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Kompetanseoverføring i et IT-konsulentselskap

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Knowledge Transfer in an IT Consultancy Company

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Abstract

The master's project that is detailed in this report was performed by a student at the Norwegian University of Science and Technology. The project is a master's degree in Computer Science. The work performed was done in cooperation with a Norwegian IT consultancy company.

The project in this report focuses on how an IT consultancy company manages knowledge sharing between employees. It provides details as to how the information flow between employees changed when the company moved from using an online discussion forum to Socialcast.

Information was gathered by extracting quantitative data from analysis tools, which existed for both the forum and Socialcast. In addition, select employees from the company were asked to reply to a questionnaire regarding their usage of the two communication tools. The work consisted of analyzing this data.

The project took time from August 21 to December 21, 2012.

Problem Description

Knowledge management, and transfer in particular, are important for a lot of modern companies. When the industrial revolution occurred a company's most valuable assets would likely be its machines and factories, as people were cheap and easy to replace. Today, the trend is reversed and companies typically consider its employees and their knowledge as its most important asset, whereas machines are cheap and easy to replace.

In software engineering, changes occur continuously as new languages appear, old languages become obsolete and new methodologies are introduced. Software engineers are encouraged to continuously learn new skills and languages, as technology changes fast [1].

In consultancy, turnover is frequently high. Employees view consultancy as a way to build their career. Some consultancy companies encourage employees to work hard for a couple of years to build a strong CV. Others try to keep the turnover low.

Taken together, it is clear that a software consultancy company lives in a state of constant flux in which employees come and go and their craft is continuously evolving. How do these companies manage the knowledge of its employees? What are their knowledge management strategies? How do they handle the information flow between their employees?

Preface

This project report is the only deliverable of a master's thesis, provided by the *Department of Computer and Information Science at the Norwegian University of Science and Technology (NTNU),* in the fall of 2012.

The assignment was to research how a modern IT consultancy company transfers and manages the knowledge of its employees and compare this to what similar companies have been doing previously.

The author would like to thank his main supervisor Tor Stålhane (NTNU) and the supervisor from the IT consultancy company for their continuous feedback and support throughout the project period.

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Jarle Svendsrud

Contents

List of Figures

Chapter 1 - Introduction and Overview

This chapter will introduce the author's motivation for the project and explain the project's scope. It will also detail the research questions, goals and methods as well as present the contents of this report.

1.1 – Background and Motivation

Right after the industrial revolution occurred, most of the available jobs were easy to perform. Anyone could be taught how to operate a machine within a matter of days without requiring additional education. Most of a company's assets were thus the machines themselves. As increasingly more of this work has become automated, more education and in-depth knowledge have become necessary to perform a successful job. In the knowledge industry today, this is especially true as many employers typically require at least a bachelor's degree, or even a master's degree from the applicants.

Today, employees also change employers more frequently than before and constantly seek to find fun and challenging work. The employers are aware of this, and while some embrace it, others try to counteract it with incentives to keep their employers. The employers all face the same problem: How do they keep a high level of knowledge and competence among their employees when people often change jobs?

A report by Forbes from 2011 shows how the "Talent Traffic" in Silicon Valley [2] looks like this:
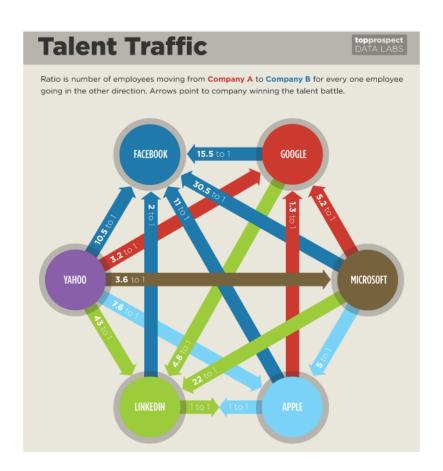
Figure 1 - US IT Companies' Talent Traffic

These companies are all dependent on their employees' competence and knowledge, which implies that knowledge management is important for them.

