The Role of IT Investment Consistency among the Enablers behind the Success of IT Deployment

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Abstract

For this study we analyzed the factors that influence organizational IT deployment success. First, we identified potential factors, then hypothesized about the relationships among the factors and then integrated the hypotheses into a research model. Finally, we empirically evaluated the hypotheses and the entire research model. Special attention was placed on the Business-IT alignment, IT management and consistency of IT investments in relation to the changes in the economy, which is a novel factor introduced in this study. We used survey data of 212 responses collected from CxOs during an economic recession. Empirical results confirmed that all research model factors impacted positively on IT deployment success. Especially, according to our findings, business-IT alignment and high quality IT management are needed to achieve consistency of IT investments, and when achieved, the impact is positive on success.

1. Introduction

The use of IT and IT-related investments accounts for a major and growing proportion of an organization’s costs [16, 62]. Although there are arguments according to which IT does not provide value [14] or offer positive competitive advantages [48], most practitioners and researchers agree with the statement that, on average, IT deployment improves performance and increases the value of an organization [12, 13, 15, 17].

The impacts of multiple factors have been investigated within the broad umbrella of IT business value (ITBV) research [62]. Factors studied include IT capabilities [4, 5, 28, 44, 53, 59], business-IT alignment [8, 33, 36], IT management and IT governance [9, 18, 26, 57, 61, 63], technology strategies and deployment [6, 20, 21, 22, 29, 32, 35, 40, 42, 50, 56, 69], IT investments and projects [38, 39, 45, 55, 63], data/information management [3, 44, 58], and integration and enterprise architecture [8, 48, 60]. Similarly, several measures for IT/organizational performance and business value provided by IT have been crafted [1, 2, 7, 15, 17, 23, 24, 35, 34, 43, 46, 47, 53, 55, 61, 62]. Our objective is to contribute to this literature by investigating the impact of consistency of IT investment and how several ITBV factors jointly affect organizational performance [43, 56, 12, 13].

Against this background, we adopted a slightly different approach to many ITBV studies. First, we raised the question: Are the various factors investigated within ITBV related to each other and, if so, do they as a whole impact organizational performance? More specifically, is it possible to design a holistic model with specified relationships between factors and influences on organizational performance and to empirically verify the influence of each factor and the entire model? Our objective is to find the answers to these questions.

Second, and as a consequence of the above-stated questions, through our research, we explored the outcomes on the level of IT deployment success. There are two reasons for the adoption of this level of investigation. First, both practitioners and researchers would like to understand how IT affects organizational performance. However, there are often significant time delays between IT investments, legacy IT service developments, enterprise architecture activities and other key IT management/governance decisions, the implementation of those decisions, and the final impacts of decisions and actions on organizational performance. There are also intervening factors related to other organizational activities and changes in the organizational environment and IT during the implementation of investments and plans [2, 15, 24, 37]. The second reason is that the success of IT deployment is related to IT’s value and hence also to organizational performance, although the empirical proof of this statement is beyond the scope of this research. As IT has become an enabler for most organizational activities and an integral part of them, we reason it to be unlikely that IT would improve organizational performance unless it is deployed successfully. As a consequence, we argue that the factors investigated within ITBV research can be seen as the factors of IT deployment success, too. Our objective is to craft our research model by doing this.

Third, changes in an organization’s environment might impact how the organization deploys IT. The phase of an economic cycle is one such change. For example, during a recession, there could be pressures to cut IT costs, to postpone IT investments, and to limit development to
improve efficiency in the short run. On the other hand, there could also be efforts to create new business, to consolidate IT assets, to improve data quality, or to develop IT management capabilities. The motive is to be better prepared for economic recovery and for the next bull market [16]. Our objective is to examine how the consistency of IT investment during a recession affects the success of IT deployment.

In summary, through our research, we have investigated two research questions: What factors act as enablers of the success of IT deployment? Secondly, how is consistency of IT investment related to the success of IT deployment and other factors that act as enablers of the success of IT deployment?

