

ИННОВАЦИОННЫЙ И ИНВЕСТИЦИОННЫЙ МЕНЕДЖМЕНТ

UDC 330.4

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AN EMPIRICAL STUDY ON THE ROLE AND TASKS OF IT TOP MANAGERS IN GERMANY

Today it is generally agreed that many business models, particularly in the service sector, rely heavily on adequate IT-support. The business agility of a company may be strongly influenced by the ability of the IT to support and even actively create business innovation and change [Sambamurthy et al., 2003; Melarkode et al., 2004], something we name IT agility [Nissen & Rennekampff, 2013]. Quite opposite to the claim of Nicholas Carr [2003] “IT doesn’t matter“ this makes the IT under certain conditions a “strategic weapon” of the respective company that can lead to competitive advantage [Byrd & Turner, 2001].

Thus, the role of IT has changed considerably over time, at least from an academic point of view. But how is this reflected in the current role and tasks of leading IT-managers? Have companies really adopted this broader perspective that views IT as more than just a cost factor or, at best, reactive enabler of business? We addressed this research question by conducting an online survey of IT top managers in large German companies. Some key results are presented in this paper.

They highlight that IT today is mostly operated in a centralized way and organized as a cost center, with the CIO typically reporting to the CEO or CFO. For the position of a CIO companies predominantly search for candidates with an academic background. Technical IT-knowledge is regarded as more important for leading IT managers than previous management experience. While CIOs today adopt a broader view on IT tasks than before, the focus still is very much on rationalization and optimization of IT with standardized and integrated IT processes. However, the support of the business strategy by the company’s IT is assessed better, the more the IT strategy is coordinated with the business strategy, but also the more the IT head is involved in the development of the business strategy. While the alignment of business and IT strategy is achieved satisfactorily from the viewpoint of the CIOs they simultaneously see insufficient IT expertise in the companies’ top management (with marked differences in the branches of industry). This and the fact that CIOs are today only to a medium degree consulted in developing the business strategy of a company points to problems in deeply aligning business and IT in practice.

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¹ The attached article An Empirical Study on the Role and Tasks of IT Top Managers in Germany by Nissen and Termer is an original, previously unpublished work which has not been submitted for publication elsewhere. It extends previous work [Nissen and Termer, 2014].

When it comes to IT agility and dealing with emerging information technologies the results also demonstrate a medium level of achievement, with adaptive abilities proving slightly better than proactive capabilities. Refs 26. Figs 13. Tables 4.

Keywords: business-IT alignment, CIO, IT management, IT tasks, IT agility, empirical study.

1. Review of IT Management in Large Enterprises in Germany

In a rapidly changing business world, information technology (IT) plays an important role in achieving the business objectives. In this context, IT management is asked to provide classical IT services, standardization and consolidation of IT as well as to improve the efficiency of business processes and increasingly the active participation in the area of new product development and creation of new business models as well as in the opening up of new revenue sources [Hanschke, 2010, p. 14–15]. At the same time, IT is demanded to contribute more measurable, more direct and more flexible than currently to the companies' success [Johannsen and Goeken, 2006].

Until recently, no one in the German-speaking area had examined how these changed spheres of responsibility are accepted, processed and realized by IT management. By means of an extensive online survey now the state of play of IT management in large German enterprises was recorded. This article presents a selection of the results concerning the topics IT management and organization, IT strategy and business-IT alignment, IT tasks and IT agility.

Such a survey could also serve as a starting point for a number of similar future examinations to process and better understand the historical development of IT management in Germany in retrospective. In the American scientific area there already exists a series of examinations carried out by LUFTMAN (such as [Luftman and Derksen, 2012]) which meanwhile makes it possible to explain past developments, better classify the state of play and better estimate the necessary future alignment.

2. Methodology and Data

The target group of the survey was overall responsible IT decision makers (also Chief Information Officers (CIO), IT directors or IT heads). With the help of the Hoppenstedt company database for universities (<http://www.hoppenstedt-hochschuldatenbank.de/>) the names of persons having overall responsibility in IT decision making were established. As only large enterprises were to be asked, as a selection criterion the minimum turnover was set at 125 million Euros. In addition, the total assets were included in the search to consider banks and insurances as well.

As the database chosen does not contain public institutions, the CIOs of the states of the Federal Republic of Germany as well as of big cities and municipalities were established and invited to participate in the survey. Altogether this procedure resulted in a population of 6.602 entries. As not in every case an IT decision maker was listed by name, only a total sample of 3.809 persons from this population was left in the end. The invitations to the survey were sent by Email with 2.416 Emails being successfully delivered. The data were collected in the period time between 1st February and 9th May 2013.

Altogether the questionnaire was run through to the end by 257 persons. Due to incomplete answers only 216 records could be further analyzed and consulted for

evaluation. The return rates according to the examination of the population are shown in Table 1.

