatterjee et al., 2001; Zmud et al., 2010).

Based on the previous argumentation, in industries classified as transform or informate, IT capability is probably considered a strategic asset. On the opposite, the IT capability of firms in automate industries is more operationally focused and employed to guarantee efficient operations and low costs. We therefore argue that in automate industries IT capability does not play a strategic role. Considering that long-term investors value strategic assets as argued above, we further detail Hypothesis 1 and formulate:

*H1a: Firms of informate and transform industries that possess superior IT capability will be characterized by an ownership structure exhibiting a higher share of long-term oriented investors than other companies of the same industry type.*

*H1b: Firms of automate industries that possess superior IT capability do not exhibit differences in their ownership structure compared to competitors of the same industry type.*

Following the argumentation of superior IT capability as a strategic asset that attracts specific types of investors, changes in the level of IT capability, either decreasing from superior to average or inferior IT capability or increasing from a lower status to superior IT capability, should have effects on the ownership structure. Hence, the ratio of long-term oriented investors changes when superior IT capability is achieved for the first time or gets lost over time. To summarize this argument, we formulate the following hypothesis:

*H2: Firms achieving (loosing) superior IT capability will be characterized by an increase (decrease) of the ratio of long-term oriented investors.*

## **4 Methodology**

### **4.1 Sample and Data**

The sample is based upon the annual InformationWeek (IW) 500 Ranking. Since 24 years, each year IW determines the 500 biggest and best corporate users of information technology. The methodology applied by IW describes a combination of different measures from technical parameters to parameters regarding IT usage. Thus, the ranking provides a more complete picture of a company's IT landscape than pure investment measures and also incorporates intermediate effects such as IT usage at the process level, which is a common criticism of highly aggregated and abstract measures. The ranking has been used broadly in past (Bharadwaj, 2000; 2003) and recent research (Banker et al., 2011; Chen et al., 2011; Chi et al., 2010; Lim et al., 2012b; Saldanha and Krishnan, 2011; Wang and Alam, 2007) as a proxy for IT capability. The IW data provides several benefits, like high response rates and experienced respondents (Lin and Bush, 2010), especially because proxy or actual data on IT capability is hardly available (Kohli and Grover, 2008). Banker et al. (2011; 2000; 2003) provide several other benefits and limitations of using the IW ranking.

To operationalize the long- and short-term investment horizon of institutional shareholders, we adopt the measurement approach by Gaspar et al. (2005). They calculate the ownership turnover at the firm

level to determine the short- or long-term orientation of its investors. They further relate the accumulated value of portfolio changes to the total portfolio value to see the rate “of how frequently [an investor] rotates his positions on all the stocks of his portfolio (churn rate)” (Gaspar et al., 2005, p. 142). Following this logic, we calculate the ownership turnover for all available institutional investors by the end of each quarter. In the next step, for all companies the average weighted turnover rate of all its individual investors is determined to provide the average holding time and thus the ownership orientation and structure for each firm from the sample. The required institutional ownership data is available and retrieved from Thomson Reuters. By adding turnover values, the initial IW sample is limited to publicly traded organizations. Non-publicly traded organizations are excluded because capital market data such as share holdings is not available.

The categorization of industries according to the three distinct industry types (automate, informate, and transformate) are based on work by Chatterjee et al. (2001). They classify industries according to the strategic role IT plays within an industry. This classification has been used widely to control for industry specific effects (e.g. Anderson et al., 2006; Banker et al., 2011).

We conduct additional robustness tests by restricting the sample to those companies that are constituents of a major U.S. stock index (i.e. Wilshire 5000 or Russell 3000). Thereby very small companies and penny stocks are excluded and the analysis is limited to stocks traded at the main stock exchanges (i.e. such as NYSE and NASDAQ).

## 4.2 Analysis

Aggregating the IW data from 2010 to 1996, we identified 1984 individual firms that are primarily U.S. based. To analyze the differences and interaction effects we distinguish four groups of companies that are split by their appearance in the ranking in two consecutive 5-year time periods (i.e. from 2009 to 2005 and from 2004 to 2000). Table 2 displays the criteria and distribution of the IW500 firms into the four groups. Similar to prior research (Bharadwaj, 2000), we determine superior IT capability if a company has been ranked at least three times within the defined 5-year time periods.