In Section 2, we explain how the objectives of our research were achieved and the research questions answered by theoretically discussing ITBV factors with their implied impacts on the success of IT deployment. In Section 3, we explain how the objectives were reached through the proposed a research model and related hypotheses. Results from the empirical study are presented in Section 4. Finally, in Section 5, the theoretical and empirical findings of our study are discussed and we explain the conclusions drawn.

2. Theoretical background

2.1. Perceived importance of IT

We drew from the rich literature on the strategic role of IT, especially from the resource-based view [7, 63]. The findings of these prior studies suggest that if IT is seen to offer a competitive advantage to an organization, the organization will take necessary actions to realize that potential. We call this factor perceived importance of IT, as senior business and IT executives’ education, experiences, attitudes, beliefs etc. about the role of IT in business impact how the importance of IT is perceived [1, 39, 47, 63].

We concluded that when an organization considers IT as a strategic resource or an asset, then the organization will likely place more emphasis and efforts on the alignment of business and IT (discussed in Section 2.2.), on the management of IT (discussed in Section 2.3), and on technology usage (discussed in Section 2.4). In addition to a belief that IT’s role is significant for an organization’s future competitive advantage [53, 43, 49, 46, 59], such positive perception of IT’s importance might manifest itself in many concrete ways. IT could be considered a partner to business [5], or as something providing value to business by facilitating new innovations or by increasing business processes’ efficiency [56, 44, 59]. One likely outcome is that the organization uses more funds on IT. Thus the proportion of IT costs (in percentages) of revenues could actually be higher [16, 12, 13].

2.2. Business–IT alignment

Business–IT alignment is also characterized by a rich literature [cf. 18]. Prior empirical research findings have indicated that the quality of business–IT alignment has positive impacts on organizational performance. For example, we drew from the work of Henderson and Venkatraman [33] who proposed that business–IT alignment has two levels: strategic and operational. They called the former “strategic fit” and the latter “operational integration.”

We concluded that when business and IT are well aligned on strategic and operational levels, it is likely that this positively influences IT management as well as it increases the consistency of IT investments. The proposition regarding IT-investment consistency means that it is less likely that IT investments would be cut down during a recession as they are considered integral to business. As a consequence, IT investments would be scaled down, in line with the scaling down of other business activities or even less, should such needs arise. Prior business–IT alignment research also led us to expect that the quality of alignment will have a direct impact on the success of IT deployment since prior research findings suggested this [33, 61].

In line with [33] we divided business-IT alignment into strategic and operational alignments. If the quality of alignment is high, it is likely that an organization better knows the impacts of IT on its business operations [24, 47]. Furthermore, it is also likely that IT-infrastructure, applications, data, and processes create a well-integrated enterprise architecture [22], that is, good operative integration, in Henderson and Venkatraman terminology [33]. On the strategic level of business–IT alignment, it is likely that senior executives, business unit executives, and IT executives share the accountabilities and responsibilities of IT management based on a clearly defined and thoroughly implemented governance arrangements [33, 61, 18, 57, 36]. This measure also reflects IT governance as the allocation of IT decision-making rights in addition to business–IT alignment.

2.3. IT management

As discussed above, we propose that IT management — including strategic and operative IT management — takes influences both from the perceived importance of IT and from business—IT alignment. The implications are that IT is managed better when an organization considers IT important for the execution of its business and that business-IT alignment helps IT management to focus on issues the organization considers important to its business. The task of IT management is to transform IT-related business needs, user requests, and other IT management issues into plans and actions the outcomes of which are measured and reported. The role of measures and reporting is to secure decisions, plans, and actions in leading to the achievement of objectives and that corrective actions be taken if necessary.
In our research, we built largely on the already mentioned work of Henderson and Venkatraman [33], as well as that of Boynton, Zmud, and Jacobs [9], Weill and Ross [61], Van Grembergen and DeHaes [59], and DeLone and McLean [24, 47]. These studies indicate what needs to be managed, how IT management decisions and other IT management actions are taken, and with what measures the outcomes of IT management should be evaluated. We concluded that well-managed IT has a positive impact on technology usage, on the consistency of IT investments, and on the success of IT deployment. The first proposition implies that good IT management results not only in clearer objectives for technology usage but also in higher volumes of technology usage. The second proposition takes its motivation from reasoning according to which IT investments are likely to be continued unless an IT investment shows poor results and needs reconsideration, or unless there are other reasons to cut down investments. The final proposition states that better management results in improved IT deployment. In other words, why bother with IT management if it would not improve performance?

