

Master's thesis

NTNU
Norwegian University of Science and Technology
Faculty of Information Technology and Electrical
Engineering
Department of Computer Science

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Development and maintenance of IT-systems in Norwegian organizations

Master's thesis in Informatics

Supervisor: John Krogstie

July 2019



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Abstract

As part of a replication study dating back to 1993 with iterations every 5 years since, this study set out to continue the investigation of IT-work distribution in Norwegian organizations. An added aspect of this study was the investigation of whether application portfolio evolution correlated with the organization's dynamic capabilities as well as their adoption of benefits management practices. Lastly there was there was an investigation of whether or not there was a direct correlation between application portfolio evolution and the competitive performance of the organizations.

Data was gathered from 87 Norwegian organizations and then analysed and compared to the results from earlier iterations of the replication study.

There was little change in the distribution of IT-work, with the standout being that organizations now spend 17% of their time on development compared to the 14% from the 2013 study. The investigation of correlations regarding application portfolio evolution lead to the discovery of it correlating, significantly, with both dynamic capabilities and benefits management practices. However, there was no correlation between application portfolio evolution and competitive performance.

Sammendrag

Som en del av en repetisjonsstudie startet i 1993 med iterasjoner hvert femte år siden, ble dette studiet gjennomført for å undersøke fordelingen av IT-arbeid i norske bedrifter. Et tilleggs aspekt ved denne oppgaven var å undersøke hvorvidt application portfolio evolution korrelerte med bedriftens dynamiske ferdigheter og dens bruk av nyttestyrings teknikker. Til slutt ble det undersøkt om det var noen korrelasjon mellom application portfolio evolution og bedriftens konkurransedyktighet.

Det ble samlet inn data fra 87 norske bedrifter. Dataen ble deretter analysert og sammenlignet med data fra tidligere iterasjoner av repetisjonsstudiet.

Det var liten endring i fordelingen av IT-arbeid sammenlignet med tidligere. Det eneste som skilte seg ut var at bedriftene nå brukte 17% av tiden sin på utvikling mens de bare brukte 14% i 2013.

Undersøkelsen av korrelasjoner vedrørende application portfolio evolution avslørte signifikante korrelasjoner til både dynamiske ferdigheter og nyttestyrings teknikker. Det var allikevel ingen signifikant korrelasjon direkte mellom application portfolio evolution og bedriftens konkurransedyktighet.

Preface

This master's thesis is written as part of the course IT3902 at NTNU and the department for computer technology and informatics. It is also part of a replication study started in 1993 by Professor John Krogstie, the replication study has had iterations every 5 years since. This paper has been written between August 2018 and July 2019.

Professor John Krogstie has also served the role of supervisor for this thesis and I owe him a great thanks for his contributions to this thesis. It would not have been possible without his expertise.

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Chapter 1

Introduction

This chapter is added to give insight about the research questions and following hypotheses, as well as giving an overview of how the report is structured.

Motivation:

As stated earlier, this thesis is part of a replication study. The aim of earlier investigations has been to monitor how organizations focus their IT-work, do they spend most of their time on application portfolio evolution or application portfolio upkeep. This will obviously be the aim of this study as well. An added goal of this study is to investigate the effect of focusing on application portfolio evolution and the author hopes to do so by investigating how applications portfolio evolution correlates with other measurements within the organizations.

The research questions are therefore as follows:

Research question 1: Is there any link between Application portfolio evolution and competitive performance

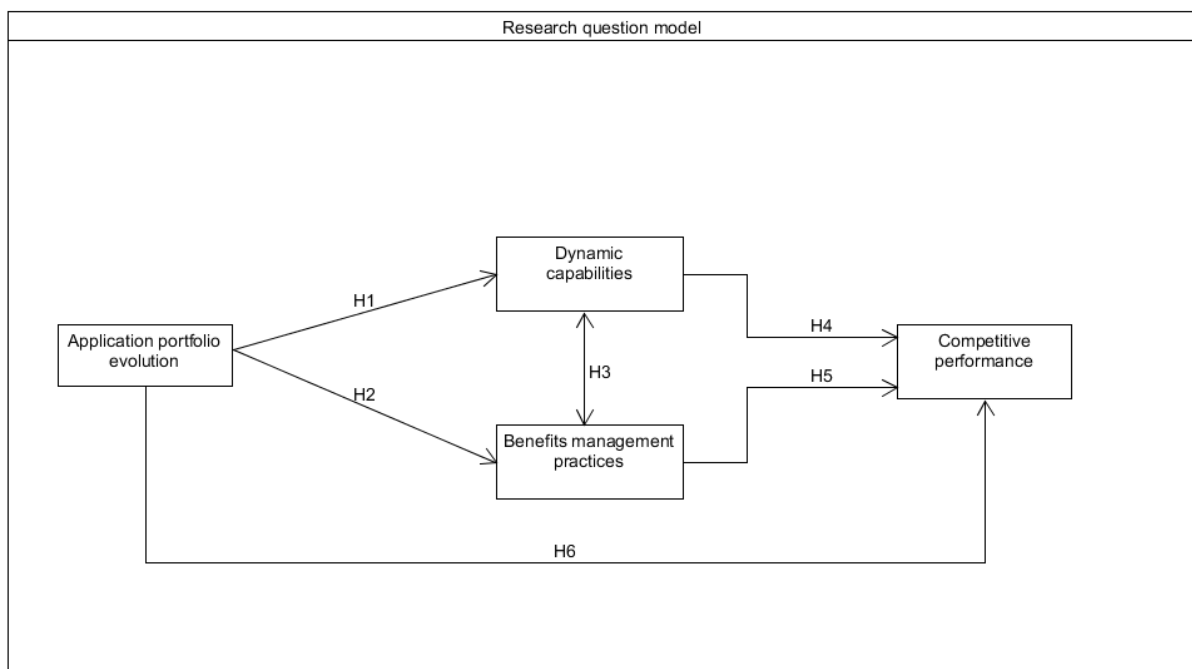


Fig 1.1 Research question 1 model.

The boxes in the model(Fig 1.1) contains scores from different questions in the survey¹. Application portfolio evolution is comprised of the awnser respondents gave to question 6.

¹ See the attached survey at the bottom of the paper.

Asking how much of their time the IT department spent working on specific tasks.

Dynamic capabilities is comprised of the answers given to question 28. Asking how well the company manages change and how effective they are at initiating it.

Benefits management practices is comprised of the answers given to question 18. Asking in which degree the company had follow specific practices regarding benefits management.

Competitive performance is comprised of the answers given to question 29. Asking how well the company performs in comparison to competing companies.

Research question 2: replication study

This paper is, as mentioned, part of a replication study and will therefore continue to state some of the same hypotheses as in earlier iterations.

Hypotheses:

H1.1: There is a significant difference in time spent on application portfolio evolution between organizations reporting higher levels of dynamic capabilities and organizations reporting lower levels of dynamic capabilities.

H1.2: There is a significant difference in time spent on application portfolio evolution between organizations stating that they do adopt benefits management practices and those who do not.

H1.3: Organizations who report high levels of dynamic capabilities also use benefits management practices and vice versa.

H1.4: Higher levels of dynamic capabilities correlates to higher levels of competitive performance.

H1.5: Increased utilization of benefits management practices correlates to increased competitive performance

H1.6: There is a significant difference in time spent on application portfolio evolution between organizations reporting high levels of competitive performance and organizations reporting lower levels of competitive performance.

H2.1: There is no difference in time spent on maintenance compared to the previous study.

H2.2: There is no difference in time spent on user support and operating compared to the previous study.

H2.3: There is no difference in time spent on development compared to the previous study.

H2.4: There is no difference in time spent on Application portfolio evolution compared to the previous study.

Report structure:

The report is built up by seven chapters starting with the current on 'Introduction' where the reader is presented with the research questions as well as an explanation to why these are considered important. Second there is a chapter called 'Method' describing the choices of methods and tools used to complete the study. The third chapter is 'Theory' describing relevant theory about key aspects of this study. The fourth chapter is 'Descriptive statistics' giving an overview of the data collected and some comments about them. Fifth is the 'Results' chapter presenting the results regarding the hypotheses. Sixth there is the 'Discussion' chapter giving an in-depth look at the results from the previous chapter as well as discussing the weaknesses of the study. Lastly there is the 'Conclusion and further work' chapter, summing up the thesis and its main results as well as presenting possibilities for further studies or investigations.