Moreover, a company's culture plays a big role here. Some companies try to encourage their employees to continuously learn and adapt. Google is one of the best-known companies in this area, with their 70/20/10 model which was articulated in 2005 [3].

How do successful companies perform knowledge management? How do the tools they use impact their strategies and vice versa?

1.2 – Project Scope

This study was done in cooperation with a Norwegian IT consultancy company, which from now on will be referred to as Company A. Company A has a couple of hundred employees and their vision is to help companies develop IT solutions. According to surveys from Universum [4], Company A has been among the most attractive IT consultancy companies among newly graduated students for several years in a row.

This study was limited to the technology department of Company A. The data gathered was subjected to analysis, in order to discover how the introduction of Socialcast affected the information flow between the employees of Company A. Previously, the primary tool for discussion had been an online discussion forum. Both the activity in general and specific posts-based information were analyzed.

This study looked at usage statistics of an old tool, an online discussion forum, and a new tool, Socialcast (see section 2.3 for details). The usage statistics included user activity and post data such as the amount of contributors per post and the amount of replies to a post.

1.3 – Research Questions and Goals

The main goal of this study is to see how a company which focuses on recruiting graduates can distribute and manage its knowledge so that its employees are continuously experienced and skilled. To do this, it was decided to analyze how employees from Company A uses a knowledge management tool and compare it to how they used an old one.

This is broken down into the following research questions:

- RQ1. How did the change from an online discussion forum to Socialcast impact the information flow between employees in Company A?
- RQ2. Is Socialcast a better knowledge management tool for Company A than an online discussion forum? By better, this study

means how well the tool is aligned with the optimal knowledge management strategy.

- o RQ2.1. If Socialcast is better than a forum, why and how is it better? If not, why not?

Prior to the start of this study, it was hypothesized that people were more active on Socialcast than on the forum. Employees in Company A also had the feeling that more non-tech employees were active on Socialcast than on the forum.

1.4 – Research Method

The data in this study was gathered from a forum analysis application and Socialcast's internal analysis tool, as well as from a selected number of posts. In addition, qualitative data was gathered by sending out a questionnaire to selected employees of Company A.

The forum and Socialcast were selected because their data was well suited for comparison and it was believed that an analysis of this data would show significant differences with regards to how the employees in Company A communicated before and after the transition to Socialcast.

The forum analysis application had a posts information file extracted from the forum database, containing information of the users' activity as well as the posts' date and who posted them. Socialcast provided the same data through its user interface. However, the raw data was not available as opposed to the forum numbers which were exported to a Microsoft Excel spreadsheet.

The posts which were selected were manually analyzed, for example by counting the amount of contributors. The questionnaires were sent to members who had been in Company A for at least four years, ensuring that they had experience with both the forum and Socialcast. The questions were open-ended in order to allow the employees to provide detailed answers based on their knowledge and opinion. The idea was to observe what kinds of trends that would appear and connect these to the quantitative data.

1.5 – Thesis Structure

The first chapter of this report focused on the background for this study and the importance of Knowledge Management in a modern IT consultancy company.

Chapter 2 will present the theoretical background for Knowledge Management and IT consultancy. Moreover, it will detail the two central tools, which have been analyzed: An online discussion forum and Socialcast. Finally, central terms will be explained in this chapter.

Chapter 3 will detail the data gathered in this study. The context and collection of this data will be described, along with validity threats and an analysis.

Chapter 4 will present and evaluate the results.

Chapter 5 will focus on what can be learned from this study. A conclusion will be presented along with implications for practice and further research.

Chapter 2 – Theory and Background

This chapter will give an introduction to relevant theory and background. This includes an introduction to knowledge management, what an online discussion forum and Socialcast are and a description of IT consultancy in Norway. A problem description framework called Cynefin will be detailed. In addition, central terms and definitions will be explained. Finally, a discussion on data, information and knowledge will be presented.