We investigated the impact of IT management by considering whether or not an organization manages IT as a strategic means currently and in the future [9, 43, 36]. We were also interested in whether an organization aligns the objectives of IT activities with business objectives in such a way that the organization is able to evaluate how IT impacts the achievement of the business objectives [33, 61, 63, 56, 26]. Good IT management practices are also considered to build on knowing the outcomes of IT management decisions, plans, and activities [24, 47].

2.4. Technology usage

In sections 2.1 – 2.3 we reviewed literature only briefly, as the literature is vast, constructs are rather well-known and as the discussed research propositions are fairly obvious to the researchers in the field. So far, we have proposed that the perceived importance of IT positively influences the usage of technology since technology usage is seen to offer more benefits when such an attitude prevails. We also suggested that good IT management favorably affects technology usage since technology usage has clearer objectives and measures when that is the case.

Although these propositions are drawn from theoretical literature, they also appear to be intuitively sound. Ordinary people probably expect that technology usage is the most important explaining factor for the success of IT deployment. As researchers, we also concluded that technology usage impacts the success of IT deployment; however, the importance of this factor needs to be empirically determined in more detail.

In the present research, we included several technologies under the term technology usage, including: e-business [19, 35, 50, 64, 21, 29] social media [40], cloud services [6, 20], and bring-your-own device (BYOD) [27, 32, 42] which is sometimes also called IT consumerization. In addition to devices, BYOD could also mean the use of an employee’s own applications and services. All of the included technologies have been available for several years. This means that organizations have had plenty of opportunities to consider their usage and to learn from their own and other organizations’ experiences. For the same reasons we excluded some other technologies, such as big data and Internet of things. The underlying argumentation is similar to that expressed in Section 1. After a decision is made to use a particular technology, it takes time to implement necessary IT and to gain experience with the technology. Thus, impacts on organizational performance take time and could be mediated by intervening factors.

Organizations that perceive the significance of IT positively and that manage IT well are expected to have better strategies and implementation plans for technology usage and to be better able to define how to increase technology usage in a managed way. Better technology usage is then believed to positively influence the success of IT deployment. Thus we investigated whether an organization has a clear strategy to deploy each of the investigated technologies in business and whether the organization has the objective to increase the use of each of the investigated technologies in business.

2.5. IT investment consistency

Investment consistency is a topical issue in economic and finance literature, but has received less attention in information systems research. The underlying idea of the present research is that changes in the environment of an organization will impact the IT investments of that organization. Changes in the environment can either create pressures to intensify IT investments and to make additional investment or they can lead to postponements, scale downs or discontinuations. The phase of an economic cycle is one environmental change that affects an organization’s IT investment activity.

Our survey data was collected during an economic recession, which continued for the second year at the time of our data collection. We deemed it to be more likely that organizations would try to find ways to postpone and cut down investments rather than to increase them. Likewise we considered that it was possible that the economic situation could have an impact on the return rate of investments and to make additional investment-risk behavior. We deemed it more likely that organizations would prefer short-return times on investments combined with low-level risks rather than the opposite. However, as discussed in Sections 2.2 and 2.3, we also proposed that if IT were better aligned with business and if IT were managed better, it would be more likely that IT investments be continued more consistently even during a recession. We finally concluded that higher consistency of IT investment positively affects the success of IT deployment.