Chapter 2

Method

This chapter is included to give an understanding of the methods and tools used to conduct the study.

Replication study:

This paper is part of a replication study dating back to 1993 when J. Krogstie conducted his research on the distribution of maintenance and development. Each following study had been spread out by a fixed interval of 5 years. The other researchers were Holgeid 1998, Jahr 2003 Davidsen 2008 and Veld 2013. Evanschitzky, Heiner, et al. (2007)[2] defines ‘a replication with extension’ as: *“a duplication of a previously published empirical research project that serves to investigate the generalizability of earlier research findings.”* Which is very much what we hope to do with this study. They go on to state that *“the discovery of empirical regularities is made possible only by replication with extension research.”* This can be interpreted as saying that only through the use of replication studies with extensions is one able to conclude that results from a study is not merely a ‘fluke’ or a single incident, but rather a trend or a regularity.

Quantitative study:

Quantitative studies are studies based on the use of quantitative data, meaning numerical data. This makes the data easily measurable, processable and comparable. Qualitative data is the other option being data gathered from interviews or similar methods. This data is therefore not numerical and harder to measure, process and compare. The basis for the use of quantitative data in this study is the fact that it is part of the replication study. Gathering another type of data the what has been done in the previous studies would make comparing the results meaningless.

Survey:

The survey was been created by J. Krogstie, K. Holgeid and P. Mikalef. Invitations to participate was received by 684 Norwegian private and public organizations, a total of 87 completed the survey making it a response rate of 12.7%. SurveyGizmo² was used as a tool to

² <https://www.surveygizmo.com/>

spread the questionnaire, making the data easily downloadable upon reaching a satisfying number of respondents. The questionnaire can be comprised into 4 sections. Section 1 consisting of questions regarding the respondent and the organization he/she works in. Section 2 consisting of questions regarding the distribution of work (maintenance/development). Section 3 consisting of questions regarding the adoption of benefits management practises. Section 4 consisting of question about the organization and how well it does considering competitive performance.

SPSS:

SPSS³ (Statistical Package for the Social Sciences) was chosen as the tool to use for processing the data. The reasoning behind this decision was that my supervisor J. Krogstie had experience with the software and therefore could ensure that it would cover all the needed functionality, as well as contribute with help/guidance in case of any problems.

Spearman's correlation:

In the process of discovering correlations in the results the Spearman⁴ approach was used. Spearman's correlation finds the correlation between two variables by ranking the scores in each variable against the other scores in the same variable. The rank generated for each instance of the variable is then used in place of the value the rank was based on. The upside to this is that outliers will still be counted but won't shift the whole result of the correlation by themselves.

³ <https://en.wikipedia.org/wiki/SPSS> (Last visited 24.06.19)

⁴ <https://www.statisticssolutions.com/correlation-pearson-kendall-spearman/> (Last visited 24.06.19)

Chapter 3

Theory

This chapter is added to give the reader necessary information about the terms and subjects covered in this report.

Maintenance and development

While there has been some debate about how to identify or separate different types of maintenance work[1], this paper will go by the definitions of Swanson.

E. B. Swanson wrote a paper in 1976 attempting to split maintenance into several subgroups[6]. The subgroups he ended up creating were '*corrective maintenance*', '*adaptive maintenance*', and '*perfective maintenance*'. These are the same subgroups used in this paper to differentiate between the different parts of maintenance work.

Corrective:

Maintenance work focused on correcting bugs and errors.

Adaptive:

Maintenance work that is done in response to changes in data and processing environment.

Perfective:

Maintenance work focused towards improving the performance, processability or the maintainability.

This paper and the survey also include a fourth type called '*enhancive maintenance*' which is a term coined by Chapin[1]

Enhancive:

Maintenance work that extends or expands a systems functionality.

Enhancive maintenance is in this paper regarded as a form of evolution, not purely as maintenance, since it involves adding new functionality to the system.

In an paper from 1995 Krogstie defined two new terms called '*functional maintenance*' and '*functional development*',[4] later renamed '*application portfolio upkeep*', and '*application portfolio evolution*'[3]. He defined them[4]:

Application portfolio upkeep:

Work made to keep up the functional coverage of the portfolio of the organization.

This includes the three⁵ other types of maintenance, but also includes the development of replacement systems

Application portfolio evolution:

Development or maintenance where changes in the application increases the functional coverage of the whole portfolio of the organization. This includes both development of new application systems which covers areas which are not covered by the existing portfolio and functional perfective⁶ maintenance.

These definitions are included in the paper to give a clearer divide between what work companies do to increase the functionality of their systems as supposed to the work done solely to ensure that their systems still operate as intended.

Benefits management:

Ward, Taylor and Bond[10] defines the process of evaluating and realising the potential of IS/IT benefits as:

'The process of organizing and managing such that potential benefits arising from the use of IT are actually realised'.

They also presents the Cranfield research program model(Fig 3.1) and states that it is the basis for the best practice guidelines of benefits management[10].

⁵ Corrective, adaptive and perfective

⁶ 'Functional perfective maintenance' has later been called enhance

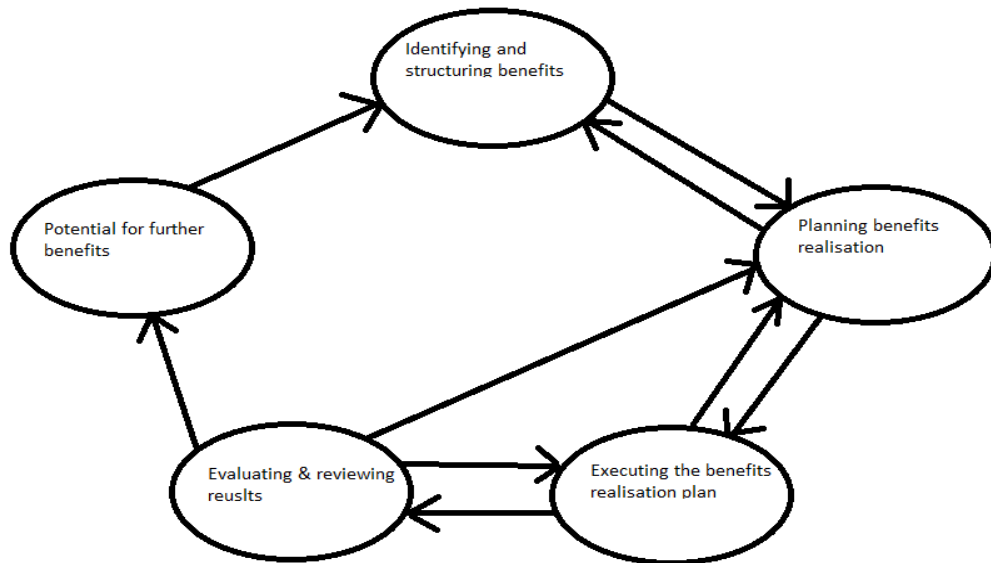


Fig 3.1 Cranefield research program model[10]

Identifying and structuring benefits:

The objective here is to identify potential benefits and finding suitable business measures for each one.

Planning benefits realisation:

A benefits realisation plan is crafted, which includes assigning someone the responsibility for realising different benefits. This also includes planning for necessary business changes.

Executing the benefits realisation plan:

The benefits realisation plan is carried out.

Evaluating & reviewing results:

Using the previously made business measure, the potential benefits identified at the start are evaluated to see if the perceived benefits have been delivered.

Potential for further benefits:

At this stage one would look at the potential to achieve further benefits. This stage also opens for the possibility to review the process and gain new knowledge which can be used in future projects.

There have been some studies attempting to discover to what extent corporations use defined methods to realise benefits. Ward et.al.[10] conducted one such investigation in the UK in 1994, and Lin and Pervan[5] did one in Australia 1999. Both found similar results. They both state that very few (Ward et.al.) and only 32.8% (Lin and Pervan) use predefined methods to

ensure benefits realisation. They also found that 47% (Ward et.al.) and 26.2% (Lin and Pervan) of their respondents admit that their current process makes it so that employees will overstate the potential benefits in a attempt to get approval for a project. Only 43% (Ward et.al.) and 27% (Lin and Perval) have a plan on how to realise the benefits they set out to achive. They both found that 26% takes the time to evaluate the perceived benefits after project completion. Regarding evaluating the project after completion only 29% (Ward et.al.) and “just over half”(Lin and Perval) have a defined process for how to ensure that what lessons they had learned from one project would be carried over into future projects.