The hypothesized effects between firms’ IT capability and their ownership structure are analyzed by conducting a mixed-design analysis of variance (also known as a split-plot ANOVA) using SPSS Statistics 20. This type of analysis fits best to test for a between-subjects factor (i.e. the four different types defined above) in combination with a longitudinal respectively repeated measure (a within-subjects variable), as in our case the firm turnover values.

Type	Description	Period 1 (2009-2005)	Period 2 (2004-2000)	N
1	OUT	Never ranked	Never ranked	475
2	LEAVE	Maximum twice	Superior IT capability (at least 3 times)	209
3	ENTER	Superior IT capability (at least 3 times)	Maximum twice	172
4	IN	Superior IT capability (at least 3 times)	Superior IT capability (at least 3 times)	190
	ELSE			938

*Table 2. Classification of groups according to times ranked by IW*

## 5 Results

To test the first hypothesis (H1) regarding superior IT capability and long-term oriented ownership structure, we classify companies according to the description presented in Table 2. The mixed-design ANOVA is conducted for the years 2000 to 2009, to test the turnover differences between superior IT



capability companies and non-ranked companies (i.e. between companies classified in the groups “IN” and “OUT”). Results are presented in Table 3. Because the condition for homogenous variances is violated in some periods, we follow the standard recommendation in the literature and restrict the level of significance from .05 to .01 (Bühl, 2011). However, the results are below both thresholds and therefore strongly support our hypothesis.

To validate these results, we conduct a robustness check with the restricted sample. The sample size is slightly reduced from 120 to 112 for companies categorized as “IN” and from 86 to 82 for the “OUT” category. The results further support H1 (see Table 4).

Source	Df	Mean squares	F	Sig.	Partial $\eta^2$
Intercept	1	132.038	8470.039	.000	.976
Factor	1	.197	12.668	.000	.058
Error	204	.016			

*Table 3. Test of Between-Subjects Effects*

Source	Df	Mean squares	F	Sig.	Partial $\eta^2$
Intercept	1	132.239	8548.682	.000	.978
Factor	1	.219	15.167	.000	.073
Error	192	.014			

*Table 4. Test of Between-Subjects Effects (restricted Sample)*

The second part of the hypothesis (H1a/b) is more detailed and requires additional consideration of the three different industry types (mapping is adopted from Kim and Mithas, 2011). A first analysis integrating the industry types as additional second factor within the split-plot ANOVA shows significant within-subjects effects for the Groups (IN and OUT) as well as for the industry types (not tabulated). Although for some years Levene’s test for homogeneity of variances is again violated, results remain below the recommended restricted significance level (Bühl, 2011). Subsequent post-hoc analysis shows significant differences between automate industries on the one side and informate and transformate industries on the other side. As expected, transformate and informate industries are characterized by comparable significant differences between superior IT capability and non-superior IT capability firms. Further, results show significant difference between automate industries and the other two industry types. The results for the detailed analysis of between-subjects effects (between “IN” and “OUT”) within each industry type ((A)utomate, (I)nformate, and (T)ransformate) are reported in Table 5 together with the values from the robustness analyses with the restricted sample.

Source	Df	Mean squares	F	Sig.	Partial $\eta^2$
Factor_A	1	.003	.255	.616	.005
Factor_A (restricted)	1	.002	.171	.681	.003
Factor_I	1	.195	13.081	.001	.150
Factor_I (restricted)	1	.187	13.199	.001	.161
Factor_T	1	.188	13.175	.001	.248
Factor_T (restricted)	1	.249	20.772	.000	.360

*Table 5. Test of Between-Subjects Effects within industries (regular and restricted)*