Table 1. Data concerning the total population and sample

Population	6602			
Total sample	3809			57.69%
Successful invitations	2416		63.43%	36.59%
Participations	257	10.64%	6.75%	3.89%
Utilizable records	216	84.05%	8.94%	5.67%

The individual questions of the questionnaire follow (mainly English-speaking empirical) articles dealing with the topic area IT management which were identified in the frame of literature search work, here especially the works of Luftman et al. [1999, 2012, 2013] as well as inter alia IBM Corporation [2011], Beimborn et al. [2007], Melarkode et al. [2004], Byrd and Turner [2001]. All business sectors are represented well in the comparably big sample (Figure 1) so that as a conclusion it can be assumed that the results among large enterprises are significant.

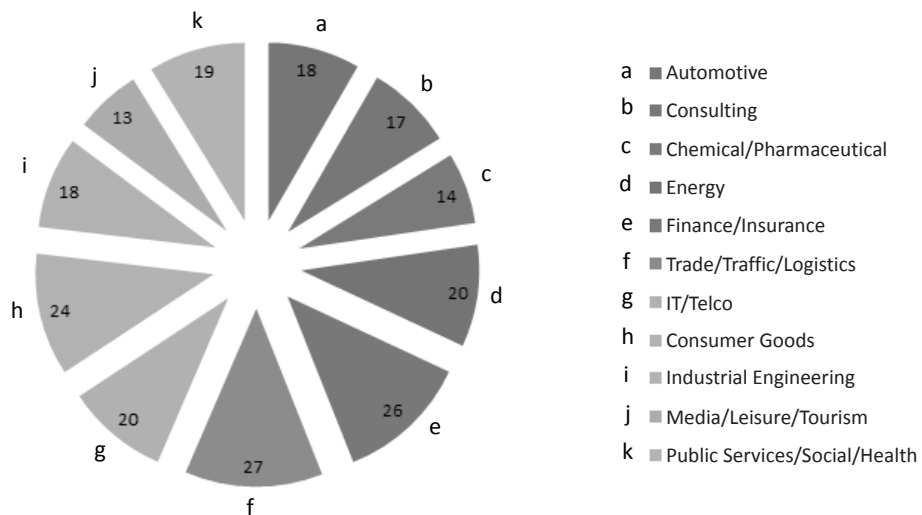


Figure 1. Distribution of study participants according to business sectors (n = 216).

3. Selected Results and Discussion

3.1. IT Management and IT Organization

The question “What is your current job title?” on one hand was used as a control question to only consider records of those persons that actually belong to the target group.

On the other hand it should be looked at to what extent the term “CIO” is really used in practice (Figure 2). Here we have a very mixed picture of the names used for these jobs. Although the Americanized term Chief Information Officer (CIO) is very dominantly spread in current specialist journals and scientific discussions (for example [Jost, 2012; IBM, 2011]), in practice obviously the German term “IT-Leiter (engl.: IT Leader)” still remains preserved which can be seen in the current survey representing the majority of the job titles. Contrary to that we have a study carried out in the English-speaking area, where 60% of the participants had the title CIO [Banker et al., 2011, p. 489].

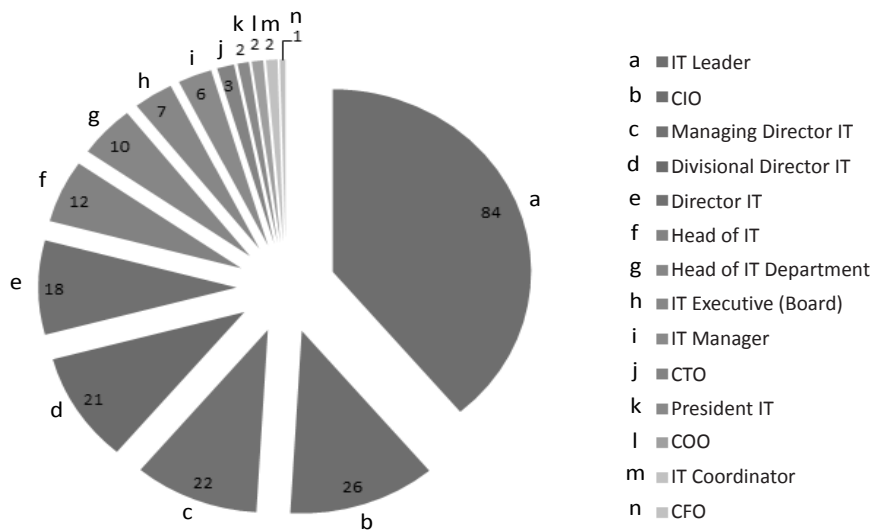


Figure 2. Job titles of IT top managers (n = 216).

As the participants were recruited from the population of large enterprises, this explains the comparably often used titles “Geschäftsführung IT (engl.: Managing Director IT)”, “Bereichsleitung IT (engl.: Divisional Director IT)”, “Direktor IT (engl.: Director IT)” and “Vorstand IT (engl.: IT Executive)”. This suggests the size and herewith the importance of the IT department and in this context as well the power of the prevailing IT manager. The terms “Abteilungsleitung IT (engl.: Head of IT Department)” and “IT Manager” in some of the answers seem to contradict the high standard of an overall responsible IT management, but only persons who according to the Hoppenstedt database were in a leading function were contacted. In these cases it is conceivable that these persons may have further responsibilities in the company next to IT management.