Dynamic capabilities

In the paper Dynamic capabilities and Strategic management[7] David Teece, Gary Pisano and Amy Shuen define the term as the following:

“The firm’s ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments. Dynamic capabilities thus reflects an organization’s ability to achieve new and innovative forms of competitive advantage given path dependencies and market positions.”

Wang and Ahmed[9] divided the term dynamic capabilities into 3 components: “*adaptive capability*”, “*absorptive capability*” and “*innovative capability*”.

Adaptive capability:

The ability to identify and capitalize on emerging market opportunities

Absorptive capability:

The ability to recognise new external information, absorb it and use it

Innovative capability:

The ability to develop new products and/or markets, through aligning strategic innovative orientation with innovative behaviours and processes.

Teece and Pisano[8] states that the competitive advantage that derives from the dynamic capabilities of an organization cant simply be bought but must be developed built, something they state might take years or decades. Winter[11] argues that for a company to efficiently maintain their dynamic capabilities at a high level, the personnel responsible for said capabilities needs to work on them regularly.

Chapter 4

Descriptive statistics

This chapter is intended to give a descriptive view of the data gathered from the survey and to improve the understanding of the results.

Respondents

This subchapter is added to clarify where and who the answers came from as to give a better understanding of the results.

View of public versus private sector regarding respondents		
Value	N	%
Public	20	23
Private	67	77

This shows a high representation of private businesses in the sample. This is of importance when regarding the following statistics as the answers given by the companies from the public sector is greater influences by single companies and mean values have to be compared to the median value.

View of the major contributors to the survey based on field of practice		
Value	N	%
Information and communication	21	24.1
Public administration and defence, and social security schemes subject to public administration	12	13.8
Electricity-, gas-, steam-, and hot water supply.	12	13.8
Funding and insurance companies	9	10.3
Health and social services	4	4.6
Transportation and storage	4	4.6
Education	3	3.4

Business related services	3	3.4
Merchandising, automobile repair	2	2.3
Industry	2	2.3
Professional, scientific and technical services	2	2.3
Construction	2	2.3
Agriculture, forestry and fishing	1	1.1
Lodging and catering	1	1.1
Culture, entertainment and recreation	1	1.1
Other	8	9.2

Here we can see that the ‘Information and communication’ companies is making up almost ¼ of the sample.

View of the respondent’s experience in his current company.		
Value	N	%
0-1 Years	1	1.1
2-4 Years	9	10.3
5-10 Years	47	54.0
11-20 Years	30	34.5

The survey included a question regarding the respondents experience with working for the company. This was based on the thought that more experience would give a better understanding of how the company was run, and how they did compare to other companies. From this table we see that the major part of our results was based on the knowledge of people who have been employed in their companies for 5 – 20 years, which adds to the validity of the findings.

In what degree is the business and IT strategy integrated.								
Value	Public		Private		Combined		2013(Combined)	
	N	%	N	%	N	%	N	%
The business strategy is developed first and helps guide the IT strategy.	2	10	30	44.8	32	36.8	3	4.5
The business strategy and the IT strategy is highly integrated and influence each other	17	85	15	22.4	32	36.8	33	50
The business strategy and IT strategy does not affect each other.	1	5	22	32.8	23	26.4	17	25.8
There is no IT strategy, its completely integrated into the business strategy.	0	0	0	0	0	0	12	18.2

The results from the table indicates an almost even distribution regarding the business/IT strategy integration, when seen from a general view. When the public/private sector divide is considered, it becomes clear that the public sector has been better at integrating the IT strategy into the business strategy. This question was also asked in the 2013 version of the replication study. Comparing our results with the ones from 2013 shows that while everyone

now has a IT strategy there is a greater divide in how well integrated it is with the business strategy.

How many people are working in your IT-department (calculated into fulltime employees)					
Sector	Min	Max	Mean	Median	Std. Deviation
Public	6	150	29.35	14	42.168
Private	6	150	31.15	25	37.808
Combined	6	150	30.74	25	38.606
2013	0	90	13.35	Not included	17.9

This table shows that the companies in the survey on average has 30 fulltime employees working in their IT-departments. There is a slight difference in the public private sector, as the ‘Median’ value tells us that half of the companies from the public sector operates with less then 14 people working in their IT-departments while this number is 25 for their private counterpart. The combined median is pulled towards the greater number since there are far more respondents from the private sector.

We also see that there has been a great increase in the number of employees working in the IT-departments. The mean value of 30.74 is by far the highest recording since the start of this replication study, (2013 – 13.35; 2008 – 14; 2003 – 10; 1998 – 11; 1993 – 24). One factor to this could of course be the growth regarding maximum size of the IT departments. Compared to 2013 when the highest number of employees was 90, there has been an 60% increase resulting in the maximum of 150 recorded in 2019.

How many hired consultants does the IT-department use in the span of a year (calculated into fulltime employees)					
Sector	Min	Max	Mean	Median	Std. Deviation
Public	1	20	4.375	1.750	5.6913
Private	1	40	8.149	4	9.6425
Combined	1	40	7.282	4	9.0035
2013	0	35	3.12	Not included	0.4

Regarding the hiring of consultants, the divide between the private and public sector is clear, as the private sector use far more consultants then the public sector. We also notice a steady increase in the number of consultants hired by the IT-department. The previous results are (2013 – 3.12; 2008 – 2.82; 2003 – 0.7; 1998 – 2.7). It is also worth noting that our results show that all companies use consultants while all other iterations of this study show a great number of companies not hiring consultants. Percentage of companies not using consultants (2019 – 0%; 2013 – 48.5%; 2008 – 45%; 2003 – 56%; 1998 – 30%).

IT systems

This subchapter is included to describe the number, state, development and reason for development of large IT systems. These results are also important when regarding the following ‘development and maintenance’ subchapter.

How many large IT systems (main systems) are operational in your company					
Sector	Min	Max	Mean	Median	Std. Deviation
Public	2	25	11.55	8	8.488
Private	2	12	3.97	3	2.443
Combined	2	25	5.71	3	5.549
2013	1	100	11.62	Not included	17.258

The table above makes it clear that there exists a large difference in number of main systems when comparing the public to the private sector. It also shows a decrease in the number of main systems that are operational. The previous recordings are (2013 – 11.62; 2008 – 8; 2003 – 5; 1998 – 10; 1993 – 10). Some of this could be explained by the sample of respondents, if the previous iterations included larger companies we can assume that it would increase the number of main systems. It could also be a result of technological development that would increase the functionality of the systems, making it redundant to have four systems do a job that could now be done by one.

Number of main systems depending on years since first installation						
	Min	Max	Mean	Median	Std.Deviation	Percentage
0 - 1 Years	0	1	0.06	0	0.234	0.99%
2 - 3 Years	0	1	0.67	1	0.474	11.51%
4 - 6 Years	0	5	0.67	0	1.604	11.51%
7 - 10 Years	0	15	1.68	0	4.296	28.97%
Above 10 Years	0	14	2.72	1	3.347	47.02%

This shows that main systems tend to have been in operation for at least 7 years. As stated above the number of main systems are decreasing, we also see that their life expectancy is greatly increasing. The average age of the systems in this and previous studies are: (2018 – 10.4 years; 2013 – 5.9 years; 2008 – 5 years; 2003 – 3.9 years; 1998 – 5 years; 1993 – 5 years)⁷.

⁷ This is an estimate based on the assumption that the age of the systems within each category is evenly distributed.

Number of new IT systems currently being developed						
	Min	Max	Mean	Median	Std.Deviation	Share of systems being replacement-systems
2018	0	6	0.53	0	1.180	61%
2013	0	5	1.57	Not included	1.431	58%
2008	Not included	Not included	1.53	Not included	Not included	64%
2003	Not included	Not included	0.74	Not included	Not included	60%
1998	Not included	Not included	1.58	Not included	Not included	57%
1993	Not included	Not included	1.92	Not included	Not included	48%

This is a record low amount on new systems being developed, which is in line with the results shown above. Although there has been a change in the amount of systems being developed the percentage of these systems being replacement systems is fairly equal to previous observations.