Regarding the hypothesized effect of changes in a firm’s IT capability on the ownership structure (H2), we analyze the interaction effects of IT capability and firm turnover over time. To investigate these effects we include all four types, i.e. companies that have a stable superior IT capability (Type 4), achieved or lost a superior IT capability respectively entered or left the ranking (Type 3 and 2), or

have not had such a capability at all in the considered ten-year period (Type 1). The overall analysis provides significant interaction effects for turnover over time and our grouping, as well as for turnover, our grouping, and industry types. To determine the single effects we conduct further analysis by separating the tests again for each industry type. Because Mauchly's sphericity assumption is violated, we rely on the conservative Greenhouse-Geisser correction because epsilon is below the .75 threshold (Girden, 1992). The results from the Greenhouse-Geisser correction for the interaction effects of turnover over time and our grouping variable are displayed in Table 6. Although testing the unrestricted sample yields significant results for the interaction effects, the restricted sample does not. This could indicate that the interaction effect is only visible for very small companies but not for major publicly listed firms. Since the portion of small companies is relatively small, we cannot further investigate this phenomenon and suggest conducting further research with more suitable data-sets.

Source	Df	Mean squares	F	Sig.	Partial $\eta^2$
Interaction A	9.687	.008	2.154	.023	.076
Interaction A (restricted)	12.208	.002	1.321	.204	.052
Interaction I	12.458	.007	1.814	.041	.039
Interaction I (restricted)	10.901	.004	1.121	.343	.026
Interaction T	13.757	.003	1.050	.403	.044
Interaction T (restricted)	11.766	.003	1.116	.348	.053

*Table 6. Interaction effects (regular and restricted)*

## 6 Conclusion

This study investigates the status of firms' IT capability and their ownership structure over a ten-year period. In particular we examine the relationship between the development of IT capability and firm ownership over time. In general, we find that superior IT capability is related to a higher ratio of long-term oriented investors. An existing IT capability attracts long-term oriented investors who are able to detect and monitor such capabilities, value potential benefits and expected future returns. In particular, we find that firms of informate and transform industries possessing superior IT capability have higher shares of long-term oriented investors (1) than direct competitors not possessing superior IT capability, and (2) if compared to automate industries. In automate industries, we were not able to detect significant ownership differences. This could be due to the employment of IT into operations and routines to focus on cost reduction and operational excellence. In this case, IT does not play a strategic role and investors probably consider alternative factors.

Considering the temporal development, we tested whether a change in superiority of IT capability accounts for changes in firms' ownership structure. The results show that changes in ownership structure are invoked but only for the full sample including all sizes of firms. Excluding small firms from the sample and focusing on indexed firms, this effect remains non-significant. Although the analysis takes advantage of the longitudinal nature of the dataset, we cannot explicitly rule out issues of reverse causality. Although there might be a potential simultaneity bias, results show an association between IT capability and firm ownership. Further research is required to investigate the dependencies between the two concepts in more detail.

It is necessary to mention a few limitations of our study. First, we use highly aggregated proxies for IT capability and ownership. Although both operationalizations are widely used in the respective research domains, not all aspects of the theoretical concepts might be covered. However, for firm ownership we were able to test alternative measures applied in the literature with comparable results. A second limitation relates to the sample of U.S. based and publicly listed firms. Therefore private as well as very small companies are excluded. The generalization of results is therefore limited to indexed capital market firms. Further, market structures and ownership characteristics in other regions such as Europe and Asia might be different.

Further research is required to scrutinize the limitations in more detail. Potential areas of further research include small and medium sized companies, extensions and comparisons to private companies, and the adaptation to countries with similar and disparate market structures. Alternative and more fine-grained measures of IT capability might provide deeper insights into the relationship as well. Finally, alternative methods should be applied to study the causal structures and dependencies.

This research offers several insights for executives such as investors and analysts. From a management perspective, the attraction of long-term oriented owners facilitates the development of time-intensive but strategic organizational capabilities, especially of the IT capability as our analysis shows. Hence, managers could purposefully influence their firm's investor portfolio by either disclosing information on IT capability to attract certain types of investors or by directly approaching preferred investors. From an investor's perspective, monitoring and supporting the development of strategic assets in contrast to focusing on short-term earnings enables sustainable growth and stable returns.