In some of the cases it can be seen that IT management is combined with other functions in the company. Three persons are as well Chief Technology Officer (CTO) which underlines their technical responsibility, two persons are also Chief Operating Officer (COO) showing a strong integration into day-to-day business and in one case IT management is also the job of the Chief Financial Officer (CFO).

It was also asked how long the persons already work as CIO or rather Head of IT in their current company (see Figure 3). At this point of time the persons questioned were employed 8.12 years on average (mean) in the position as leading IT responsible. The

range of answers was from 1 month up to 39 years. A few exceptional cases already work for 30 years or longer as Head of IT in their company.

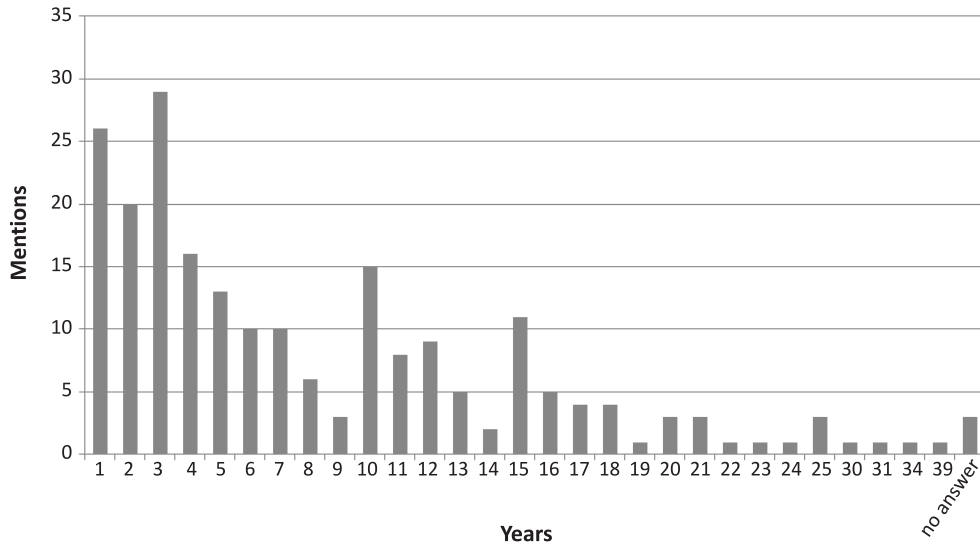


Figure 3. How long the IT top managers have held their current position already ($n = 216$).

In addition it was asked, in which position the person had worked directly before they became IT top manager (Table 2). Here it was clear that persons having an IT background with leadership experience comparatively most often were appointed as IT top managers. It was obvious, too, that clearly more persons become IT leaders which do not have any leadership experience but an IT background than the other way round. It seems to be important for companies to rather find persons for the CIO job which have IT knowledge and understanding than persons which do just have experience in leadership.

Table 2. Previous professional background of IT top managers ($n = 199$)

IT Background	with	31 (26.7%)	69 (59.4%)
	with out	4 (3.4%)	12 (10.3%)
		without	with
$n = 116$		Managerial Experience	

before: different company

IT Background	with	21 (25.3%)	50 (60.2%)
	with out	1 (1.2%)	11 (13.3%)
		without	with
$n = 83$		Managerial Experience	

before: same company

Furthermore the participants were enquired about their gender. As a result we have a clear imbalance between men and women concerning the distribution of IT leadership positions being evident with a women proportion of 6.5% only. This corresponds with the low proportion of female students in computer science and business informatics courses as well as in IT-related consultancy in Germany [Termer and Nissen, 2011].

Asked about their educational qualification, more than two thirds have a polytechnical or university degree and even 14% have a doctorate. Altogether more than 80% of the IT top managers in our study have successfully finished higher education.

The participants were also asked about the reporting structure within the companies (Figure 4). In the USA for years now there is a clear change of the CIO reporting structure towards a reporting system which is oriented to the top business management so that there 43% report to the CEO, 27% to the CFO and 16% to the COO [Luftman and Derksen, 2012, p.216]. In comparison 47% of the IT top managers in German large enterprises currently report to the CEO. If those companies are added in which the CIO reports to the management board, more than 60% of the IT top managers are directly connected to the top business executive which should make the business-IT alignment more easy. Furthermore, more than 31% report to the CFO, but only 3% to the COO.

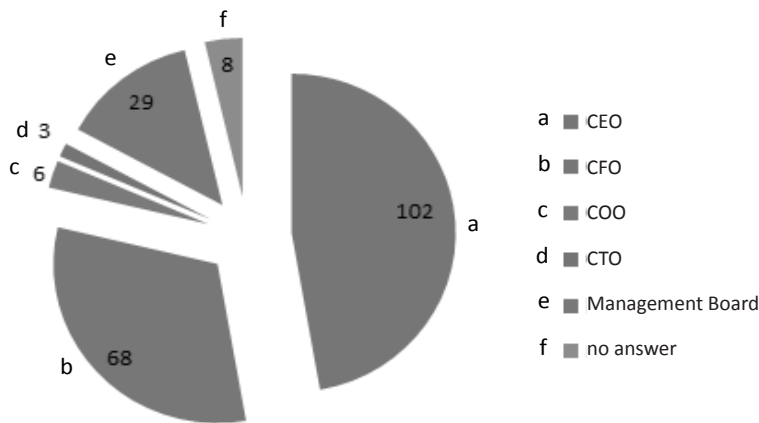


Figure 4. Whom IT top managers report to ($n = 216$).

