THE INFLUENCE OF STRATEGIC FOCUS FOR SUPPORTING THE ABILITY OF THE IT-DEPARTMENT TO DELIVER VALUE OVER TIME

John Krogstie and Tor Kristian Veld

IDI, NTNU
krogstie@idi.ntnu.no, torkristianveld@gmail.com

Abstract

We have earlier presented numbers from studies performed in 1993, 1998, 2003, 2008 and 2013 among Norwegian organizations on how they conduct information systems development and maintenance. A major finding is that even if we witness large changes in the underlying implementation technology and development methods used, a number of aspects such as overall percentage of time uses for maintaining and evolving systems in production compared to time used for development and the distribution of time on different maintenance activities is remarkably stable on average. Still there are large differences in the information systems evolution efficiency between different organizations. In this paper we investigate how the strategic thinking on IT potentially influences the ability of the organization to have a larger proportion of value-added IT-activity. We find that where the IT-manager is involved on a regular basis with the enterprise management and IT and business strategy are aligned, more of the time used on IT is used for value-adding activities.

1 INTRODUCTION

Although it has long been known that only a small fraction (15-20%) of the effort used on IT in organizations is done on making new systems (Veld and Krogstie 2014), research in information systems and software engineering is excessively interested in this part of the system lifecycle. As a recent example, the new Norwegian IT-council is primarily focused on IT-projects. As summarized in (Jørgensen 2015a), there are an obvious potential for improvements in this area. Many investigations points to that around 10% of the investments in new projects ends up delivering nothing (Jørgensen 2015b, Sauer, Gemino et al. 2007, El Emam and Koru 2008, Tichy and Bascom 2008).

Still only looking at projects developing new systems provides a too limited view to understand successful information systems support in organizations. Application systems are valuable when they provide information in a manner that enables people to meet their evolving objectives more effectively (Boehm 1999). Many have claimed that the large amount of work that goes into maintenance compared to the amount of work used for development is a sign on poor use of resources to meet these demands. On the other hand, as stated already by Brooks (1987), it is one of the essential properties of application systems that they are under a constant pressure of change, and thus they should be expected to change to stay relevant. Given the evolutionary nature of the sources of system demands, it shouldn’t be surprising that specifications and the related information system must evolve (Boehm 1999).

The goal of both development activities and maintenance activities is to keep the overall information system of the organization relevant to the business, meaning that the systems support the fulfillment of organizational goals. A lot of the activities labelled ‘maintenance’, so-called enhancive maintenance (Chapin et al 2001), are in this light value-adding acts, enabling the users of the systems to do new task. On the other hand, a large proportion of the ‘new’ systems being developed are replacement systems, in its first installment primarily replacing the existing system(s) without adding much to what end-users can do with the overall application systems portfolio of the organization (Davidsen & Krogstie, 2010).

Based on this argumentation we have earlier developed the concept application portfolio evolution (Krogstie 1995) as a more meaningful high-level measure to evaluate to what extent an organization is
able to evolve their application system portfolio efficiently. How application portfolio evolution is different from traditional development is described further in the next section. We have earlier shown how this figure has been quite stable over the last 15 years (Veld and Krogstie 2014), based on replication studies (Brooks et al 2008) in the area.

Information technology is more pervasive than ever, constituting a significant factor for performance and survival of businesses. It is essential that the IT-people within organizations understands the business needs in order to provide the necessary support and bring value, which is especially important when IT is the main value creator. Therefore, alignment between the business and IT within organizations is an issue of great concern. Although the average amount of time for value-adding IT-activities has been found to be stable, one can find large differences between different organizations. In this paper, we present results on the impact on how the organization thinks upon IT-strategy, and how IT and Business strategy are aligned influence application portfolio evolution and other measures on percentage of value-adding activities. We will in section 2 first give definitions of some of the main terms used within software development and maintenance, including the terms application portfolio upkeep and application portfolio evolution. We then describe how we have differentiated between IT-strategy and business strategy alignment approaches. We describe the research method including the main hypothesis, before the main descriptive results from our investigations are presented. Section 5 investigates in more detail the stated hypothesis on the influence of strategic thinking in the organization on work distribution. The last section summarizes our results and presents possible future work. Relevant parts of the survey forms used are found in the Appendix.