The age of the systems being replaced						
	N	Min	Max	Mean	Median	Std.Deviation
7 – 10 Years	26	0	1	0.3	0	0.460
Above 10 Years	4	0	2	0.05	0	0.301

There were no systems being replaced that were younger than 7 years. It is clear from this that most systems that get replaced, is replaced in the interval between 7 - 10 years after deployment. There has been similar recording in the earlier iterations of the study with the results being (2013 – 8.25 years; 2008 – 6.9 years; 2003 – 5.5 years; 1998 – 10.5 years; 1993 – 8.5 years).

Reasons for developing replacement systems (1 - Not important, 5 – Very important)					
Option	Min	Max	Mean	Median	Std.Deviation
Very hard to maintain existing system	1	5	2.23	1	1.717
Very hard to operate existing system	1	5	2.46	2	1.576
Very hard to use existing system	1	4	1.60	1	0.958
There exists alternative package-solutions	1	5	1.57	1	0.948
Transition to new technical architecture	2	4	3.01	3	0.869
Standardisation with the rest of the organization	1	5	3.71	4	1.302
Integration with other, new or existing systems	1	5	4.31	5	1.082

The two major reasons for developing replacement systems is, based on our sample, ‘standardisation with the rest of the organization’ as well as ‘integration with other, new or existing systems’. This combined with the fact that very few states that the existing systems are hard to use or maintain, leads to the conclusion that the companies are satisfied with their systems mainly replace them due to structural adaptations. Earlier iterations also state much of the same with “Integrations with other systems” getting an average score of 3.44 in 2013

and 3.7 in 2008. The lowest score at 1.57 regarding package solutions is also in line with earlier observations (2013 – 1.77; 2008 – 1.9; 2003 – 1.9; 1998 – 1.6; 1993 – 1.8).

In what part of the IT system lifecycle does companies use a predefined method (Percentage of users)					
Option	2018	2013	2008	2003	1998
Planning	36.8%	16.3%	31.5%	43.5%	34.0%
Analysis	29.9%	12.2%	24.1%	23.9%	30.2%
Requirements specifications	47.1%	14.3%	48.2%	56.5%	50.9%
Design	73.6%	14.3%	33.3%	45.7%	39.6%
Implementation	63.2%	22.4%	38.9%	52.5%	43.4%
Testing	36.8%	22.4%	44.4%	54.3%	34.0%
Deployment	64.4%	20.4%	33.3%	32.6%	26.4%
Operating	66.7%	26.5%	40.7%	37.0%	32.1%
Maintenance	36.8%	24.5%	29.6%	28.3%	30.2%
Project management	100%	32.7%	37.0%	34.8%	41.5%
Program management	20.7%	8.2%	Not included	Not included	Not included
Benefits management	29.9%	9.4%	Not included	Not included	Not included

From the table 2013 stands out regarding the use of predefined methods. Some of this could be attributed to the format of the questioner that year which asked the respondents to state which method they use instead of simply stating if a method was used at all, which has been the case in all other iterations. Disregarding the 2013 results there is still a positive development with the results from 2018 showing record high values in 6 out of 10 categories. The stand-out categories regarding increase from previous years are Project management, Design, Deployment, Operating. If we were to assume that the results from 2013 were not affected by the change in format, we can also note a great increase in the use of predefined methods regarding program management and benefits management.

Development and maintenance

This subchapter is added to describe the distribution of work in the companies participating in the survey, the subchapter also bears importance to the replication study-part of this paper as that is based on how this distribution has change since 1993.

Distribution of work					
Type	Min	Max	Mean	Median	Std.Deviation
Corrective maintenance	5%	21%	11%	10%	0.055
Adaptive maintenance	5%	21%	9%	10%	0.034
Enhancive maintenance	5%	40%	12%	10%	0.046
Perfective maintenance	5%	15%	8%	6%	0.024
Replacement systems	0%	33%	9%	10%	0.045
New systems	5%	25%	8%	6%	0.032
Operating	2%	35%	22%	20%	0.068
User support	1%	30%	21%	20%	0.059
Maintenance	25%	83%	40%	40%	0.099
Development	10%	50%	17%	15%	0.062
Share of work that is maintenance	36%	88%	70%	71%	0.077
Share of work that is development	12%	64%	30%	29%	0.077
Application portfolio evolution	21%	55%	35%	33%	0.074
Application portfolio upkeep	45%	79%	65%	67%	0.074

The table above presents the distribution of work. It shows that companies spent most of their time on maintenance, which has been the trend seen earlier in this replication study. When looking at only maintenance and development the following has been the results thought the replication study:

Type/Year	2018	2013	2008	2003	1998	1993
Development	30%	22%	34%	34%	27%	41%
Maintenance	70%	78%	66%	66%	73%	59%

Even though there has been a slight increase to the time spent on development its in line with recent results. The time spent on other things then development and maintenance is almost identical to 2013: Operating (2018 – 22%; 2013 – 22%) and Support (2018 – 21%; 2013 – 23%).

Type/Year	2018	2013	2008	2003	1998	1993
Upkeep	65%	68%	63%	61%	62%	44%
Evolution	35%	32%	37%	39%	38%	56%

Regarding application portfolio upkeep and application portfolio evolution the results are in line with previous findings.

What the above estimate is based on	
Option	Number of respondents
Reasonably accurate, based on good data	3
A rough estimate, based on minimal data	42
A qualified guess, based on no data	42

The table states that only 3.4% have based the answers regarding distribution of work on good data and that the answers are reasonably accurate. This must be seen together with the data earlier in the chapter stating that most of the respondents have at least 5 years' experience in their company and 1/3 have more then 11 years. The years of experience should lead to good insight in how the IT-departments invest their time and therefore give credibility to the answers given.

Benefits management

To what degree does your organization use the following practises to ensure benefits realisation (1 – Always, 5 – Never)		
Option	Mean	Don't know (option)
Establishing a 'business case' or something similar before starting IT projects.	1.92	0
Creating a plan for the realisation of benefits before starting IT projects.	2	0
Assigning responsibility for realising benefits for a project.	2.43	1
Benefits management during a project.	3.10	24
Evaluating the realised benefits after project completion.	2.97	1
Quantifying the realised benefits	3.76	24
Altering the estimation of benefits during projects	4	1
Identifying further benefits upon project completion	3.97	1

There is clearly a low adoption of several benefits management practises. The most adopted options are practises one could imagine organizations would use simply to get a project approved. If one were to further assume that the respondents who answered "don't know" actually don't use the methods the scores would have been even worse.

Who is responsible for the realisation of benefits in IT projects (1 – always, 5 – never)	
Option	Mean
Project leader	3.40
Line manager in functional department	2.78
Line manager in IT- department	3.44
Management	4.40
Professional resources	3.69
Others	4.84

‘Line manager in functional department’ seems to be the most frequent choice but still he/she is relatively rarely given the responsibility for realising benefits. Seen together with the results above the that’s not to strange considering that the responsibility is only assigned to someone half the time.

To what degree does the organization’s processes for estimating benefits lead to inflated estimates	
Option	Percentage
To a high degree	0%
To some degree	23%
To a low degree	47.1%
Not at all	29.9%

70.1% state that the way their organization estimates benefits does, at least a low degree, lead to inflated benefits estimations.

What percentage of your organization’s IT projects does realise the expected benefits	
Option	Percentage
<25%	20.7%
25% - 49%	0
50% - 75%	36.8%
>75%	42.5%

Even though the highest share of respondents answered that more than 75% of their projects realised the expected benefits, more than one fifth of the organizations say that they realise the expected benefits in less than 25% of their projects.

What is the reason for the lower than expected perceived benefits from IT-projects (1 – To a high degree, 4 – Not at all)	
Option	Mean
General over optimism	1.64
Deliberate over estimation of benefits in order to get the ‘go-ahead’ on the project	4.00
Unexpected problems/incidents that leads to less realised benefits	2.28
The estimation process itself leads to over optimism	2.36

This question was only given to the 50 respondents who answered 75% or less on the question regarding how many of their IT-projects delivered the expected benefits. It is worth noting that none of the respondents blames ‘deliberate over estimation of benefits’ and that most of them points to ‘general over optimism’ as the cause for failing to realise the expected benefits.