Besides the reporting structure, the organization of the IT department was looked at as well. On a seven-step scale it was asked whether the IT department is organized rather in a more centralized or decentralized way (Figure 5). Here it was obvious that the majority of the IT departments is organized centrally. Altogether 76% of the participants say that their IT department is organized centrally or mainly centrally (categories 1 and 2), whereas 6% say that it is organized decentralized or mainly decentralized (categories 6 and 7). Almost 16% describe a hybrid form of organization, combining elements of a centralized and a decentralized organization (categories 3, 4 and 5).

A rather centrally organized IT has a clear reporting structure towards an existing central higher leading position and offers the best opportunities to create standardized management structures. A rather decentralized IT organization is rooted in the individual business units of a company and, therefore, is able to act more autonomously. It is then, however, more difficult to work on the goals set by a higher central IT, but offers the possibility to pay better attention to the needs of the individual business departments. A mixed structure tries to combine the advantages of both organizational forms by making use of the companywide synergies of a central IT and — as well — the opportunities offered by an individually designed departmental IT. In comparison to the American study by Luftman and Derksen, our results show differences. In the American study, 61%

indicate to have a central IT, 3% describe their IT to be decentralized and 33% say that their IT organization is hybrid [Luftman and Derksen, 2012, p. 216].

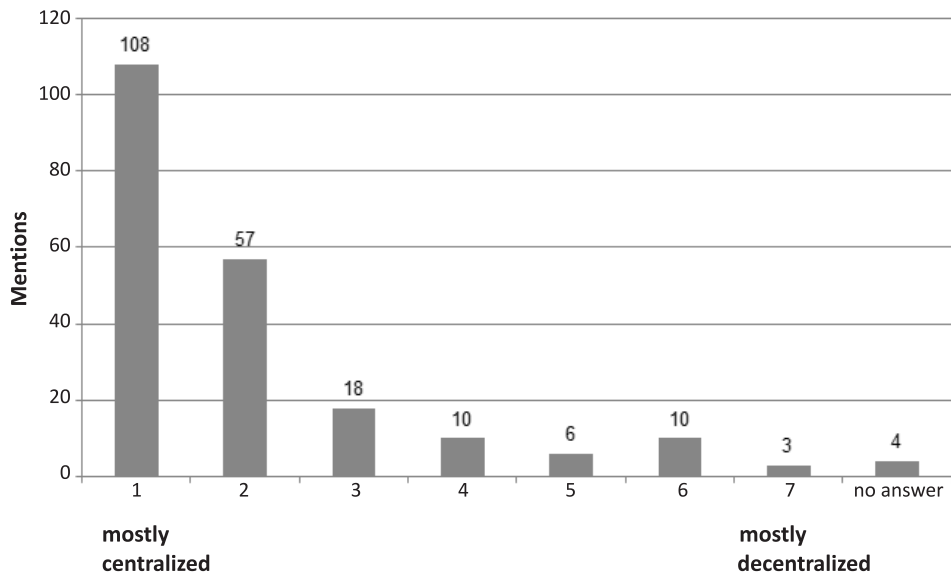


Figure 5. Centralization level of the IT organization in the enterprises asked ($n = 216$).

Another question referred to the form of IT business organization in the company (Figure 6). Here you can see that the majority of the IT departments are run as cost centers (54.2%) and only a small part as profit centers (6.5%). If a department is run as a cost center, it has a fixed cost budget within which the department has decision-making power. Contrary to that the profit center form should make profits and the department's success is measured with view to the return on investment [Vahs, 2009, p. 162–163]. Up to a specified extent, the head of the department is authorized to make decisions almost independently. Almost one third of the IT departments (32.4%) is run as shared service centers, the way it is for example proposed in the context of the ITIL-framework. With this form of organizational design, services are offered to other departments and settled internally [Vahs, 2009, p. 169–170].

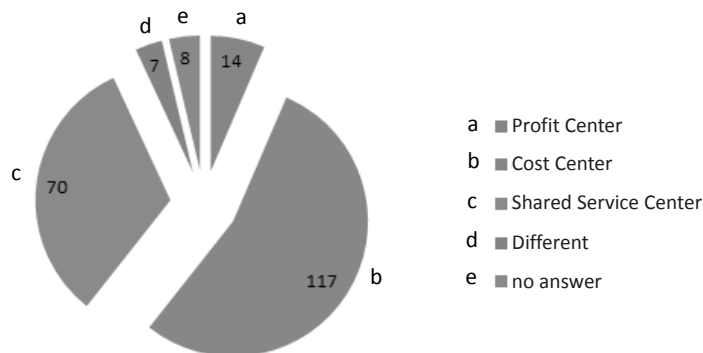


Figure 6. Business organization form of IT in the enterprises asked ($n = 216$).