2 BACKGROUND

Maintenance has traditionally been divided into three types: corrective, adaptive and perfective (ISO 2010) inspired by work going back to (Swanson 1976). This vocabulary is well established both in theory and practice, and we here use the standardized terms with some clarifications and further division also anchored in the literature:

Maintenance is defined as the process of modifying a software system or component after initial delivery to production.

- Corrective maintenance is work done to correct faults in hardware and software.
- Adaptive maintenance is work done to make the computer program usable in a changed environment.
- Perfective maintenance is work done to improve the performance, maintainability, or other attributes of a computer program. Perfective maintenance has been divided into enhance maintenance (Chapin 2000) and non-functional perfective maintenance. Enhancive maintenance involves changes and additions to the functionality offered to the users by the system. Non-functional perfective maintenance implies improvements to the quality features of the information system and other features being important for the maintainers of the system, such as modifiability. Non-functional perfective maintenance thus includes what is termed preventive maintenance, but also such things as improving the performance of the system without adding new functionality.

In addition to the traditional temporal distinction between development and maintenance, we have earlier introduced the concepts application portfolio evolution and application portfolio upkeep (originally termed functional development and functional maintenance when first introduced in (Krogstie 1995)).

1. Application portfolio upkeep: Work made to keep the functional coverage of the information system portfolio of the organization at the current level. This includes:
   a) Corrective maintenance
   b) Adaptive maintenance
   c) Non-functional perfective maintenance
   d) Development of replacement systems
2. Application portfolio evolution: Development or maintenance where changes in the application increase the functional coverage of the total application systems portfolio of the organization. This includes:

   a) Enhancive maintenance
   b) Development of new systems that cover areas, which are not covered earlier by other systems in the organizations

We note that some researchers provide more detailed overview of maintenance tasks (Chapin et al 2001, Jones 2006). Jones (2006) has in total 21 categories: This includes user-support as a part of maintenance an area usually looked upon as belonging to 'other work' in other overviews.

Turning to alignment between business and IT, this allows for business strategy to utilize the capabilities of IT to improve business performance. The Strategic Alignment Model (SAM) (Henderson and Venkatraman 1989) summarizes alignment with domains, fundamental dimensions and relationships (represented as boxes and bi-directional arrows respectively — Figure 1)

The SAM provide a generic map for alignment in an organization with two fundamental dimensions. Strategic integration refers to the fit between external and internal domains — strategy and infrastructure respectively — for both business and IT indicated through the perpendicular bi-directional arrows; business strategy should be aligned with internal structures and business functions, and similarly, IT structures and operations should be aligned with the IT strategy they are meant to facilitate. Functional integration refers to the fit between business and IT both for strategy as well as internal structure, which is indicated by the horizontal bi-directional arrows. Business strategy should be aligned with IT strategy for realizing value from IT investments which is over main takeaway towards our current work. Similarly, internal structures and business operations should be aligned with IS structures and operations. Two additional types of relationships can be identified in the SAM, which are together referred to as cross-domain alignment, and are presented through the diagonal bi-directional arrows. Linkage refers to analyzing business strategy to define requirements for IS structures and processes, while automation refers to the potential of IT to shape or change the internal structure and business operations.

According to Chan and Reich (2007) there are several dimensions of alignment: strategic, structural, social, and cultural. The strategic refers to the degree to which the business strategy and plans, and the IT
strategy and plans, complement each other cf SAM above. The structural dimension refers to the degree of structural fit between IT and the business that is influenced by the location of IT decision-making rights, reporting relationships, decentralization of IT, and the deployment of IT personnel. The social dimension refers to the state in which business and IT executives within an organizational unit understand and are committed to the business and IT mission, objectives, and plans. The cultural dimension refers to the need of IT planning to be aligned with cultural elements such as the business planning style and top management communication style.

When it comes to the strategic IT-focus, we have looked at two aspects in particular in our last survey: The role of the IT-manager and IT strategy-Business strategy alignment, arguing that to have long-time positive effect on IT (witnessed as being able to use a larger proportion of the effort on application portfolio evolution). IT-issues should be closely related to business issues. For the second area (IT strategy-Business strategy alignment), four possibilities were proposed in the survey investigation:

a. The business strategy and the IT-strategy do not influence each other
b. The business strategy is developed first and this guides the work on the IT-strategy
c. The business strategy and the IT-strategy are tightly integrated
d. There is no own IT-strategy, IT is completely integrated in the business strategy

where a) above is regarded as particularly bad practice, although it can be argued that due to the rapid changes in the technological opportunities warrants to have and maintain a specific IT-strategy to avoid ‘Kodak’-moments i.e. not being able to handle disruptive changes enabled by technological progress.