2.1 – Definitions and Terms

KM is short for Knowledge Management. KM is a set of strategies and practices to enhance the sharing of experience and insight among the employees of a company (see section 2.4 for details).

Web 2.0 is a term to describe non-static internet pages. When the World Wide Web was new, most pages were very static. Since then, the web has become increasingly more dynamic. Examples include social networks, blogs and video sharing sites such as YouTube. The term Web 2.0 does not refer to a specific technical specification but instead refers to the collection of services and technologies which make the web dynamic.

Codification strategy is a KM strategy where the aim is to quantify and store a set of experiences. Typically this strategy is adopted by companies which have homogenous tasks.

Personalization strategy is a KM strategy where the aim is to let the KM tools focus on the people rather than their experiences. In complex environments where the tasks are seldom similar, this approach is advised to assist employees in getting hold of the right person for help.

Forum is short for online discussion forum.

Thread is a discussion topic on a forum. The term can also refer to the first post of that topic (i.e. the start of the topic).

Message is a topic initiated to a group on Socialcast.

Reply is a reply to a thread on a discussion forum or a message in Socialcast.

Post is a term for threads, messages and replies. For example, 2 threads with 1 reply each constitute a total of 4 posts.

Died out is a term that refers to a thread or message that is no longer active. In essence, this means that it has been a long time since anyone replied to it.

External services refer to the plethora of third party services on the internet where people can post questions and discuss programming problems and challenges. StackOverflow.com, or StackOverflow, is among the biggest of these services and is frequently used by most programmers.

WYSIWYG is short for "what you see is what you get".

2.2 – Data, Information and Knowledge

'A Duality of Knowledge' is an article from the Information Research publication [5]. It states that:

"Recently there has been recognition that some knowledge cannot be quantified and cannot be captured, codified or stored."

It is essential to define what knowledge is when discussing knowledge management. In particular, a distinction between data, information and knowledge is needed to clarify what the aims of knowledge management is, compared to simple information storage.

The term knowledge is defined as follows in the Oxford Dictionary and Thesaurus (1995):

"Awareness or familiarity gained by experience (of a person, a fact, or thing)."

The experience part here implies that context is relevant for knowledge. Knowledge is typically divided into two types, as first introduced by Polanyi [6]: Tacit and explicit. Tacit knowledge refers to knowledge that a human is unable to express. Polanyi wrote that humans *"know more than we can tell"*. On the other hand, explicit knowledge is knowledge that we are able to codify and store.

Figure 2 - Tacit and Explicit Knowledge

The figure above explains how these types of knowledge interact and relate to each other. An example of explicit knowledge in terms of programming is how to write a for-each loop in a specific language, for example Java. An example of tacit knowledge in terms of programming is how a software architect judges an existing IT application architecture. While there are general guidelines for what a good architecture is, the process of analyzing it as a whole is largely based on tacit knowledge.

"Although we all have an intuitive understanding of the term 'information', our understanding is not sufficient to allow us to create, for example, a theory of information which would allow us to explain manifestations such as meaning, knowledge, insight or wisdom." – Tom Stonier [7].

In the field of artificial intelligence, data represents a raw value, which in itself means nothing. Information is often referred to as "data with meaning". In his PhD, Dingsøyr [8] says that *"Knowledge is then often defined as information that is used, or made operative".* Peter Drucker [9] defines knowledge as "information effective in action, information focused on results".

It is not within the scope of this study to complete the discussion on knowledge, but for all intents and purposes this latter definition from Drucker will be used, with regards to both tacit and explicit knowledge.

2.3 – Online Discussion Forum and Socialcast

This section will detail an online discussion forum, which is a tool for discussion, and Socialcast, which is a social networking product for companies.

2.3.1 - Online Discussion Forum
"Online discussion forums are an increasingly common use of new information and communication technologies in education. As a tool for promoting conversational modes of learning, it has been suggested that online discussion forums can lead to enhanced learning outcomes for students." - M.J.W. Thomas [10]

While this study deals with a professional company, sharing knowledge for students and professionals alike revolve around the same principles.