3.2. IT Strategy, IT Tasks and Business-IT Alignment

Strategic IT planning means the systematic drawing up of a tuned up plan of activities for the further development of the IT architecture / system landscape and the IT basic infrastructure of a company on the basis of business objectives and plans [Dern, 2009, p.295]. Concerning the strategic design of IT management, the IT top managers were at first asked how many working days they spend with strategic questions and tasks (Figure 7). This open question resulted in a broad diversification of the answers starting with 4 up to 220 working days.

Three-quarters of the participants do not spend more than 40 working days with strategic tasks, with the median being at 20 working days. If a total number of 220 working days per year is the basis, then we talk about an average of 10% of the working days available. But also outlier values could be found among the answers naming more than 100 or in one case even 220 working days (probably 100% of the time available) used for strategic tasks.

Although at the beginning of the set of questions a definition of the term IT strategy was given, this description still allows a certain flexibility for interpretation so that the broad diversification of the answers may be attributable to a differing definition of the term strategy and, therefore, a more or less restricted comprehension of “strategic tasks” among the persons questioned.

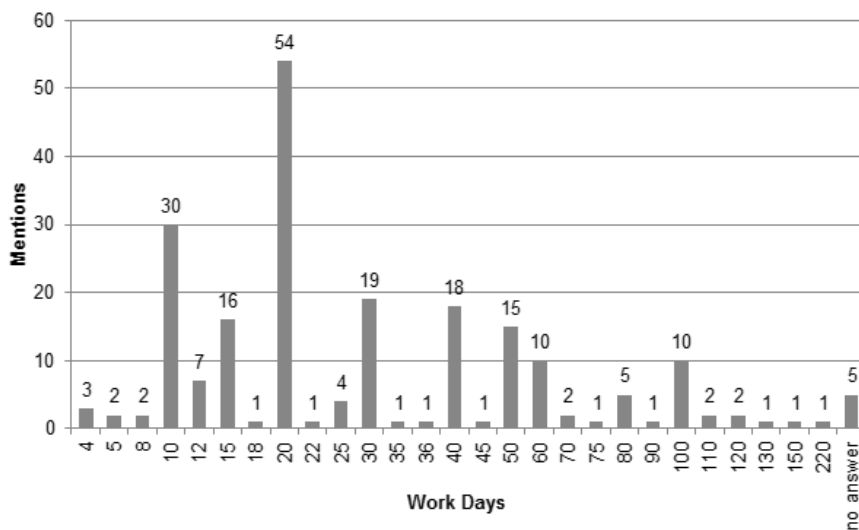


Figure 7. Number of days per year the participants spend on IT strategy tasks ($n = 216$).

In addition we asked, how regularly the strategic IT planning of the company is checked. Here it was obvious that these check-ups are carried out quarterly with 75% of the participants saying that at the latest every 12 months a strategic IT planning is made. One group with 24 and a second with even 36 months stand out.

Between the number of working days being used for strategic tasks and the period of time in which the IT strategy is checked regularly we have a (Pearson) correlation of

-0.165 which is significant on a level of 0.01. This means that the more working days are used for strategic tasks, the shorter is the interval in which the strategic IT planning is looked at.

Business-IT alignment, which describes the level of mutual alignment between IT and business units, is judged to have an important role in strategic planning [Masak, 2006, p. 10]. Elements of a well-designed business-IT alignment are, among other things, the integration of IT into the strategy development of the company, a good business comprehension of the IT staff as well as a close collaboration between IT department and business departments [Luftman et al., 1999, p. 14].

The results of the survey (Figure 8) in this area show that from the point of view of the IT top management, the coordination of IT strategy and business strategy all in all takes place on a large up to a very large scale. The participants also say that the company's IT supports the business strategy on a large scale. But the other way round IT managerial staff only participates to a medium degree in the development of the business strategy. The answers to this question showed the largest diversification concerning the sector averages. The energy sector reaches the lowest value — here IT top managers only partly participate in developing the business strategy. Contrary to that we have trade, traffic and logistics with an extensive participation. In the financial services sector the coordination of the IT strategy with the business strategy and the support of the business strategy by the company's IT is judged the most positive. The lowest values can be found in the media industry and the energy sector.

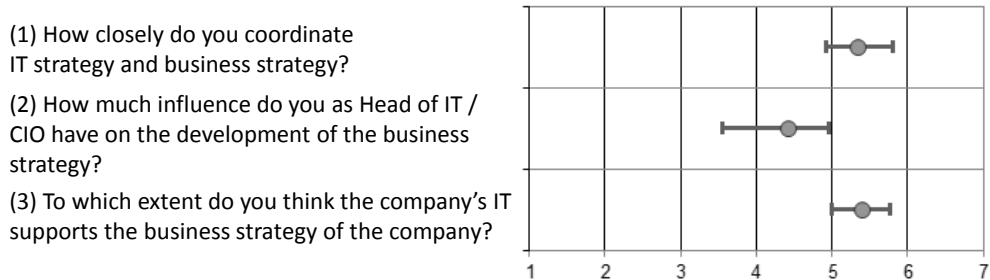


Figure 8. Coordination between IT strategy and business strategy on the average of all companies looked at (business-IT alignment, „7“ corresponds to the best value, the total average and range of the sector average are given, $n = 216$).

We then looked whether any significant correlations could be found between the answers concerning the just mentioned aspects of business-IT alignment. As can be seen from Table 3, very positive and significant correlations² were found.