Overall how happy is management in your organization with the perceived benefits from investments in IT	
Option	Percentage
Totally unhappy	0%
Somewhat unhappy	0%
Neutral	20.7%
Somewhat happy	49.4%
Totally happy	29.9%

All the respondents state that management is at least neutral regarding happiness with the return benefits from IT investments, and the majority is somewhat happy.

Capabilities

How effective is your organization regarding the following areas (1 – Very effective, 7 – Not effective)	
Option	Mean
Knowledge about users and clients	1.98
Control and access to distribution channels	3.46
Beneficial relationship to users and clients	1.92
Established customer base	1.77
Effective and successful production department	2.48
Big business benefits and technical expertise	3.08
Technological abilities and equipment	2.82

The organization reports generally high levels of effectiveness in all areas.

Indicate how effective your organization is regarding the following areas (1 – Very effective, 7 – Not effective)	
When detecting opportunities or threats our organization has effective routines for...	
Option	Mean
Generation of potential solutions	2.48
Evaluating and choosing potential solutions	2.63
Start a detailed plan to execute a potential solution	3.13

Most of the organizations have, generally effective, routines in place for dealing with both opportunities and threats.

Indicate how effective your organization is regarding the following areas (1 – Very effective, 7 – Not effective)	
Option	Mean
Identifying, evaluating and importing new information and knowledge	2.70
Transforming existing information into new knowledge	2.98
Assimilating new information and knowledge	3.67
Using obtained information and knowledge when making decisions.	3.79
Finding new ways or in a great degree alter the ways we achieve our goals	3.77
Altering organizational processes in accordance to changes in the organization's priorities.	4.01
Reconfigure our organizational processes to find new and productive assets.	3.91

Its worth noting that almost all the option has an average score and the majority is on the 'Not effective' side of the spectrum.

We do a lot better than our main competitor regarding (1 – Completely disagree, 7 – Completely agree)	
Option	Mean
Profitability	6.16
Profits in percentage of sales	3.49
Reducing the delivery time on products and/or services	3.86
Reducing operational costs	4.89
Profitability growth	3.01
Quick reaction time to market demands	4.32

Quick confirmation on orders from users/clients	5.26
Customer/client satisfaction	4.54
Offering better product/service quality	4.28

Most of the organizations state that they do well compared to the competition, and the only minor struggles seems to be profit growth and reducing delivery times.

Chapter 5

Results

This chapter is added to present the results regarding the hypotheses.

H1.1 (Not rejected):

Correlations

			Funcdev	DynamicCapabilities
Spearman's rho	Funcdev	Correlation Coefficient	1.000	-.555**
		Sig. (2-tailed)	.	.000
		N	88	87
	DynamicCapabilities	Correlation Coefficient	-.555**	1.000
		Sig. (2-tailed)	.000	.
		N	87	87

** . Correlation is significant at the 0.01 level (2-tailed).

The scores Dynamic capabilities are based on goes from 1-7 where 1 indicates excellent dynamic capabilities. The Funcdev score is also a combined score summarizing how much of their time the organizations uses on application portfolio evolution (APE).

The table show a clear correlation between the increased focus on APE and better dynamic capabilities.

H1.2 (Not rejected):

Correlations

			Funcdev	BenefitsPractices
Spearman's rho	Funcdev	Correlation Coefficient	1.000	-.495**
		Sig. (2-tailed)	.	.000
		N	88	87
	BenefitsPractices	Correlation Coefficient	-.495**	1.000
		Sig. (2-tailed)	.000	.
		N	87	87

** . Correlation is significant at the 0.01 level (2-tailed).

There is a significant correlation between the Funcdev(APE) and the adoption of benefits management practices (BMP). The variables are positively correlated as the BenefitsPractices variable consists of scores from 1 to 7 where a lower score indicates higher adoption of BMP.

H1.3 (Not rejected):

Correlations

			BenefitsPractices	DynamicCapabilities
Spearman's rho	BenefitsPractices	Correlation Coefficient	1.000	.691**
		Sig. (2-tailed)	.	.000
		N	87	87
	DynamicCapabilities	Correlation Coefficient	.691**	1.000
		Sig. (2-tailed)	.000	.
		N	87	87

** . Correlation is significant at the 0.01 level (2-tailed).

There is a significant correlation between utilizing BMP and reporting higher levels of dynamic capabilities.

H1.4 (Not rejected):

Correlations

			DynamicCapabilities	CompetitivePerformance
Spearman's rho	DynamicCapabilities	Correlation Coefficient	1.000	-.376**
		Sig. (2-tailed)	.	.000
		N	87	87
	CompetitivePerformance	Correlation Coefficient	-.376**	1.000
		Sig. (2-tailed)	.000	.
		N	87	87

** . Correlation is significant at the 0.01 level (2-tailed).

There is a significant difference in competitive performance depending on the dynamic capabilities of the organization. The correlation is negative due to the fact that the dynamic capabilities are better at a lower score while the opposite is true for the competitive performance.

H1.5 (Not rejected):

Correlations

			CompetitiveP erformance	BenefitsPracti ces
Spearman's rho	CompetitivePerformance	Correlation Coefficient	1.000	-.383**
		Sig. (2-tailed)	.	.000
		N	87	87
	BenefitsPractices	Correlation Coefficient	-.383**	1.000
		Sig. (2-tailed)	.000	.
		N	87	87

** . Correlation is significant at the 0.01 level (2-tailed).

There is a significant difference in competitive performance depending on the organizations ability to adopt BMP. The correlation is negative due to the fact that the BMP scores are better at lower digits while the opposite is true for the competitive performance.

H1.6 (Rejected):

Correlations

			Funcdev	CompetitiveP erformance
Spearman's rho	Funcdev	Correlation Coefficient	1.000	.081
		Sig. (2-tailed)	.	.457
		N	88	87
	CompetitivePerformance	Correlation Coefficient	.081	1.000
		Sig. (2-tailed)	.457	.
		N	87	87

For the final hypotheses there is no significant difference in time spent on APE in regards to the competitive performance.

H2.1 (Not rejected):

The finding from this study was that IT departments on average spent 40% of their time on maintenance, in the results from 2013 that number was 41%. There is no significant difference in time spent on maintenance.

H2.2 (Not rejected):

The results from 2018 indicates an average of 22% of the IT departments time was spent on operating and 21% spent on user support. The results from 2013 was 22% on operating and 23% on support. There is no significant difference in time spent on operating and support.

H2.3 (Rejected):

In 2018 the average IT department spent 17% of their time on development. The result from 2013 was 14%. There has been a slight increase in time spent on development.

H2.4 (Not Rejected):

The time spent on application portfolio evolution in 2018 was 35% of the total IT departments work schedule. In 2013 this was 32%. There was no significant difference in time spent on application portfolio evolution.

Chapter 6

Discussion

This chapter is added to evaluate and discuss the finding in the 'Results' chapter as well as weaknesses regarding the study.

Results

Research question 1 was created was conceived from the idea that a higher share of development within a business would correlate with higher dynamic capabilities. The reason for this was thought to be that the more you develop the better you would get at seeing the new trends in the market, adopting new technology and finding new ideas for how you develop. It was further believed that organizations that say they have great dynamic capabilities would be the once that had, to the greatest degree, adopted benefits management practises. This came from the reasoning that these organizations state that they are good at finding, adopting and using new information and knowledge. Having scored highly in either dynamic capabilities or benefits management practises was then believed to correlate well with the competitive performance, as having great capability for change or having adopted techniques for ensuring the realisation of benefits was both deemed as a plus towards performance. Lastly if all previous mentioned correlations could be proven, it was thought that one would be able to trace it back and draw the line, check correlation, between high levels of development and competitive performance.

As on can read from the results in the chapter above all the hypothesis, barring the last, where proven. However, none where discussed, nor seen in light of the other data gathered from this survey.

H1.1

The results proved the existence of a correlation between application portfolio evolution and dynamic capabilities. As seen earlier in the paper application portfolio evolution has been relatively stable the since 1998 having taken up 32% - 39% of the evolution/upkeep split since then. There has been no earlier iteration in this replication study where dynamic capabilities have been measured, so there is no older data from this study to compare with. Nonetheless the organizations on average reports that they are not very effective nor ineffective regarding dynamic capabilities. However, the data shows that organizations on average are very capable of dealing with things as they are, as well as responding to threats

and opportunities. It is possible to argue that given the confidence of how well they handle things day to day now, and their ability to handle threats/opportunities combined with their below average score regarding the ability to assimilate new information and knowledge would lead to the organizations not feeling the need to develop new IT-systems or new functionality.