How does one investigate consistency of IT investments, and its relations to an economic cycle during a recession?
We identified two complementary approaches. An organization might wish to cut down IT costs, to postpone IT developments and investments in order to increase the efficiency of the organization [16]. Similar cut down and postponement activities could be carried out in other activities, such as marketing, business development, etc. Efficiency could also be enhanced by improving the quality of data, by educating users to deploy IT better, by developing IT management capabilities, or by standardizing and consolidating IT to reduce the complexity of IT, for example by removing overlapping IT assets. At least a part of these actions could be implemented with no or little IT investments. These actions could have positive long-term effects during recovery and the next bull market. Such actions also go against the economic cycle similar to actual investments into new IT-enabled business.

2.6. Impact on the success of IT deployment

The ultimate goal of organizations is to increase the success of IT deployment and through that, organizational performance. Our research proposes that the perceived significance of IT, business–IT alignment, IT management, technology usage, and IT-investment consistency provide the foundation for this. The linkages between the mentioned factors, as discussed in sections 2.1–2.5, are seen to have strong causalities and also to have path-mediated impacts for some of the factors. For example, the perceived significance of IT is not seen to directly impact the success of IT deployment but path-mediated by business–IT alignment, IT management and technology usage.

In this research we focused on the impacts on the success of IT deployment rather than on the impacts on organizational behavior for reasons given in Section 1. We drew on user satisfaction research [1, 2, 9, 15, 24] and on IT project performance research [39, 45, 55] when dependent variables were defined.

3. Research model and methodology

3.1. Research model and hypotheses

The theoretical research model used in this study is shown in Figure 1. The framework builds on the concepts discussed in Section 2 and consists of six main constructs. The research model shows that there is a relatively complex structure of direct and indirect relationships behind the success of IT deployment. We assume that the outcomes of IT are not solely dependent on the technology used, the IT management, IT investments, or the business-IT alignment, but are a right combination of these drivers and an antecedent to them—the perceived importance of IT.

Thus, the hypotheses for this research are as follows:

- H1: Perceived importance of IT positively affects technology usage.
- H2: Perceived importance of IT positively affects IT management.
- H3: Perceived importance of IT positively affects business-IT alignment.
- H4: Business-IT alignment positively affects IT management.
- H5: Business-IT alignment positively affects the success of IT deployment.
- H6: Business-IT alignment positively affects the consistency of IT investments.
- H7: Management of IT positively affects technology usage.
- H8: Management of IT positively affects the success of IT deployment.
- H9: Management of IT positively affects the consistency of IT investments.
- H10: Technology usage positively affects the success of IT deployment.
- H11: Business-IT alignment positively affects the success of IT deployment.

One may notice that all eleven hypotheses are expected to have positive effects, direct or indirect, on the success of IT deployment.
3.2. Research method

To validate these research hypotheses, we adopted survey research as the data collection method. In the study, we used a relatively large, existing data set called IT-Barometer 2013, which includes data that was collected by a National Data Processing Association in mid-2013. The data was collected from the CIOs and Business Executives, mainly of organizations with over 500 employees. In this study, we used only that part of the available data that concentrated on the hypothesized issues. The operationalization of the constructs, the respective measurement items with appropriate references, are given in Appendix 1. The listed references served as a theoretical background and as an idea source or motivation for the question items. The number of measurement items per construct varies between three and eleven items.

Invitation to participate in the survey along with one reminder was sent to 2,128 people. The response rate was 10%, which we regard as normal for IS management studies. Of the respondents, 53% (n=115) were CIOs and other IT managers, 19% were business executives, and 28% were senior business experts. Twenty-seven percent of them worked in industry, 12% in commerce, 46% in services, and 14% in public sector organizations. Forty-nine percent of the CIOs in the data reported to CEOs, 26% to CFOs, and 25% to other CxOs.

The relevance of the study’s theoretical findings was empirically assessed using one form of confirmatory factor analysis (CFA), namely structural equations modeling (SEM). The variance-based SEM—more often referred to as partial least squares (PLS)—was used instead of covariance-based SEM (CBSEM).