According to Wikipedia: [11] "An **Internet forum**, or **message board**, is an online discussion site where people can hold conversations in the form of posted messages."

The rigid structure of an online forum means that it is static in its nature. The information contained within the forum will grow over time as members create new threads or contribute to existing threads. However, the forum is still divided into sections and you have to manually navigate around to find what you are looking for. This means that you have to actively seek out what you're interested in.

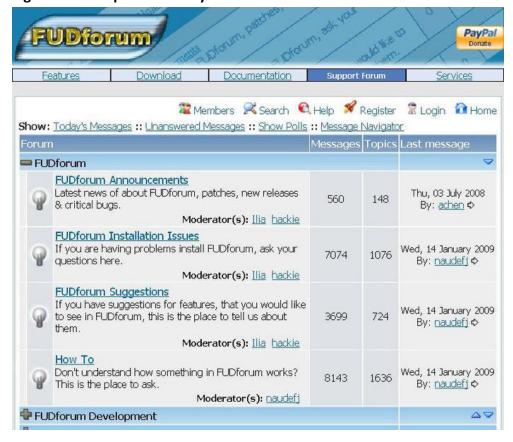**Figure 3 - Example Forum Layout**

The diagram above shows a sample forum structure, with a listing of the various categories on the left. On the right, the amount of messages and topics are displayed along followed by a notification of the last action.

Forums typically allow users to post rich messages, including pictures, YouTube-videos and text formatting. The most basic elements of a forum

are its threads and replies. Wikipedia defines a thread as "a collection of posts, usually displayed from oldest to latest". The definition of a post is:

"A user-submitted message enclosed into a block containing the user's details and the date and time it was submitted. Members are usually allowed to edit or delete their own posts. Posts are contained in threads, where they appear as boxes one after another."

When a user wants to post a new forum message, a text editor window appears where the user is allowed to format the message, along with any rich data. Most forums also have a WYSIWYG preview mode, allowing the user to double-check his post before submitting it to the forum.

For this reason, an online discussion forum is well suited for long posts and discussions. On the other hand, users may find it hard to retrieve relevant data as the forum grows, due to its static nature.

In recent years, social networking has gotten big. Facebook surpassed 1 billion active users in October 2012 [12]. Some people wonder if this has affected the popularity of forums. One thread discussing this particular issue [13] has a member who claims that: *"…the most popular forums are the ones with a purpose beyond just chatting."*

2.3.2 - Socialcast

Socialcast is an IT product developed by vmware. Their own description is as follows [14]:

"Socialcast is the enterprise social networking platform that connects people to the knowledge, ideas and resources they need to work better together."

Essentially, Socialcast allows the employees of a company to connect and share, both on a professional and social level, simultaneously in real-time. For example, a professionally related message might get serious answers as well as funny comments. The social network core structure means that users who are familiar with services such as Facebook or Twitter will easily adapt to Socialcast.

Compared to an online discussion forum, Socialcast is dynamic. Its news feed is always changing, based on the most recent contributions of fellow members.

Figure 4 - Socialcast Example Layout

The diagram above pictures a sample Socialcast window. To the left, there are a number of navigation options available to the user, as well a list of groups that the user has joined. In the center there is a news feed and a post box, allowing the user to quickly submit a message.

2.4 – Knowledge Management

"For hundreds of years, owners of family businesses have passed their commercial wisdom on to their children ... but it wasn't until the 1990s that chief executives started talking about knowledge management" - Morten T. Hansen et al. [15]

Knowledge management, as a defined discipline, is relatively young. As the key assets of companies have gone from natural resources and machines to human knowledge, understanding how to utilize this knowledge has become important to today's managers and executives.

According to Wikipedia [16], the increased use of computers and specific adaptations of technology have enhanced the efforts of knowledge management. Examples include knowledge databases, expert systems and intranets.