## References

- Anderson, M.C., Banker, R.D., and Ravindran, S. (2006). Value Implications of Investments in Information Technology. *Management Science*, 52 (9), 1359-1376.
- Aral, S. and Weill, P. (2007). It Assets, Organizational Capabilities, and Firm Performance: How Resource Allocations and Organizational Differences Explain Performance Variation. *Organization Science*, 18 (5), 763-780.
- Banker, R.D., Hu, N., Pavlou, P.A., and Luftman, J.N. (2011). Cio Reporting Structure, Strategic Positioning, and Firm Performance. *MIS Quarterly*, 35 (2), 487-504.
- Berle, A.A. and Means, G.C. (1932). *The Modern Corporation and Private Property*. Macmillan.
- Bharadwaj, A., Sambamurthy, V., and Zmud, R. (1999). It Capabilities: Theoretical Perspectives and Empirical Operationalization. In *Proceedings of the 20th International Conference on Information Systems (ICIS)*, Charlotte, NC.
- Bharadwaj, A.S. (2000). A Resource-Based Perspective on Information Technology Capability and Firm Performance: An Empirical Investigation. *MIS Quarterly*, 24 (1), 169-196.
- Bhatt, G.D. and Grover, V. (2005). Types of Information Technology Capabilities and Their Role in Competitive Advantage: An Empirical Study. *Journal of Management Information Systems*, 22 (2), 253-277.
- Broadbent, M., Weill, P., and Neo, B.S. (1999). Strategic Context and Patterns of It Infrastructure Capabilities. *Journal of Strategic Information Systems*, 8 (2), 157-187.
- Brynjolfsson, E. and Hitt, L. (1996). Paradox Lost? Firm-Level Evidence on the Returns to Information Systems Spending. *Management Science*, 42 (4), 541-558.
- Bühl, A. (2011). *Spss 20: Einführung in Die Moderne Datenanalyse*. 13th. Pearson.
- Bushee, B.J. (1998). The Influence of Institutional Investors in Myopic R&D Investment Behavior. *Accounting Review*, 73 (3), 305-333.
- Chatterjee, D., Richardson, V.J., and Zmud, R.W. (2001). Examining the Shareholder Wealth Effects of Announcements of Newly Created Cio Positions. *MIS Quarterly*, 25 (1), 43-70.
- Chen, C., Lim, J.-H., and Stratopoulos, T.C. (2011). It Capability and a Firm's Ability to Recover from Losses: Evidence from the Economic Downturn of the Early 2000s: *Journal of Information Systems*. *Journal of Information Systems*, 25 (2), 117-144.
- Chi, L., Ravichandran, T., and Andrevski, G. (2010). Information Technology, Network Structure, and Competitive Action. *Information Systems Research*, 21 (3), 543-570.
- Connelly, B.L., Tihanyi, L., Certo, S.T., and Hitt, M.A. (2010). Marching to the Beat of Different Drummers: The Influence of Institutional Owners on Competitive Actions. *Academy of Management Journal*, 53 (4), 723-742.
- Cormier, D., Aerts, W., Ledoux, M.-J., and Magnan, M. (2009). Attributes of Social and Human Capital Disclosure and Information Asymmetry between Managers and Investors. *Canadian Journal of Administrative Sciences (Canadian Journal of Administrative Sciences)*, 26 (1), 71-88.