This choice was based on three arguments that limit the usage of CBSEM in certain circumstances: First, CBSEM aims to estimate a set of given parameters in a way that the theorized covariance matrix corresponds as closely as possible to the empirically discovered covariance matrix. This notion fundamentally limits the usability of CBSEM for predicting the future, as the objective is to achieve a fit for the status quo rather than to open ways for alternative solutions [31]. Furthermore, due to its purely confirmatory nature, CBSEM might prove to be problematic specifically in situations where the theoretical fundament for the proposition are still developing.

Second, because CBSEM uses either maximum likelihood or generalized-least-squares regression methods in calculations, it requires that the empirically gathered dataset be normally distributed. Moreover, the sample size requirements significantly increase, requiring at least 200 observations as a minimum for the research to be valid (ibid). The small sample size is perhaps the most pervasive argument for using PLS [51]. It is generally accepted that the minimum sample size is only 10 times the number of indicators in the most complex formative construct, added to by the number of paths directed at the construct. In this case, the highest number of constructs is thirteen, directed to technology usage, and thus the minimum sample size would be 130, which our number of useful responses (212) clearly exceeds. Although the rule is questioned [30, 41], it is commonly proposed and applied [10, 31]. Contrasting to CBSEM, PLS does not provide overall fit indices for the evaluation of the model quality but there are different measures to evaluate the measurement and the structural models.

A PLS-model of the success of enterprise IT deployment was created using SmartPLS 2.0M3 to evaluate the measurement quality and to verify the structural hypotheses of the research model [52].

4. Analysis and results

Next, we adopted a two-step analysis, in which the measurement model and the structural model were validated separately.

4.1. Measurement model

First, the reliability of the full PLS model was analyzed. It soon became clear that the reliability of some constructs (composite reliability) as well as their average variances extracted (AVE) were much too low and that modifications to the original model had to be made. For this purpose, some indicators (X15, X21, X22, X23, X24, X26, X29, X51, and X52) behind latent constructs were reduced. The indicator cross-loadings for the full PLS model were used to find the proper indicator candidates for exclusion. The overview of the quality indicators of the final model is summarized in Table 1.

Because all AVE, composite reliability, and Cronbach’s alpha values were greater than the recommended threshold values (0.50, 0.70, and 0.70), the variance caused by error terms no longer gave rise to questioning the validity of the model, and the analysis of the measurement model suggested acceptable convergent validity. In addition, the items significantly loaded on their constructs, showing satisfactory discriminant and convergent validities.

The discriminant validity was evaluated by comparing the square root of the AVE for each construct with the correlations between it and all other constructs. Bolded elements in the diagonal (Table 1, last six columns) are square roots of AVE and off-diagonal elements are inter-construct correlations. Because the bolded elements on the diagonal are greater than the elements in the respective row or column, the results indicate that the particular construct differs from all other constructs.

Since the PLS model is firmly backed by statements of reliability and validity, assessing the structural model and the respective hypotheses can be conducted to meet the study’s objectives.
4.2. Structural model

After having the measurement model refined and validated, we tested the hypotheses proposed by the research model by assessing the structural (inner) model. After some experiments with a different number of bootstrap samples, a bootstrapping procedure with 212 cases and 1000 resamples was used to test the significance of all paths in the research model [31]. The results of the analysis are summarized in Figure 2, which shows the explained variances (R²), the path coefficients, and the significance levels. The analysis indicates that Hypotheses H2 –H7, H9, and H11 were supported by the data, whereas Hypotheses H1, H8, and H10 were not. Generally, the results indicate a good predicting power of the model.