The following 6 choices were given for the respondents to describe the main task of the IT-manager, tapping into the social alignment aspect (Chan & Reich, 2007)

a. Fire fighting and daily operations
b. Ensuring cost-effective delivery of core IT services
c. Ensure that new projects are delivered on time, within budget and with high quality
d. Collaboration with business management on improvements to application
e. Being proactive toward business management with new ideas and initiatives to change processes and applications
f. Develop new business models that exploit technological opportunities

where the first three are indications on having an overly IT-oriented focus, whereas the last three are looked upon as having a more pro-active business-oriented focus which will be beneficial for achieving and maintaining long-term value for the organization.

3 RESEARCH METHOD

In connection to this work, we have performed two surveys. One is our main replication study covering a large number of topics matching the ones we had investigated 4 times earlier. The other is in connection to the yearly ‘IT i praksis’ (Ramboll 2014) investigation done by Ramboll in early 2014, where we have included the questions relative to work distribution from our replication study, to compare this with e.g. the benefit of IT and alignment of IT and business strategy. We present these investigations individually below.

Our main replication survey was implemented in the SurveyMonkey web-tool and invitations were distributed by e-mail to 388 Norwegian organizations. The organizations were randomly selected from the list of member organizations of DnD (The Norwegian Computer Society - NCS) (NCS has currently around 1000 member organizations primarily in the private sector) and OSDF - the public sector IT-forum, to have also respondents from the public sector. Comparisons between private and public sector are provided in (Krogstie and Veld 2015). ‘IT i praksis’ was sent out to more than 500 organizations, equally divided between the public and the private sector, and we made sure to avoid overlap between the respondents.
The form in our replication study contained 41 questions including demographic data. The main questions from the form are found in the appendix. The contents of the form were based on previous investigations within this area; especially those described in (Davidsen and Krogsie 2010, Holgeid et al 2000, Krogsie and Solberg 1994, Krogsie et al 2006, Lientz and Swanson 1980, Nosek and Palvia 1990, Swanson and Beath 1989). Data from the replication study can be made available on request. In this paper, we present result combining the data from the replication study with data from the IT i Praksis study, relative to questions found in both forms.

Galtung (1967) regards that the least size that is meaningful in a survey is 40 units. Since survey-investigations in the area of development and maintenance of application systems toward the same population earlier had given a response rate in the area of 22%-28% (Davidsen and Krogsie 2010) and the response rate of similar surveys has been around 20-25% (e.g. (Lientz and Swanson 1980, Nosek and Palvia 1990)), an answer ratio of approximately 20% was expected. This would have resulted in around 77 responses. 87 responses were returned in the replication study, giving a response rate of 22% on the replication study. Out of these only 68 responses could be used for the analysis. The additional responses were not complete, and in particular did not include responses to the questions relative to distribution of work.

Although this provides sufficiently many responses for doing statistical analysis, it would be even better to have a larger number of responses, based on a higher response rate. Our other investigation, linked to ‘IT i praksis’ supported this goal. Out of 533 distributed survey forms in this investigation, 272 responses (i.e. 51%) where returned, although only 208 provided responses to the questions that was shared with our main replication study. When we put the valid responses together, we had an overall response-rate of 39% which is higher than in comparable surveys.

The forms in our main investigation were filled in using the web-form by people with long experience with application systems related work (average 21,3 years), typically filling the role as IT director in the company. Judged on the responses, all organizations where doing work on all support-line levels (1-3) (Kajko-Mattson et al 2004), but with different emphasis on different types of support, and different patterns of (out)-sourcing of activities. Because of this we will be cautious when interpreting the results.

**Hypothesis**

The following main hypotheses were formulated before the investigation to look into how various measures for distribution of work differ relative to strategic alignment.