As a conclusion, this means that the support of the business strategy by the company's IT is assessed better, the more the IT strategy is coordinated with the business strategy, but also the more the IT head is involved in the development of the business strategy. As the answers show that the participation of the leading IT manager in the development of the business strategy today on average is comparatively low, this again demonstrates an unrealized potential which could be used to increase the business-IT alignment.

² For correlation analysis the rank correlation coefficient by Spearman is used (Spearman's Rho; r_s) [Janssen and Laatz 2013, p. 274], as the answers looked at are ordinal scaled characteristics.

Table 3. Business-IT alignment (correlations)

		(2) How much influence do you as Head of IT / CIO have on the development of the business strategy?	(3) To which extent do you think the company's IT supports the business strategy of the company?
(1) How closely do you coordinate IT strategy and business strategy?	r_s	.445**	.448**
	Sign.	.000	.000
(2) How much influence do you as Head of IT / CIO have on the development of the business strategy?	r_s		.489**
	Sign.		.000
** The correlation is significant on the 0.01 level (2-sided).			

As a limiting factor it has to be underlined that the survey concentrates on the perspective of the IT top managers. In order to gain a sound statement, the business side ideally would have to be asked as well to be in the position to assess the quality of the mutual coordination of business and IT strategy. Thus, for the future, it generally would make sense to carry out an additional — but very time-consuming — questioning of the management board and business unit leaders.

In addition it was asked, from a strategic point of view, which tasks the IT department in the respective company has (Figure 9). Here different tasks as answer possibilities were predetermined which were identified to be typical according to a CIO study of IBM [IBM Corporation, 2011].

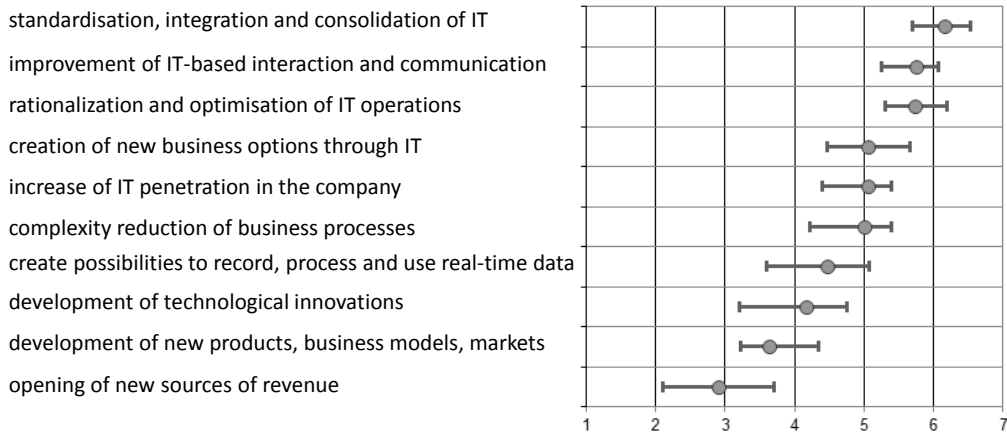


Figure 9. Range in which tasks are part of the company IT's responsibilities ("7" represents the strongest agreement, the total average and range of the sector average are given, $n = 216$).

Standardization, integration and consolidation of IT were named as the most important tasks (highest cross-sector average) which together with the third most frequently quotation — rationalization and optimization — indicate a rather cost-oriented

understanding of the role of IT. These statements correspond with the dominant design of the IT department as a cost center (Figure 6). At the same time, the IT-based interaction and communication in the company is to be improved.

In a second group of tasks, the support of the business tasks in the company is named. Next to the reduction of complexity in already existing business processes a general increase of IT penetration is targeted. With the creation of new business opportunities the wish becomes clear to make better use of the innovation potential that IT has for the companies.

In the third group of tasks, we find the provision of real-time data as well as the development of technological innovations, with these two tasks having the biggest span among the averages by sectors.

The fourth group contains the development of new products, markets and business models as well as the opening of new sources of revenue for the company. Generally this last group was not seen as part of the overall task of the company's IT by the IT top managers. Altogether the answers show a cross-sector similar evaluation of the role of IT.

Finally, the managerial IT staff was asked to judge the IT expertise of the top business management in their companies (Figure 10). The results achieved tend to lie in the middle-ranking area. There are definitely differences between the sectors with the sector averages giving evidence about the professional background of the individual top management. The IT and telecommunication sector reached the highest value, which is not surprising, as the core business in this sector bases on information technology. At some distance follows the energy sector, which again underlines the importance of IT and the high IT penetration in this industry. The lowest level can be found in the public sector, which again is plausible as especially in the authorities and institutions of the social and health sector the top management mostly has its professional background in administration.

How do you assess the IT-comprehension of your company's top management?

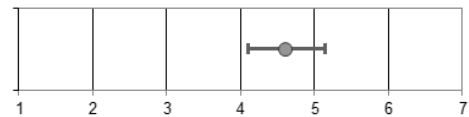


Figure 10. IT-expertise of business executives according to IT top managers ("7" represents the best value, the total average and range of the sector average are given, $n = 216$).