H1.2

There was a significant correlation between application portfolio evolution and benefits management practices. The organizations on average reported that they often created 'business cases' before projects and made plans for how to realize the benefits they wanted to achieve. Following how the organizations rate themselves further into the process of benefits management, the scores begin to drop. Organizations, on average, state that they 'rarely': alter the estimation of benefits during the project, quantify the realised benefits upon project completion or investigate the possibility for further benefits upon project completion. To sum it up it seems organizations set out on the right track and get lost in the process. One of the reasons they fail to follow up the process could be that they don't assign that responsibility to anyone. When asked how often they do that the average score, on a scale from 1 – Always to 5 – Never, was 2.43 which seems high compared to how poorly organizations seem to follow up the realisation of benefits. This must be seen in light of the later question asking how often certain persons got this responsibility, the question also featured a 'others' option, making it so that the summed average in theory should sum up to 2.43. However, the summed score from how often anyone was put in charge of benefits realisation when specifically asking who that might be, dropped to 3.76. Both questions used the same scale. This suggests there might be an overestimation of how often someone is assigned the responsibility and could be the explanation for the poor benefits realisation scores in the later stages of the process.

Correlations

		BenefitsPractices	I det store og hele, hvor tilfreds tror du din toppledelse er med nytten som din organisasjon får fra investeringer i IT?
Spearman's rho	BenefitsPractices	Correlation Coefficient	1.000
		Sig. (2-tailed)	.036
		N	87
	I det store og hele, hvor tilfreds tror du din toppledelse er med nytten som din organisasjon får fra investeringer i IT?	Correlation Coefficient	-.225*
		Sig. (2-tailed)	.036
		N	87

*. Correlation is significant at the 0.05 level (2-tailed).

Lower scores are better for BenefitsPractices while the opposite is true for the other option, making the negative correlation positive.

There is also the added correlation between the adoption of benefits management practices and how satisfied top-management are with the return benefits from IT-investments. This could work both ways, making it so that when management invests in IT where there are good benefits management practices they are satisfied with the returns and therefore more inclined to invest again. The new investments would then again lead to more development and higher application portfolio evolution scores.

H1.3

The idea behind this was that the ability to find, adopt and use new information and knowledge would lead to the adoption of benefits management practices. From the results chapter one can see that this correlation, at 0.691 was proven with the highest correlation coefficient off all the hypotheses.

Spearman's rho	BenefitsPractices	Correlation Coefficient	1.000	.699**
		Sig. (2-tailed)	.	.000
		N	87	87
	Assimilere ny informasjon og kunnskap:Vennligst indker hvor effektiv bedriften din er på å fÅlgende områder (1 å €' veldig effektiv, 7 å€' ikke effektiv).	Correlation Coefficient	.699**	1.000
		Sig. (2-tailed)	.000	.
		N	87	87

** . Correlation is significant at the 0.01 level (2-tailed).

To support this the correlation between one of the factors, how well the organization assimilates new information and technology, which makes up the dynamic capabilities score and benefits management practices was investigated. It showed an even higher correlation coefficient at 0.699. Another very interesting thing to note about dynamic capabilities and benefits management is their relation to 'current operational capabilities'. Current operational capabilities is a combined score based on question 26 in the questionnaire. The questions it is made up of ask about the organization's current stands regarding: relationship to and knowledge about their customers/clients, their technical expertise, the quality of equipment they possess, the production-department and their access to distribution channels.

Correlations

			CurrentOpera tionalCapabili ties	BenefitsPracti ces
Spearman's rho	CurrentOperationalCapa bilities	Correlation Coefficient	1.000	.029
		Sig. (2-tailed)	.	.788
		N	87	87
	BenefitsPractices	Correlation Coefficient	.029	1.000
		Sig. (2-tailed)	.788	.
		N	87	87

When looking at how this correlates with benefits management practices, we can see that there is no correlation.

Correlations

			CurrentOperationalCapabilities	DynamicCapabilities
Spearman's rho	CurrentOperationalCapabilities	Correlation Coefficient	1.000	.567**
		Sig. (2-tailed)	.	.000
		N	87	87
	DynamicCapabilities	Correlation Coefficient	.567**	1.000
		Sig. (2-tailed)	.000	.
		N	87	87

** . Correlation is significant at the 0.01 level (2-tailed).

Checking the same variable up against dynamic capabilities reveals a clear correlation. On the back of this one could say that the dynamic capabilities score of an organizations would effect the chances that the same organizations has adopted benefits management practises, and that their current operational capabilities has no bearing on it, even though there is a correlation between the two capability scores.

H1.4

There was a correlation between dynamic capabilities and competitive performance. This was expected as the ability to adapt to market changes and even stay ahead of the curve by being better at seeking out new ways to operate was thought to correlate well with competitive performance.

Correlations

			CurrentOperationalCapabilities	CompetitivePerformance
Spearman's rho	CurrentOperationalCapabilities	Correlation Coefficient	1.000	-.650**
		Sig. (2-tailed)	.	.000
		N	87	87
	CompetitivePerformance	Correlation Coefficient	-.650**	1.000
		Sig. (2-tailed)	.000	.
		N	87	87

** . Correlation is significant at the 0.01 level (2-tailed).

It might be even less surprising that the current operational capabilities of the organizations correlated as well. The reason it is included is to emphasise the difference in correlation coefficients as the one between 'dynamic capabilities' and 'competitive performance' was only '-.376' and therefore the lowest coefficient of all the significant correlations noted in result chapter. Both of the variables, 'dynamic capabilities' and 'current operational

capabilities' are set up in the way that a lower score implies a higher grade while the opposite is true for the 'competitive performance' score. That means that since the correlation coefficients are negative it is a positive correlation.

H1.5

Noted in the result chapter there was a significant correlation between benefits management practices and competitive performance. As seen in the section regarding 'H1.2' it was also shown that there is a correlation between benefits management practices and how satisfied top-management is with the return benefits from IT-investments. While it the correlation is significant and a good testimony to the adoption of benefits management practices, there is no data on which benefits leads to a higher satisfaction.

Spearman's rho	CompetitivePerformance	Correlation Coefficient	1.000	.694**
		Sig. (2-tailed)	.	.000
		N	87	87
	I det store og hele, hvor tilfreds tror du din toppledelse er med nytten som din organisasjon får fra investeringer i IT?	Correlation Coefficient	.694**	1.000
		Sig. (2-tailed)	.000	.
		N	87	87

** . Correlation is significant at the 0.01 level (2-tailed).

There exists an even stronger correlation between a satisfied top-management and competitive performance. Looking at all three correlations discussed in this section, one could argue that the benefits achieved when using benefits management practices has positive effect on the competitive performance of the company which is something top-management is likely to find satisfying.

H1.6

This was the last hypothesis, the one that was meant to come true if all the previous ones passed. This paper found correlations between application portfolio evolution, and both dynamic capabilities and benefits management practices. Which in turn both correlated with competitive performance. Still there was no significant correlation directly between application portfolio evolution and competitive performance. If one splits application portfolio application into 'developing new systems with new functionality' and 'enhance maintenance' it is possible to get a better picture of why the correlation does not add up.

Correlations

			CompetitiveP erformance	New
Spearman's rho	CompetitivePerformance	Correlation Coefficient	1.000	.444**
		Sig. (2-tailed)	.	.000
		N	87	87
	New	Correlation Coefficient	.444**	1.000
		Sig. (2-tailed)	.000	.
		N	87	88

** . Correlation is significant at the 0.01 level (2-tailed).

There is a significant correlation between development of new systems and competitive performance. Further development of new systems has correlations coefficients at 0.403 (significant) and 0.029 (not significant) towards 'dynamic capabilities' and 'benefits management practices' respectively.

Correlations

			CompetitiveP erformance	enhancive
Spearman's rho	CompetitivePerformance	Correlation Coefficient	1.000	-.013
		Sig. (2-tailed)	.	.904
		N	87	87
	enhancive	Correlation Coefficient	-.013	1.000
		Sig. (2-tailed)	.904	.
		N	87	88

Though its not significant, there is a slight negative correlation between enhancive maintenance and competitive performance. Further enhancive maintenance has correlation coefficients at 0.466 (significant) and 0.727 (significant) towards 'dynamic capabilities' and benefits management practices respectively'.