1. **H1**: There is no difference between the percentages of time used for maintenance reported in our survey in organizations with good or poor IT and business alignment.
2. **H2**: There is no difference between the percentages of time used on development reported in our survey in organizations with good or poor IT and business alignment.
3. **H3**: There is no difference between the breakdown of maintenance work (in corrective, adaptive, enhance and perfective maintenance) in our survey in organizations with good or poor IT and business alignment.
4. **H4**: There is no difference between the distribution of work among maintenance and development in our survey in organizations with good or poor IT and business alignment.
5. **H5**: There is no difference between the distribution of application portfolio upkeep and application portfolio evolution in our survey in organizations with good or poor IT and business alignment.

**4 DESCRIPTIVE RESULTS**

Work on application systems was in the survey divided into the six categories presented in section 2. The same categories were also used in 1993, 1998 and 2003 and 2008. We also asked for the time used for user-support and for systems operations which took up the additional time for the work in the IT departments. For these figures we have numbers both from the earlier studies by others (going back to the
Lientz/Swanson study in the seventies (Lientz and Swanson 1980), our previous studies in Norway, the main replication study and the ‘IT i praksis’ study, and we present here the aggregated numbers from these studies below. Note that in the surveys, we do not ask for numbers of our specific figures on application portfolio evolution and upkeep, but calculate them from figures of the more well-known types of maintenance and development. The main reason to present these numbers here is to see to what extend the main numbers in the last investigations are typical for the numbers reported on these figures over time, or if they differing a lot from these.

**Figure 2 Work distribution over time**

Figure 2 summarizes the descriptive results on the distribution of work in the categories in our investigation, comparing to previous investigations. Along the X-axis we find the different investigations by us, indicated by year. ‘LS’ denotes the historical investigation by Lientz and Swanson. 40.7% of the total work among the responding organizations in 2013 is maintenance activities, and 16.6% is development activities. From the graph in Fig. 2, we see this is quite similar to the last 3 investigations, although on a different level than the first investigation (and from Lientz/Swanson), primarily because the larger amount of work going into other work such as operations and user-support.
When disregarding other work than development and maintenance of application systems, the percentages from the 2013 study are as follows: maintenance activities: 73%, development activities: 27% (see fig 3). This is a bit more skewed towards maintenance than in the previous investigations, back to the level reported in 1998 (pre Y2K). 65% of development and maintenance work was application portfolio upkeep, and 35% was application portfolio evolution. This is almost the same as in 2008, 2003 and 1998, which in turn was significantly different from the situation in 1993 where application portfolio upkeep- and application portfolio evolution respectively amounted to 44% and 56% of the work. Thus also here we find the result from the last investigation to not differ much from the previous 3 investigations.

![Figure 3 Development of application portfolio upkeep and evolution over time](image)

% of time

Figure 4 summarizes the results on the breakdown of maintenance activities from our investigations where we look upon the complete portfolio of the responding organizations. Most interesting for comparison with other surveys is looking at corrective, adaptive, and perfective maintenance, which appears also to be quite stable. We do note though that the enhancive maintenance part of perfective maintenance appears to have stabilized on a lower level than we found 20 years ago.

![Figure 4 Development of maintenance work distribution over time](image)

5 Testing Hypothesis on Strategic Focus on IT in the Organization and Work Distribution

Based on our discussion in the introduction, it should not be a surprise that what we in particular are interested in is H5, whereas we would not expect there to be large differences on the other areas (except on enhancive maintenance).

Before looking for significant relationships to follow up the stated hypothesis related to, the variables used in the comparisons were tested for normality as illustrated in Table 1. We provide here data to test the distribution of the relevant variables from the 2013 investigation. As indicated by the significant numbers (in boldface), data for a number of variables cannot be investigated as if they were normally distributed, since we in these cases must reject the null-hypothesis that the numbers are normally distributed, since either the Shapiro-Wilks (S-W Sign) and/or the Kolmogorov-Smirnov (Lilliefors-Sign.) significance levels
are less than 0.05. On some variables (e.g. application portfolio upkeep) we could use the assumption of normal distribution in the tests below, using t-tests, whereas for the others we use a non-parametric test (Mann-Whitney).

We list the number of cases, the mean and the standard deviation for all relevant figures to test the eight hypotheses (for H3, there are four test, for the difference in corrective, adaptive, enhancive and perfective maintenance respectively), having the numbers of good practice on the top and those with bad practice according to the discussion in Section 2 in the bottom. N is the number of organizations of each type. \( \Delta \) is the absolute difference in the mean between the two groups, and \( p \) is the probability for erroneously rejecting the equality of means.