- The perceived importance of IT has a significant impact on the business–IT alignment and on the management of IT.
- Almost 60% of the quality of IT management is determined by the importance of IT and by the business-IT alignment.
- Consistency of IT investments depends on the quality of IT management together with the level of alignment.
- The usage of new technology (e-commerce, social media, cloud computing, BYOD) is affected by the

Table 1. Reliability measures of the model (AVE=Average Variance Extracted, CR=Composite Reliability, CA=Cronbach’s Alpha)

| Construct              | # of Items | Mean | Std  | Loading (t-value) | AVE  | CR   | CA   | A    | C    | PI   | M    | O    | TU   |
|------------------------|------------|------|------|-------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Alignment, A           | 3          | 4.47 | 1.27 | 0.77, 0.88, 0.78  | 0.66 | 0.85 | 0.75 | 0.81 |      |      |      |      |      |      |      |      |
| Consistency, C         | 5          | 4.53 | 1.10 | 0.59, 0.75, 0.83, 0.74, 0.84 | 0.57 | 0.87 | 0.81 | 0.51 | 0.76 |      |      |      |      |      |      |      |
| Perceived Importance, PI | 4      | 5.52 | 0.97 | 0.74, 0.79, 0.86, 0.75 | 0.62 | 0.87 | 0.79 | 0.52 | 0.54 | 0.79 |      |      |      |      |      |      |
| Management, M          | 4          | 4.42 | 1.25 | 0.86, 0.66, 0.87, 0.84 | 0.66 | 0.89 | 0.83 | 0.63 | 0.64 | 0.69 | 0.81 |      |      |      |      |
| Outcomes, O            | 5          | 5.26 | 1.05 | 0.86, 0.75, 0.72, 0.84, 0.68 | 0.60 | 0.88 | 0.83 | 0.62 | 0.48 | 0.54 | 0.51 | 0.77 |      |      |      |
| Technology Usage, TU   | 5          | 3.75 | 1.26 | 0.76, 0.65, 0.77, 0.74, 0.61 | 0.50 | 0.83 | 0.77 | 0.37 | 0.32 | 0.34 | 0.41 | 0.32 | 0.71 |      |      |      |

Figure 2 Results of the PLS analysis
quality of IT management, but the technology alone seems to have only a minor effect on the IT outcomes.

- Instead, the consistency of IT investments and the level of alignment have a strong effect on IT outcomes.
- The quality of IT management seems to be perceived through the consistency of IT investments.
- 42.5% of IT outcomes are determined by the proposed model.

Because there are no negative relationships in the model, one can expect a kind of cumulative process behind the IT outcomes. Success in one area leads to success in another area and finally to the success of IT deployment in general. And vice versa—if one area fails, there is a big risk that the other areas in the path will fail too. The relationships within the model can be further analyzed in detail. For example, the positive impact of the alignment alone on the IT outcomes is described in Figure 3.

![Alignment vs. Outcomes](image)

\[ y = 0.4871x + 3.0801 \]

\[ R^2 = 0.3523 \]

**Figure 3 The Impact of Business - IT alignment on IT outcomes**

5. Discussion and Conclusions

The relationship between IT investments and organizational performance has been studied extensively. The famous productivity paradox claims that IT does not necessarily contribute to better performance [11]. Many factors have been put forward to explain this finding. Poor management and long-term immaterial benefits were proposed to be the most important reasons. Brynjolfssson and Hitt [12] showed in a later study that companies actually gain benefits, but a big part of the benefits eventually leak to their customers in the form of lower prices or better quality. They also speculated that new ways of operating often gradually become a new standard in an industry and no longer offer a competitive advantage. At the same time, the new ways of operating become a strategic necessity. Consequently, single IT investments might not result in better performance. Porter put forward similar argumentation on the strategic impact of Internet [49]. However, if IT investments are made consistently and wisely over a long period of time—for example by establishing high-performance IT infrastructure and sound application portfolios—organizational performance benefits could be achieved [37].

In this study, we investigated multiple factors potentially impacting an organization’s performance. Many interesting and some even obvious results were discovered. In summary, several things have to succeed at the same time to achieve desired outcomes from IT deployment. IT needs to be considered important, aligned with business, managed properly, and used responsibly. We were particularly interested in finding out if consistent IT investments during a recession help organizations to flourish. Consistent IT investments were detected to result from proper alignment between IT and business as well as from good IT management. Data collected during an economic recession indicated clearly that organizations, which showed consistency in their IT investments—that in other words followed their original plans to deploy IT—performed better during the economic downturn.