It is the combinations of these two variables, 'development of new systems' and enhancive maintenance', that does not correlate with competitive performance. So, there is no clear indication that neither development of new systems nor enhancive maintenance has been the core drive behind the correlations or lack thereof. While enhancive maintenance correlates best with both dynamic capabilities and benefits management practices the same variable is the one that does not correlate with competitive performance, though both of the for mentioned variables correlate well with it and competitive performance.

H2.1-4

The results from the hypotheses regarding the replication part of the thesis gave few surprises. Most of the results were in line with what they have been throughout the replication study. The one that stands out is H2.3 where there is a slight increase compare to 2013, however 2013 was a record low for development and the slight increase brings the percentage back towards the level it's been at in earlier years.

Weaknesses

Sample size

With 87 respondents this was the largest number of responses throughout the replication study. The last iteration (2013) had 62 respondents, making it a 40% increase this year. 87 respondents are still a fairly low number of respondents and with a response rate of only 12.7% from the 684 invitations that were distributed it would attribute a lot to the credibility of the results if it was based on larger sample size.

Researcher

This is the first time the author has undertaken any scientific research of this scope, making it prone to bias and misinterpretation of data. To combat this the author has had a supervisor with extensive experience regarding the field of interest and this type of research in general.

Qualitative data

The results presented in this thesis are derived purely from quantitative data. Quantitative data is great for processing, comparing and measuring. However, it lacks the ability to explain why the results came to be. To exemplify it with this study: The results show that organizations in general spend more time on maintenance then development, but there is no data to clarify why this is.

Survey

The questionnaire was a great way to ensure a desirable number of respondents, but its no way of telling whether all respondents have interpreted the questions the same way. There is also the possibility that not all respondents answer truthfully, respondents might for example be to proud to admit that their organization isn't doing as well as what they want it to. All the responses are obviously anonymous which in part were hoped to combat such incidents.

Chapter 7

Conclusion and further work

This chapter is added to sum up the findings in the study, as well as presenting possibilities for further research based on the findings in this study.

Conclusion

Most of the results presented in this thesis is in line with what has been perceived in previous iterations of the study. The stand-out differences are the number of hired consultants and the state of the organization's main systems and the development of these. Organizations hire almost twice as many consultants as in 2013 and while all the organizations that participated in this study stated that they had hired consultants, only 51.5% reported the same in 2013. There has also been a large change in the data regarding IT-systems. The organizations main systems get older, fewer and the development of new ones has dropped. This is a trend seen in the 2013 study as well.

The results show that organizations are better at their 'current operational abilities' than their 'dynamic capabilities', while organizations in general reports good 'competitive performance'. Regarding benefits management, the adoptions of these practices are at a fairly low level even though they correlate well with both competitive performance and how satisfied top-management are with the return benefits from their IT-investments. Application portfolio evolution correlated with both dynamic capabilities and benefits management practices, which both in turn correlated with competitive performance, but there was no correlation directly between application portfolio evolution and competitive performance.

Further work

Mainly it would be appropriate to continue the replication study and monitor the work distribution between evolution and upkeep. This would also be necessary to keep track of the trend where IT-systems tend to live longer and become fewer. The author would recommend conducting a qualitative study among some of the organizations that participated in this study, in an attempt to figure out how the results presented here came to be. This should be done in the foreseeable future to make it relevant to the quantitative data gathered here or include a qualitative aspect in the next iteration of the replication study five years from now. As shown in the discussion chapter there was a far higher correlation coefficient between 'current operational capabilities' and 'competitive performance' than between 'dynamic capabilities' and 'competitive performance'. It would therefore be interesting to see how the

data regarding dynamic capabilities in this study would correlate with current operational capabilities and competitive performance in the next study. This recommendation is based on the thought that dynamic capabilities are intended to measure how well equipped the organizations are to adapt to market changes and stay ahead of the curve, it is therefore more of an indicator of how well the organization could do in the future than how well it does now.

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Appendix A The questionnaire

This is the full version on the questionnaire respondents where asked to fill in to gather data for this study. The questionnaire is in Norwegian as all of the respondents where Norwegian organizations.

Utvikling og vedlikehold av IT-systemer i norske virksomheter

(untitled)

1. Virksomhet som du svarer på vegne av

2. Hvor lenge har du arbeidet i virksomheten? *

- 0-1 år
- 2-4 år
- 5-10 år
- 11-20 år
- mer enn 20 år

3. Jeg jobber i: *

- Privat sektor
- Offentlig sektor

4. I hvilken industri tilhører din virksomhet (tenk kun på kjernevirksomheten)? *

Annen tjensteyting
Bergverksdrift og utvinning
Bygge- og anleggsvirksomhet
Elektrisitets-, gass-, damp-, og varmtvannsforsyning
Faglig, vitenskapelig og teknisk tjensteyting
Finansierings- og forsikringsvirksomhet
Forretningsmessig tjensteyting
Helse- og sosialtjenester
Industri
Informasjon og kommunikasjon
Internasjonale organisasjoner og organer
Jordbruk, skogbruk og fiske
Kulturell virksomhet, underholdning og fritidsaktiviteter
Offentlig administrasjon og forsvar, og trygdeordninger underlagt offentlig forvaltning
Omsetning og drift av fast eiendom
Overnattings- og serveringsvirksomhet
Transport og lagring
Undervisning
Vannforsyning-, avløps- og renovasjonsvirksomhet
Varehandel, reparasjon av motorvogner

5. Hvor tett er virksomhets- og IT-strategi integrert? *

- Virksomhetsstrategien og IT-strategien påvirker ikke hverandre
- Virksomhetsstrategien utvikles først, og brukes til å gi retningslinjer for IT-strategien
- Virksomhets og IT-strategien er tett integrert og påvirker hverandre
- Vi har ingen egen IT- strategi. IT er fullstendig integrert i virksomhetsstrategien
- Vet ikke

6. På bakgrunn av de totalt utførte timeverk internt i IT-avdelingen i løpet av et år, hvor mye (i prosent, totalt 100%) brukes til: *

% Rette feil i IT-systemer som er i drift	<input type="text"/>
% Tilpasse IT-systemer i drift til endret teknisk arkitektur	<input type="text"/>
% Utvikle ny funksjonalitet i IT-systemer som er i drift	<input type="text"/>
% Forbedre ikke-funksjonelle egenskaper (f.eks. ytelse og sikkerhet) i IT-systemer som er i drift	<input type="text"/>
% Utvikle nye IT-system som overlapper/erstatte eksisterende IT-systemer funksjonelt sett	<input type="text"/>
% Utvikle nye IT-system for å dekke nye funksjonsområder	<input type="text"/>
% Drift	<input type="text"/>
% Brukerstøtte	<input type="text"/>
% Annet	<input type="text"/>

7. Svaret på spørsmål om fordeling av timeverk ovenfor er: *

- Rimelig nøyaktig, basert på gode data
- Et grovt estimat, basert på minimale data
- En best mulig gjetning, ikke basert på noen data

8. Hvor stor andel i prosent av følgende aktiviteter gjøres av andre virksomheter, ved utsetting (outsourcing) av aktiviteten? *

% Rette feil i IT-systemer som er i drift	<input type="text"/>
% Tilpasse IT-systemer i drift til endret teknisk arkitektur	<input type="text"/>
% Utvikle ny funksjonalitet i IT-systemer som er i drift	<input type="text"/>
% Forbedre ikke-funksjonelle egenskaper (f.eks. ytelse og sikkerhet) i IT-systemer som er i drift	<input type="text"/>
% Utvikle nye IT-system som overlapper/erstatte eksisterende IT-systemer funksjonelt sett	<input type="text"/>
% Utvikle nye IT-system for å dekke nye funksjonsområder	<input type="text"/>
% Drift	<input type="text"/>
% Brukerstøtte	<input type="text"/>

(untitled)