- Daniel, K. and Titman, S. (2006). Market Reactions to Tangible and Intangible Information. *Journal of Finance*, 61 (4), 1605-1643.
- Dehning, B. and Stratopoulos, T. (2003). Determinants of a Sustainable Competitive Advantage Due to an It-Enabled Strategy. *The Journal of Strategic Information Systems*, 12 (1), 7-28.
- Gaspar, J.-M., Massa, M., and Matos, P. (2005). Shareholder Investment Horizons and the Market for Corporate Control. *Journal of Financial Economics*, 76 (1), 135-165.
- Gillan, S.L. and Starks, L.T. (2007). The Evolution of Shareholder Activism in the United States. *Journal of Applied Corporate Finance*, 19 (1), 55-73.
- Girden, E. (1992). *Anova: Repeated Measures*. Sage, Newbury Park, CA.
- Gordon, S.R. and Tarafdar, M. (2007). How Do a Company's Information Technology Competences Influence Its Ability to Innovate? *Journal of Enterprise Information Management*, 20 (3), 271-290.
- Jiang, H. (2010). Institutional Investors, Intangible Information, and the Book-to-Market Effect. *Journal of Financial Economics*, 96 (1), 98-126.
- Joshi, K.D., Lei, C., Datta, A., and Shu, H. (2010). Changing the Competitive Landscape: Continuous Innovation through It-Enabled Knowledge Capabilities. *Information Systems Research*, 21 (3), 472-495.
- Ke, B. and Petroni, K. (2004). How Informed Are Actively Trading Institutional Investors? Evidence from Their Trading Behavior before a Break in a String of Consecutive Earnings Increases. *Journal of Accounting Research*, 42 (5), 895-927.
- Kim, K. and Mithas, S. (2011). How Does Bond Market View It investments of Firms? An Empirical Analysis of Bond Ratings and Yield Spread. In *Proceedings of the 32nd International Conference on Information Systems*, Shanghai, China.
- Kimbrough, M.D. (2007). The Influences of Financial Statement Recognition and Analyst Coverage on the Market's Valuation of R&D Capital. *The Accounting Review*, 82 (5), 1195-1225.
- Kohli, R., Devaraj, S., and Ow, T.T. (2012). Does Information Technology Investment Influence a Firm's Market Value? A Case of Non-Publicly Traded Healthcare Firms. *MIS Quarterly*, 36 (4), 1145-1163.
- Kohli, R. and Grover, V. (2008). Business Value of It: An Essay on Expanding Research Directions to Keep up with the Times. *Journal of the Association for Information Systems*, 9 (1), 23-39.
- Lev, B. (2001). *Intangibles: Management, Measurement, and Reporting*. Brookings Institution, Washington, D.C.
- Lim, J.-H., Stratopoulos, T.C., and Wirjanto, T.S. (2012a). Path Dependence of Dynamic Information Technology Capability: An Empirical Investigation. *Journal of Management Information Systems*, 28 (3), 45-84.
- Lim, J.-H., Stratopoulos, T.C., and Wirjanto, T.S. (2012b). Role of It Executives in the Firm's Ability to Achieve Competitive Advantage through It Capability. *International Journal of Accounting Information Systems*, 13 (1), 21-40.
- Lin, Q. and Lee, J. (2004). Consumer Information Search When Making Investment Decisions. *Financial Services Review*, 13 (4), 319-332.
- Lin, S.-f. and Bush, A.A. (2010). The Effect of It capabilities on Cross-Functional Capabilities. In *Proceedings of the 31st International Conference on Information Systems (ICIS)*, St. Louis, MO.
- Loibl, C. and Hira, T.K. (2009). Investor Information Search. *Journal of Economic Psychology*, 30 (1), 24-41.
- Masli, A., Richardson, V.J., Sanchez, J.M., and Smith, R.E. (2011). Returns to It Excellence: Evidence from Financial Performance around Information Technology Excellence Awards. *International Journal of Accounting Information Systems*, 12 (3), 189-205.
- Mata, F.J., Fuerst, W.L., and Barney, J.B. (1995). Information Technology and Sustained Competitive Advantage: A Resource-Based Analysis. *MIS Quarterly*, 19 (4), 487-505-505.
- Melville, N., Kraemer, K., and Gurbaxani, V. (2004). Information Technology and Organizational Performance: An Integrative Model of It Business Value. *MIS Quarterly*, 28 (2), 283-322.
- Muhanna, W.A. and Stoel, M.D. (2010). How Do Investors Value It? An Empirical Investigation of the Value Relevance of It Capability and It Spending across Industries. *Journal of Information Systems*, 24 (1), 43-66.