The results show a clear improvement potential for the IT comprehension of the top business management in many sectors, whereas a sound IT knowledge in company leadership and in the business departments would make a successful business-IT alignment much easier. This is also measurably expressed by the fact that the higher the IT expertise of the top management is, the more the IT management is integrated in the design of the company's strategy. Significantly positive links could as well be found between the IT expertise in top management and its prioritization of the topics research & development, innovations and technological leadership.

3.3. IT Agility

As markets change, business models alter and technology evolves information systems need to change. The ability and speed of change in information systems are crucial success factors for the success of the business itself [Sambamurthy et al, 2003; Melarkode

et al, 2004; Ahsan and Ngo-Ye, 2005]. We call this “IT Agility”. IT agility is the ability of the information function of a company to respond very quickly, preferably in real time, to changing capacity demands and changes in functional requirements as well, and identify future IT-based innovations in business and support them proactively [Nissen and Mladin, 2009; Nissen and Rennenkampff, 2013; Rennenkampff, 2015].

In this context, one important task which is considered to be part of IT management is to estimate the future development of information technology [Dern, 2009, p.64]. The advancement of IT takes place in increasingly shorter cycles. So it belongs to the range of tasks of IT management to examine the potential of changing and emerging technologies and to estimate, whether or how far these could be used to increase the company’s profit. Here one can speak of predictive power or anticipation skills of the IT department [Melarkode et al., 2004, p.46].

Altogether, all sectors say that their making of predictions is medium or rather good (Figure 11). The comparably lowest value can be found in the financial services sector. The media sector has the highest values in those questions which are assessed almost one step higher than in the financial services sector.

- (1) How intense does your IT department screen for emerging new information technologies?
- (2) How strong are the efforts of your IT department to analyze new information technologies in detail?
- (3) How well does your IT department develop scenarios for the handling of possible future advancements of information technologies?

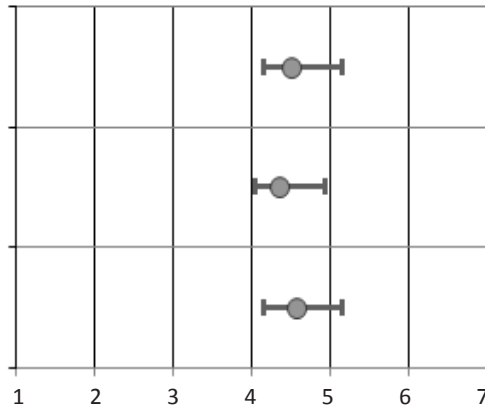


Figure 11. Dealing with emerging information technologies (“7” represents the best value, the total average and range of the sector average are given, $n = 216$).

The (Spearman) correlations between the three answers are greatly positive and very significant which means that the three tasks being asked about are very closely related (Table 4). The quality of the scenario development therefore depends very much on the efforts made for the analysis of new technologies. These efforts again are very much related to the intensity with which the observations are carried out.

A well-developed anticipation or rather predictive power should make it possible for an organization to better adapt to future circumstances and to define in advance the preferred way of dealing with future situations for the case that these circumstances become reality. As prediction or rather anticipation is connected to costs and the future can only be predicted to a limited extent it is necessary to develop an adaptability potential to be in the position to better adapt to changing conditions which could not be predicted. This demand — to quickly adapt to changing conditions — is more and more demanded from IT departments [Hanschke, 2010, p.19].

Table 4. Dealing with emerging information technologies (correlations)

		(2) How strong are the efforts of your IT department to analyze new information technologies in detail?	(3) How well does your IT department develop scenarios for the handling of possible future advancements of information technologies?
(1) How intense does your IT department screen for emerging new information technologies?	r_s	.716**	.607**
	Sign.	.000	.000
(2) How strong are the efforts of your IT department to analyze new information technologies in detail?	r_s		.715**
	Sign.		.000

** The correlation is significant on the 0.01 level (2-sided).

Concerning this topic area we asked questions about the adaptability in IT departments depending on what was the trigger for the necessary change (Figure 12).

How easy can the IT department adapt to changes due to ...

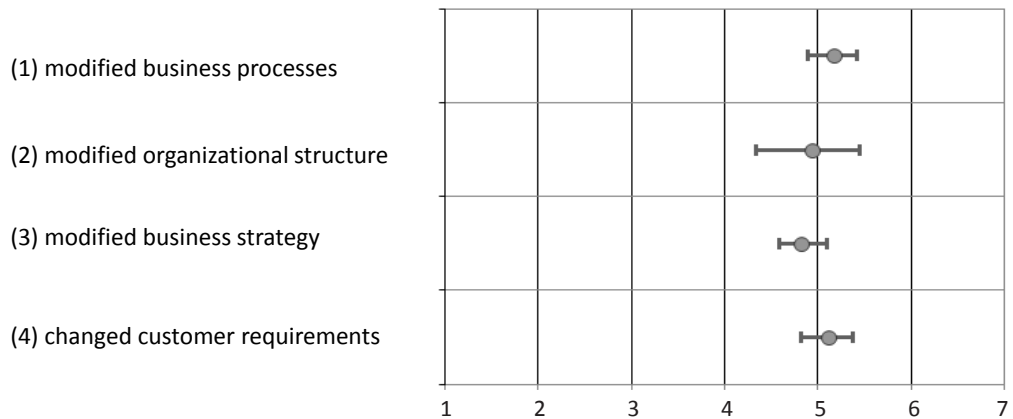


Figure 12. Adaptability of the IT department (“7” represents the best value, the total average and range of the sector average are given, $n = 216$).