9. Hvor mange personer er ansatt i IT-avdelingen (omregnet til fulltidsansatte)? *

10. Hvor mange innleide konsulenter har IT-avdelingen i gjennomsnitt over et år (omregnet til fulltidsansatte)? *

11. Hvor mange større IT-systemer (hovedsystemer) er i drift i virksomheten? *

12. Hva er aldersfordelingen til eksisterende hovedsystemer regnet i år etter første installasjon? (Antall systemer skal summere til svar i spørsmålet Q11 ovenfor). Oppgi antall systemer per årsintervall. *

0-1 år

2-3 år

4-6 år

7-10 år

Over 10 år

13. Hvor mange nye IT-systemer er for tiden under utvikling? *

14. Av totalt antall nye IT-systemer under utvikling, hvor mange av disse er "erstatningssystemer"? (Systemer som hovedsakelig dekker funksjonalitet som alt er dekket i eksisterende systemer) *

15. Hva er aldersfordelingen på de IT-systemene som eventuelt erstattes?
(Antall systemer skal summere til svar på spørsmålet Q14 ovenfor) *

0-1 år	<input type="text"/>
2-3 år	<input type="text"/>
4-6 år	<input type="text"/>
7-10 år	<input type="text"/>
Over 10 år	<input type="text"/>

16. Ved utvikling av erstatningssystemer, hva er de viktigste grunnene for at de eksisterende systemene blir erstattet (gi score fra 1-5 på alle punktene nedenfor) *

	1 - Ikke viktig årsak (1)	2 (2)	3 (3)	4 (4)	5 - Viktig årsak (5)
Svært vanskelig å vedlikeholde eksisterende system	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Svært vanskelig å drifte eksisterende system	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Svært vanskelig å bruke eksisterende system	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Finnes alternativ pakkeløsning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Overgang til ny teknisk arkitektur	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Standardisering med resten av organisasjonen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Integrering med andre nye eller eksisterende systemer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

17. I hvilke deler av livssyklusen til IT-systemene anvendes en på forhånd definert metode (sett ett eller flere kryss)? *

- Planlegging
- Analyse
- Kravspesifikasjon
- Design
- Implementering
- Testing
- Utrulling
- Drift
- Vedlikehold
- Prosjektledelse
- Programledelse
- Nyttestyring (gevinstrealisering)

18. Nyttestyring (gevinstrealisering) i forbindelse med IT-prosjekter. I hvilken grad er følgende praksiser tilstede i din organisasjon? *

	Vet ikke	Alltid (1)	Ofte (2)	Av og til (3)	Sjelden (4)	Aldri (5)
Etablering av "Business case" eller tilsvarende før oppstart av IT-prosjekter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Utarbeidelse av plan for uthenting av nytte/gevinster før oppstart av IT-prosjekter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tilordning av ansvar for uthenting av nytte/gevinster	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nyttestyring underveis i prosjektgjennomføringen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Evaluering av oppnådd nytte etter at prosjekter avsluttes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Kvantifisering av oppnådd nytte	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Endring av nytteestimer underveis i prosjektene	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Identifisering av ytterligere nytte etter prosjektene	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

19. Hvem har ansvar for realisering av nytte fra IT-prosjekter i din organisasjon (i den grad noen har ansvar)? *

	Vet ikke	Alltid (1)	Ofte (2)	Av og til (3)	Sjelden (4)	Aldri (5)
Prosjektleder	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Linjeleder i fagavdeling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Linjeleder i IT-avdelingen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Topplederen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fagressurser	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Andre	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

20. Hvordan blir anslag på **usikkerhet** til kostnader og nytte angitt i din organisasjon? *

	Ja	Nei	Vet ikke
Usikkerheten til kostnadene blir angitt kvantitativt (f.eks som minimum-maximum)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Usikkerheten til kostnadene blir angitt kvalitativt (f.eks som høy, middels eller lav)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Usikkerheten til nytten/gevinstene ble angitt kvantitativt (f eks som minimum-maximum)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Usikkerheten til nytten/gevinstene ble angitt kvalitativt (f eks som høy, middels eller lav usikkerhet)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

21. **Estimering** av nytte. Slik du vurderer estimering av nytte i din organisasjon, i hvilken grad fører prosessene for estimering av nytte til for høye (overdrevne) nytteestimerater? *

- I stor grad
- I noen grad
- I liten grad
- Ikke i det hele tatt

22. Etter din mening/erfaring, så kan følgende sies om IT-prosjektene i din organisasjon: *

	Svært bra (2)	Bra (1)	Akseptabel (0)	Dårlig (problematisk) (-1)	Svært dårlig (svært problematisk) (-2)	Vet ikke
Nytten for kunden/brukeren er..	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Kostnadskontrollen er..	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tidskontrollen er..	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Teknisk kvalitet på leveranser er..	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

23. I det store og hele, hvilken andel av IT-prosjektene i din organisasjon fører til den nytten som er forventet? *

- Vet ikke / ingen forventet nytte er planlagt
- Mindre enn 25%
- 25-49%
- 50-74%
- Mer enn 75%

24. Hva mener du er årsaken til at IT-prosjektene i din organisasjon ikke fører til nytten som var forventet *

	I stor grad (1)	I noe grad (2)	I liten grad (3)	Ikke i det hele tatt (4)	Vet ikke (5)
Generell overoptimisme	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bevisst overestimering av nytte for å få lov til å starte prosjektet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Uventede problemer/hendelser fører til mindre nytte enn forventet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Selve estimeringsprosessen har egenskaper som fører til overoptimisme	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="text" value="Enter another option"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

25. I det store og hele, hvor tilfreds tror du din toppledelse er med nytten som din organisasjon får fra investeringer i IT? *

- Helt misfornøyd
- Litt misfornøyd
- Nøytral
- Ganske fornøyd
- Helt fornøyd

(untitled)

26. Vennligst indiker hvor effektiv virksomheten din er på følgende områder (1 – veldig effektiv, 7 – ikke effektiv). *

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)
Kunnskap om brukere og kunder	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Kontroll og tilgang på distribusjonskanaler	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fordelaktige forhold til kunder/brukere	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Etablert kundebase	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Effektiv og vellykket produksjonsavdeling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Stordriftsfordeler og teknisk ekspertise	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Teknologiske evner og utstyr	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

27. Vennligst indiker hvor effektiv bedriften din er på følgende områder (1 – veldig effektiv, 7 – ikke effektiv).

Når muligheter eller trusler blir oppdaget har bedriften vår effektive rutiner for..: *

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)
utforming av potensielle løsninger	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
evaluere og velge potensielle løsninger	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
påbegynne en detaljert plan for å gjennomføre en potensiell løsning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

28. Vennligst indiker hvor effektiv bedriften din er på følgende områder (1 – veldig effektiv, 7 – ikke effektiv). *

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)
Identifisere, evaluere og importere ny informasjon og kunnskap	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Å gjøre eksisterende informasjon om til ny kunnskap	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Assimilere ny informasjon og kunnskap	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Å benytte oppsamlet informasjon og kunnskap som hjelp når man tar beslutninger	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Finne nye måter eller i stor grad endre måtene vi oppnår målene våre på.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Endre virksomhets-prosessen vår i forhold til endringer i virksomhetens prioriteringer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rekonfigurere våre virksomhets-prosesser for finne nye produktive eiendeler	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

29. Vi gjør det mye bedre en våre hovedkonkurrenter når det kommer til: (1 – helt uenig, 7 – helt enig) *

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)
Lønnsomhet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fortjeneste i prosent av salg	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Å redusere leveringstid på produkter og/eller tjenester	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Å redusere driftskostnader	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vekst i lønnsomhet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rask respons på krav fra markedet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rask bekreftelse på bestillinger fra kunder/brukere	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Å gjøre kundene og brukerne mer fornøyde	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Å tilby bedre produkt- og servicekvalitet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

30. Hvordan vil du vurdere din organisasjons evne til å generere følgende typer innovasjoner i produktene / tjenestene du introduserer (1 - mye svakere enn konkurranse 7 - mye sterkere enn konkurranse) *

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)
Innovasjoner som styrker dine rådende produkt- / tjenester	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Innovasjoner som styrker din eksisterende kompetanse i rådende produkter / tjenester	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Innovasjoner som forsterker hvordan du konkurrerer i øyeblikket	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Innovasjoner som gjør dine rådende produkt- / tjenestelinjer overflødige	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Innovasjoner som fundamentalt endrer dine rådende produkter / tjenester	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Innovasjoner som gjør din eksisterende ekspertise i rådende produkter / tjenester	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