We tested H1-H5 by comparing with dividing the respondents according to the differentiations described in the end of section 2. First we look upon those organizations that have the IT-strategy and Business strategy aligned or not as listed in table 2:

Looking upon those with an IT-oriented role vs. a business-oriented role, we have the following (table 3): Table 3 is built up in the same manner as table 2. Looking at both table 2 and 3, we find two differences being significant in both tables, relative to percentage of enhancive maintenance and percentage of application portfolio upkeep. We will discuss this further below.

**Table 1 Normality test of variables**

<table>
<thead>
<tr>
<th>Figure</th>
<th>Kolmogorov-Smirnov</th>
<th>Sign (p)</th>
<th>Shapiro-Wilks</th>
<th>S-W Sign (p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrective maintenance 2013</td>
<td>.238</td>
<td>.000</td>
<td>.770</td>
<td>.000</td>
</tr>
<tr>
<td>Adaptive maintenance 2013</td>
<td>.124</td>
<td>.000</td>
<td>.922</td>
<td>.000</td>
</tr>
<tr>
<td>Enhancive maintenance 2013</td>
<td>.166</td>
<td>.000</td>
<td>.866</td>
<td>.000</td>
</tr>
<tr>
<td>Perfective maintenance 2013</td>
<td>.121</td>
<td>.000</td>
<td>.901</td>
<td>.000</td>
</tr>
<tr>
<td>Maintenance 2013</td>
<td>.086</td>
<td>.000</td>
<td>.979</td>
<td>.001</td>
</tr>
<tr>
<td>Development 2013</td>
<td>.117</td>
<td>.000</td>
<td>.271</td>
<td>.000</td>
</tr>
<tr>
<td>Maintenance relative to development 2013</td>
<td>.097</td>
<td>.000</td>
<td>.948</td>
<td>.000</td>
</tr>
<tr>
<td>Application portfolio upkeep 2013</td>
<td>.051</td>
<td>.089</td>
<td>.990</td>
<td>.060</td>
</tr>
</tbody>
</table>

**Table 2 Test of hypothesis relative to alignment**

<table>
<thead>
<tr>
<th></th>
<th>Good practice</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>( \Delta )</th>
<th>( P )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance, percentage of all work (vs. H1)</td>
<td>Yes</td>
<td>249</td>
<td>41,1</td>
<td>16,5</td>
<td>3,2</td>
<td>.562</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>22</td>
<td>37,9</td>
<td>14,8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Development, percentage of all work (vs. H2)</td>
<td>Yes</td>
<td>249</td>
<td>17,4</td>
<td>14,4</td>
<td>8,5</td>
<td>.004</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>22</td>
<td>8,9</td>
<td>8,6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrective maintenance, percentage of all work (vs. H3a)</td>
<td>Yes</td>
<td>249</td>
<td>10,0</td>
<td>8,1</td>
<td>-1,5</td>
<td>.296</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>22</td>
<td>11,5</td>
<td>6,7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adaptive maintenance, percentage of all work (vs. H3b)</td>
<td>Yes</td>
<td>249</td>
<td>9,7</td>
<td>6,4</td>
<td>0,7</td>
<td>.778</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>22</td>
<td>9,0</td>
<td>6,7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enhancive maintenance, percentage of all work (vs. H3c)</td>
<td>Yes</td>
<td>249</td>
<td>13,3</td>
<td>10,5</td>
<td>3,9</td>
<td>.042</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>22</td>
<td>9,4</td>
<td>8,4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perfective maintenance, percentage of all work (vs. H3d)</td>
<td>Yes</td>
<td>249</td>
<td>21,3</td>
<td>12,7</td>
<td>.204</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Revisiting our hypotheses, we conclude the following:

- **H1**: There is no difference between the percentage of time used for maintenance reported in our survey in organizations with good or poor IT and business alignment. Not rejected, there was no significant difference on either of the situations investigated.
- **H2**: There is no difference between the percentage of time used on development reported in our survey in organizations with good or poor IT and alignment. Partly rejected. There was a significance difference between those not looking upon IT-strategy and business strategy in an integrated manner, and those that do as for the amount of time used on development.
- **H3**: There is no difference between the breakdown of maintenance work (in corrective, adaptive, enhance and perfective maintenance) in our survey in organizations with good or poor IT and business alignment. For enhance maintenance, this is rejected. Also the amount of corrective maintenance is larger in the organizations that have an IT-oriented focus rather than a business strategic focus.
- **H4**: There is no difference between the distribution of work among maintenance and development in our survey in organizations with good or poor IT and business alignment. Partly rejected. There was a significance higher percentage used on maintenance than development (due to little development activities cf. discussion on hypothesis H2 above) between those not looking upon IT-strategy and business strategy in an integrated manner, and those that do.
- **H5**: There is no difference between the distribution of application portfolio upkeep and application portfolio evolution in our survey in organizations with good or poor IT and alignment. Rejected.
In particular we find that enhancive maintenance and application portfolio evolutions is significantly different in the expected direction according to both of our measures of IT-strategy and business strategy alignment. Just as interesting is it that the level of maintenance does not differ with different role of the IT-manager, i.e. again pointing to a reason not only looking upon the amount of successful development, but also how maintenance time is used.

6 Conclusions and Further Work

A survey investigation of this form has known limitations (Jørgensen 1994, Kitchenham et al 2002). In our case we had a larger number of responses than in earlier surveys, and a response rate of almost 40% with responses from around 275 organizations gives us increased confidence in the results. Most of the persons who responded were IT managers in the company. They may have different views of the reality than developers and maintainers. For example, Jørgensen (1994) found that manager estimates the proportion of corrective maintenance to be too high when based on best guesses instead of good data, see also (Schach et al 2003) which report a similar effect. All such investigations have data from IT managers though, thus it is reasonable to compare between these investigations when looking upon trends.

Achieving consistent answers requires that the respondents have a common understanding of the basic concepts of the survey form. This may be difficult to ensure in practice. For example, Jørgensen (1994) found that the respondents used their own definition of, for example, “software maintenance” even though the term was defined at the beginning of the questionnaire. We conducted a pilot study in several companies to detect unclear questions and whether the time for filling-in the forms was reasonable. On earlier versions of the form we have done similar pilots and also got comments from several colleagues including experts in cognitive psychology which were highly familiar with the use of survey techniques and ensuring clarity of the formulation of questions. The forms were then refined. For many questions, there was space available to issue comments. This possibility together with the possibility to crosscheck numbers between different questions, were the main mechanisms used to identify possible misunderstanding among the respondents, which could be followed up specifically afterwards.

Among the risks when designing survey forms are leading or sensitive questions, resulting in biased or dishonest answers. We believe that we have mostly avoided this problem. We promised and effectuated full confidentiality to the respondents.

Another issue is that all the organizations have been done in Norway. When we did the first investigations (Krogstie and Sølvberg 1994), these where compared with the main international investigations at that time, finding similar patterns as what had been reported in other countries. On the other hand, we would welcome the replication of our study in other countries to further investigate the generalizability of our results.

It can be argued that reducing strategic alignment into four modes, each of significant complexity, into good and bad practice is overly simplistic, and that this should be extended with more detailed questions on the actual practice and perceived performance of the practice. Strategic alignment is more difficult and complex than being possible to be reduced into one statement, thus we are not covering the whole area spread out by Chan and Reich (2007) in this investigation. To come up with more concrete empirical data on to what extent the application systems support in an organization is efficient, demands another type of investigation, surveying the whole portfolio of individual organizations, and getting more detailed data on the amount of the work that is looked upon as giving the end-user improved support, and how efficient this improved support was provided. This should include the views of the users of the application systems portfolio in addition to those of the IS-managers and developers. Results from such detailed case studies on the other hand are hard to generalize.

Contrary to our main replication study which is run every five years, ‘IT i praksis’ is run yearly, and getting high level work distribution data and strategic focus regularly is interesting for further investigations. A long-term plan is to do a similar replication investigation in 2018, following up our five-year cycle, but
before that have done additional case studies to more precisely pinpoint relevant issues including methodological, managerial and technological trends and issues to investigate.

ACKNOWLEDGEMENT

We would like to thank all the participants of the survey-investigation for their effort in filling in the forms. We would also like to thank everyone helping us in the piloting and refinement of the questionnaire. In particular we would like to thank Rambøll for the collaboration around ‘IT i praksis’. Finally thanks to the NOKOBIT reviewers.