Our advice to practitioners is to ensure the existence of a smooth and continuous IT budget, to develop and to realize the plans based on a well-aligned investment portfolio. This pays off when the economic situation changes. It offers opportunities to realize identified benefits and to cash them in when the economy turns again to a bull market. Even though cost cutting and IT-investment postponement sound like an easy way to save funds during a recession, the consequences can be very harmful in the long run.

Although our research was able to explain a large proportion of IT performance success \( R^2=0.425 \), the factors of our model, of course, do not represent a complete list of success factors. For example, we were forced to leave out the impact of business and IT executive capabilities due to limitations in the data. The survey included 182 survey questions. Questions on respondents’ personal capabilities, management culture of the organization, composition of IT budget etc. had to be dropped to ensure the capturing of responses from the busy business and IT executives of primarily large organizations. Respondent’s industry, size of organization, position either in business or IT, to whom the CIO reported, whether or not IT costs included “traditional” or also business IT costs had limited amount of dependencies with the question items shown in Appendix 1. These dependencies were measured with Pearson’s
correlation coefficient and/or with the Student t-test.

Our findings provide evidence that consistent IT investments are especially important to organizations that perceive IT to have great importance for their business. If IT is seen to have only a support and non-enabling role, it could be easier to cut IT costs during a recession. On the other hand, one might ask if IT could be used to cut other costs in these organizations, and if IT investments should still be continued in order to achieve that. Furthermore, what happens to organizations who did not invest into IT, if the new standard of their industry is more IT-dependent? Longitudinal studies on the consistency of IT investment are needed in the future to properly address these issues and to give organizations better contextual advice on how to manage their IT investments.