- Pavlou, P.A. and El Sawy, O.A. (2010). The "Third Hand": It-Enabled Competitive Advantage in Turbulence through Improvisational Capabilities. *Information Systems Research*, 21 (3), 443-471.
- Powell, T.C. and Dent-Micallef, A. (1997). Information Technology as Competitive Advantage: The Role of Human, Business, and Technology Resources. *Strategic Management Journal*, 18 (5), 375-405.
- Rai, A., Pavlou, P.A., Im, G., and Du, S. (2012). Interfirm It Capability Profiles and Communications for Cocreating Relational Value: Evidence from the Logistics Industry. *MIS Quarterly*, 36 (1), 233-262; A231-A235.
- Ravichandran, T., Liu, Y., Han, S., and Hasan, I. (2009). Diversification and Firm Performance: Exploring the Moderating Effects of Information Technology Spending. *Journal of Management Information Systems*, 25 (4), 205-240.
- Ray, G., Dazhong, W., and Konana, P. (2009). Competitive Environment and the Relationship between It and Vertical Integration. *Information Systems Research*, 20 (4), 585-603.
- Ross, J.W., Beath, C.M., and Goodhue, D.L. (1996). Develop Long-Term Competitiveness through It Assets. *Sloan Management Review*, 38 (1), 31-42.
- Ryan, L.V. and Schneider, M. (2002). The Antecedents of Institutional Investor Activism. *Academy of Management Review*, 27 (4), 554-573.
- Saldanha, T.J. and Krishnan, M.S. (2011). Leveraging It for Business Innovation: Does the Role of the Cio Matter? In *Proceedings of the 32nd International Conference on Information Systems (ICIS)*, Shanghai, China.
- Sambamurthy, V., Bharadwaj, A., and Grover, V. (2003). Shaping Agility through Digital Options: Reconceptualizing the Role of Information Technology in Contemporary Firms. *MIS Quarterly*, 27 (2), 237-263.
- Sambamurthy, V. and Zmud, R.W. (1997). At the Heart of Success: Organizationwide Management Competence. In *Steps to the Future: Fresh Thinking on the Management of It-Based Organizational Transformation* (C. Sauer and P. Yetton Eds.), pp. 143-163, Jossey-Bass, San Francisco.
- Santhanam, R. and Hartono, E. (2003). Issues in Linking Information Technology Capability to Firm Performance. *MIS Quarterly*, 27 (1), 125-153.
- Saunders, A. (2010). Valuing It-Related Intangible Capital. In *International Conference on Information Systems (ICIS)*, Saint Louis, Missouri.
- Schein, E.H. (1992). The Role of the Ceo in the Management of Change: The Case of Information Technology. In *Transforming Organizations* (T.A. Kochan and M. Useem Eds.), pp. 325-345, Oxford University Press, Oxford.
- Soh, C. and Markus, M.L. (1995). How It Creates Business Value: A Process Theory Synthesis. In *International Conference on Information Systems*, Amsterdam.
- Stoel, M.D. and Muhanna, W.A. (2009). It Capabilities and Firm Performance: A Contingency Analysis of the Role of Industry and It Capability Type. *Information & Management*, 46 (3), 181-189.
- Tanriverdi, H., Rai, A., and Venkatraman, N. (2010). Reframing the Dominant Quests of Information Systems Strategy Research for Complex Adaptive Business Systems. *Information Systems Research*, 21 (4), 822-834.
- Wang, L. and Alam, P. (2007). Information Technology Capability: Firm Valuation, Earnings Uncertainty, and Forecast Accuracy. *Journal of Information Systems*, 21 (2), 27-48.
- Webster, J. and Watson, R.T. (2002). Analyzing the Past to Prepare for the Future: Writing a Literature Review. *MIS Quarterly*, 26 (2), xiii-xxiii.
- Yan, X.S. and Zhang, Z. (2009). Institutional Investors and Equity Returns: Are Short-Term Institutions Better Informed? *Review of Financial Studies*, 22 893-924.
- Zmud, R.W., Shaft, T., Zheng, W., and Croes, H.J.P. (2010). Systematic Differences in Firm's Information Technology Signaling: Implications for Research Design. *Journal of the Association for Information Systems*, 11 (3), 149-181.