REFERENCES


appear in IEEE Software
APPENDIX A - Contents of the survey form

Below is listed the main questions from the survey form. This is not an exact copy of the form used. For reasons of brevity, we have mainly included the questions relevant to the results presented in the paper. We have below changed the layout and removed most of the room for giving additional information and qualification of the answers provided in the SurveyMonkey forms. We have neither included the additional material explaining the format and vocabulary used in the form. The survey form content has also been translated into English from Norwegian.

4. Current position: ___IT-Manager  
   ___Project manager  
   ___System developer, designer etc.

6. Years of computer experience: ____

7. Type of organisation (Telecom, banking, etc.):_____

8. How would you best describe the relationship between IT-strategy and business strategy in your organization
   a. __The business strategy and the IT-strategy do not influence each other  
      b __The business strategy is developed first and this guides the work on the IT-strategy  
      c __The business strategy and the IT-strategy is tightly integrated  
      d __There is no own IT-strategy, IT is completely integrated in the business strategy

9 How would you describe the main tasks of the IT-manager in the organization?
   a __ Fire fighting and daily operations  
      b ___Ensuring cost-effective delivery of core IT services  
      c ___Ensure that new projects are delivered on time, within budget and with high quality  
      d ___Collaboration with business management on improvements to application  
      e __ Being proactive toward business management with new ideas and initiatives to change processes and applications  
      f __ Develop new business models that exploit technological opportunities

10. Number of employees in your organisation: ____

11 What is the annual budget of the IS-organisation in 2013 including hardware, software and personnel (in mill. NOK)?
   2013
   a.  more than 50  ____  
   b.  between 40 and 50  ____  
   c.  between 30 and 40  ____  
   d.  between 20 and 30  ____  
   e.  between 10 and 20  ____  
   f.  between 1 and 10  ____  
   g.  less than 1  ____

12. How much of the following activity is outsourced:
   a. ___The total IT-activity (%)  
      b. ___Development of new applications (%)  
      c. ___Maintenance of existing application (%)  
      d. ___Operations (%)  
      e. ___User support (%)  
      f ___Other specify: _____________________________
Distribute your IS department's work into the following categories:

%  

a. Correcting errors in systems in operation  
b. Adapt the system to changed technical architecture  
c. Develop new functionality in existing systems  
d. Improve non-functional properties (e.g. performance)  
e. Develop new systems which provide similar functionality as existing systems  
f. Develop new systems to cover new functional areas  
g. ___Operations  
h. ___User support  
i. ___Other, specify: _____________________________  
Total: 100%  

16 Your answer above is:  
a. Reasonable accurate, based on good data  
b. A rough estimate, based on minimal data  
c. A best guess, not based on any data  

17. Specify the number of full-time positions in the IS department? _______ positions  

18. How many of these positions are dedicated to system developers? _______ positions  

20. What is the annual average number of hire IT consultants (converted to full-time personnel)? _______ persons  

21. Specify the number of current main systems in your organisation _______ systems  

24. What is the total number of end-users?  
   Internal _______  External _______  

26. Specify age of the main systems (years since first installation)?  
<table>
<thead>
<tr>
<th>Years</th>
<th>Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1</td>
<td>______</td>
</tr>
<tr>
<td>1-3</td>
<td>______</td>
</tr>
<tr>
<td>3-6</td>
<td>______</td>
</tr>
<tr>
<td>6-10</td>
<td>______</td>
</tr>
<tr>
<td>&gt; 10</td>
<td>______</td>
</tr>
</tbody>
</table>

35. What is the number of systems currently being developed? _______ systems  

36. Of the total number of new systems currently under development, how many of these are replacement systems (for systems currently in the application system portfolio)? _______ systems  

37. What is the age distribution of the systems to be replaced?  
<table>
<thead>
<tr>
<th>Years</th>
<th>Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1</td>
<td>______</td>
</tr>
<tr>
<td>1-3</td>
<td>______</td>
</tr>
<tr>
<td>3-6</td>
<td>______</td>
</tr>
<tr>
<td>6-10</td>
<td>______</td>
</tr>
<tr>
<td>&gt;10</td>
<td>______</td>
</tr>
</tbody>
</table>