Here in all sectors we had consistently positive assessments of the adaptability with the information given that the IT department mostly adapts rather easily to changes. But differences can be seen when we look at which reasons make adaptations in IT necessary. An adaptation which becomes necessary as a result of changed business processes, a modification in business strategy or a change of customer requirements can be carried out on a similar level in all sectors (the difference between the highest and the lowest sector average is approx. half an answer category each). On the other hand, adaptations that become necessary due to a change in the organizational structure have a wider range

of answers (the difference between the highest and the lowest sector average is more than one answer category). All in all the sectors trade, traffic and logistics as well as the energy industry have the highest average values, thus adapting most easily in this case.

Next to the anticipation of changes and the adaptation to unforeseen changing conditions, a third way of dealing with change might be a proactive way of acting which means that an IT organization activates changes itself. Carrying out changes on the initiative of the IT department helps to reduce the uncertainties caused by the changes and reduces the necessity of a reactive way of acting. Instead, the initiative remains with the company. In the recent past, the proactive IT management is a new challenge for CIOs [Patten et al., 2005, p. 2787; Melarkode et al., 2004, p. 47; Nissen and Mladin 2009; Nissen et al., 2012; Nissen and Rennenkampff, 2013; Rennenkampff, 2015].

In a set of questions we looked at to what extent the IT department changes independently, makes suggestions in other areas of the company, and which consequences such initiatives of the IT department had (Figure 13).

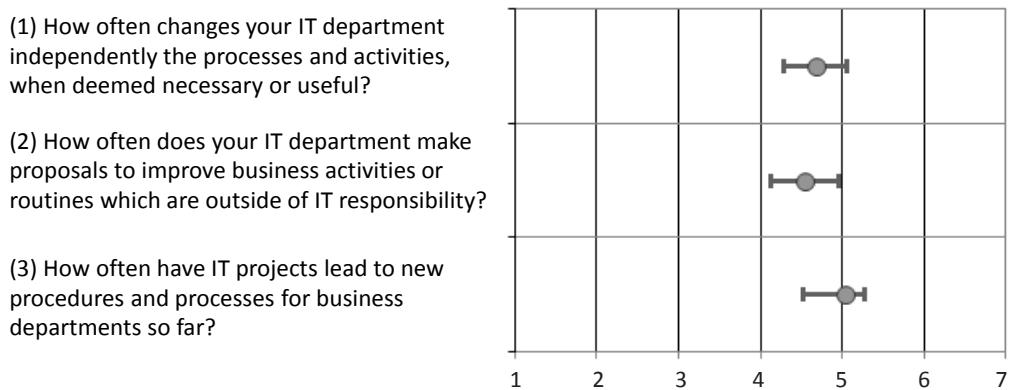


Figure 13. Initiative and proactive production of changes through the IT department (“7” represents highest frequency, the total average and range of the sector average are given, (n = 216).

Looking at the industry averages, it becomes clear that in the consulting sector the lowest industry averages are reached, which means that in this sector rather occasionally changes are activated by the IT department or initiated in other parts of the company. On the other side of the spectrum highest industry averages can be found in different sectors. In the energy industry the independent adaptation of processes and activities is assessed best. The frequency of proposals to improve business activities or routines in other departments of the company is assessed best in trade, traffic and logistics. Finally, projects in the IT department of the financial services sector lead to most new procedures and processes for business departments.

4. Limitations of the Study and Future Research

Even though the results of the study have been collected and analyzed carefully, we have to point to some limitations. At first it has to be underlined that in this study only representatives of large enterprises (minimum turnover 125 million Euro) were asked and, as a conclusion, the answers should not be transferred to small or medium-sized

companies without reflection. In addition, the IT top managers were questioned about their own sphere of responsibility. Although we assume that the participants answered honestly, the answers given still remain subjective and could therefore be distorted positively.

For questions concerning the coordination between the business departments/company management and IT, an additional survey dealing with the business side in the companies looked at would make sense to be in the position to include their perspective, too. But such a project would require considerable efforts and would have exceeded the framework of our study focusing on IT top managers.

With view to the broad diversification of the answers to the question about how much time is spend on strategic IT tasks, it would be interesting for future studies to examine, which tasks IT top managers actually categorize as strategic and how the total number of available working days are spread over the entire spectrum of operations. It would be of interest, too, how in terms of the percentage these tasks are spread over the individual sectors and which connection these have to the fulfilment of the different tasks of the IT department.

Further research questions could also aim at examining the criteria for choosing IT managerial staff in more detail, to further analyze the importance of different criteria and henceforth to follow the development of the evaluation and possible shifting of these criteria over time. Herewith suggestions could be made which may contribute to the training of future IT managerial staff, for example within the framework of business informatics studies or for the development of advanced training measures.

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