6. References


## Appendix 1. Operational definitions of the measures

<table>
<thead>
<tr>
<th>Construct</th>
<th>Question item - Evaluate how well the following statements apply to your organization</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>If IT as a source of competitive advantage and improved organizational performance</strong></td>
<td>X11 The role of IT as a future competitive advantage increases</td>
<td>7, 43, 46, 53, 59</td>
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<tr>
<td></td>
<td>X12 IT serves our business as a partner</td>
<td>5, 9, 62</td>
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<tr>
<td><strong>The capability of IT to support innovations and to provide value to business in this way</strong></td>
<td>X13 IT provides value to our business by facilitating the development of new innovations and by increasing the efficiency of our business processes</td>
<td>9, 23, 44, 56</td>
</tr>
<tr>
<td></td>
<td>X14 It is extremely important to our future success that IT provide value to our business by facilitating the development of new innovations and by increasing the efficiency of our business processes in the future</td>
<td>44, 56, 59</td>
</tr>
<tr>
<td><strong>How big is the proportion of IT costs from the revenues of your organization or from the total budget?</strong></td>
<td>X15 Percents (%) of revenues</td>
<td>12, 13, 16, 44</td>
</tr>
<tr>
<td><strong>Strategic role and deployment of e-commerce, social media, and innovation IT</strong></td>
<td>X21 My organization has a clear strategy and implementation plan for e-commerce as a part of business operations</td>
<td>19, 21, 29, 35, 50, 64</td>
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<td></td>
<td>X22 The goal of my organization is to significantly increase the use of e-commerce as a part of business operations</td>
<td>19, 21, 29, 35, 50, 64</td>
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<tr>
<td></td>
<td>X23 My organization has a clear strategy and implementation plan for social media as a part of business operations</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>X24 The goal of my organization is to significantly increase the use of social media as a part of business operations</td>
<td>40</td>
</tr>
<tr>
<td><strong>Strategic role and deployment of cloud services</strong></td>
<td>X25 My organization has a clear strategy and implementation plan for cloud services as a part of business operations</td>
<td>6, 20</td>
</tr>
<tr>
<td></td>
<td>X26 The goal of my organization is to significantly increase the use of cloud services</td>
<td>6, 20</td>
</tr>
<tr>
<td><strong>Strategic role and deployment of BYOD (Bring Your Own Device)/IT consumerization</strong></td>
<td>X27 My organization has a clear strategy and implementation plan for BYOD/IT consumerization as a part of business operations</td>
<td>27, 32, 42</td>
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<td></td>
<td>X28 The goal of my organization is to enable the use of same devices at work and for leisure time</td>
<td>27, 32, 42</td>
</tr>
<tr>
<td></td>
<td>X29 The goal of my organization is to enable the use of the same applications and services at work as for leisure time</td>
<td>27, 32, 42</td>
</tr>
<tr>
<td></td>
<td>X210 In my organization, BYOD/IT consumerization is acknowledged in our IT strategy and implementation plan as well as in the development of IT services</td>
<td>27, 32, 42</td>
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<tr>
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<td>X211 The current enterprise architecture of my organizations enables the inclusion of BYOD devices, applications, and services into enterprise architecture</td>
<td>27, 29, 32, 42</td>
</tr>
<tr>
<td><strong>The strategic management of IT</strong></td>
<td>X31 We manage IT and develop its management as a strategic means</td>
<td>9, 17, 36, 43, 53, 59</td>
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<td></td>
<td>X32 It is extremely important to our future success that we manage IT and develop its management as a strategic means in the future</td>
<td>43, 53, 59</td>
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<td>X33 We align the objectives of our IT activities with our business objectives so that we are able to evaluate how IT impacts the achievement of our business objectives</td>
<td>18, 26, 33, 57, 61, 63</td>
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<tr>
<td></td>
<td>X34 Based on reliable metrics, we know well the benefits of IT management and its development as a strategic means</td>
<td>9, 17, 24, 43, 47</td>
</tr>
<tr>
<td><strong>Operative alignment of business and IT</strong></td>
<td>X41 We know well the impact of IT on our business</td>
<td>9, 17, 24, 43, 47</td>
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<td></td>
<td>X42 In our organization’s IT infrastructure, applications, data, and processes create an integrated whole</td>
<td>22, 57</td>
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<tr>
<td><strong>The strategic alignment of business and IT</strong></td>
<td>X43 Senior executives, business unit executives, and IT executives share the accountabilities and responsibilities of IT management on the basis of clearly defined governance arrangement</td>
<td>18, 33, 35, 58, 61</td>
</tr>
<tr>
<td><strong>The impact of economy on business operations during the recent year</strong></td>
<td>X51 We increased the efficiency of IT by cutting IT costs</td>
<td>2, 12, 13, 16</td>
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<td>X52 We postponed IT purchases and IT investments</td>
<td>11, 12, 13, 38</td>
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<td>X53 We used IT to create new business</td>
<td>44</td>
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<td>X54 We increased IT benefits by educating users</td>
<td>4, 28, 44, 54</td>
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<td>X55 We improved the quality of IT-enabled data/information and eliminated problems caused by broken data flows</td>
<td>3, 44, 48, 58</td>
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<td>X56 We integrated and consolidated our enterprise architecture</td>
<td>2, 8, 23, 48, 60</td>
</tr>
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<td>X57 We improved business driven IT management within our organization</td>
<td>4, 5</td>
</tr>
<tr>
<td><strong>What elementary school grading (4-10) would you give to the deployment of IT within your organization</strong></td>
<td>Y1 What elementary school grading (4-10) would you give to the deployment of IT as a whole within your organization?</td>
<td>1, 15, 24, 25, 47</td>
</tr>
<tr>
<td><strong>Evaluate how well IT projects succeeded in your organization</strong></td>
<td>P1 The outcomes of IT projects correspond in general with our plans</td>
<td>15, 55</td>
</tr>
<tr>
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<td>P2 IT projects kept their time-tables</td>
<td>39, 45, 55</td>
</tr>
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<td>P3 IT projects kept their agreed budgets</td>
<td>39, 45, 55</td>
</tr>
<tr>
<td></td>
<td>P4 IT projects achieved the business objectives defined for them</td>
<td>39, 45, 55</td>
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</tbody>
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