McAfee coined a term called 'Enterprise 2.0' in 2006 [17]. He says that modern web functionality, commonly referred to as Web 2.0, has opened up new ways of implementing strategies for managing knowledge. The vision along this line is that knowledge management should be more based on people participation and emergence.

Morten T. Hansen et al. [15] claim that consultancy firms have knowledge as their core asset, and this was the reason why they were among the first businesses to pay attention to knowledge management. These companies were also among the first to aggressively explore the use of information technology to assist their knowledge management. The authors also found that consultants approach knowledge management differently.

Mainly, there are two approaches which are typical. One of them centers on the computer, where knowledge is codified and stored in databases. This is called the codification strategy. The other approach is called the personalization strategy and in this case, the knowledge is closely tied to the person who developed it and is shared mainly through direct person-to-person contact. The main role of computers in the latter case, relative to knowledge management, is to help facilitate person-to-person communication. The authors later found that these approaches appear to be universal, not just unique to consultants. They believe that "the choice between codification and personalization is the central one facing virtually all companies in the area of knowledge management". McAfee's Enterprise 2.0 correlates well with the personalization strategy.

The following diagram from "What's Your Strategy for Managing Knowledge" [15] summarizes some of the differences between the codification and personalization strategies:

Figure 5 - Codification and Personalization Strategy Traits

How should a company decide which approach to take? It depends on the context of the company and the work it performs. In general, a static environment with lots of similar jobs is well suited for a codification strategy. On the other hand, a company which experiences unique problems and rarely encounter the same issue twice would be better off investing in a personalization strategy.

Donald Hislop defines knowledge management [18] as follows:

"Knowledge management is an umbrella term which refers to any deliberate effort to manage the knowledge of an organization's workforce, which can be achieved via a wide range of methods including directly, through the use of particular of ICT, or more indirectly through the management of social processes, the structuring of organizations in particular ways or via the use of particular culture and people management practices."

The definition above captures the various aspects which knowledge management incorporates. This definition will be used for this study.

25

2.5 - Cynefin

Cynefin is a problem description framework. It was first introduced in 1999 by Dave Snowden [19]. Its purpose was to describe problems, systems and situations in an actual management practice.

Cynefin consists of five domains: Disorder, chaos, complex, complicated and simple. These domains represent various states in which problems and challenges may appear. The following diagram shows the typical visualization of Cynefin:

Figure 6 - Cynefin Framework

The dark red headlines detail the name of the domain. The three red words detail the recommended heuristic approach to solving the problem. The green expressions describe how the solution can be reached.
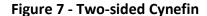
The domains can be described as follows [19], [20]:
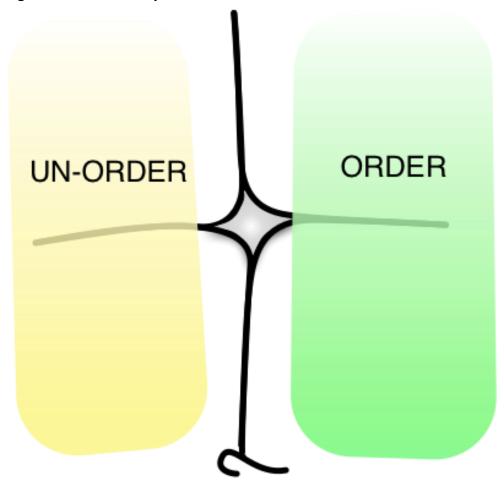
- **Disordered** is a domain in which a problem exists if it does not fit into any of the other domains.
- **Chaotic** is a domain in which a problem exists if there is no relationship between cause and effect at the systems level. Another way to think of chaotic is that it is impossible to provide a clear description of the problem or solution.
- **Complex** is a domain in which a problem exists if the relationship between cause and effect can only be perceived after a solution has been presented. Another way to think of a complex problem is that there are multiple good results to think of prior to trying a solution, but it is impossible to verify them before an implementation has been made.
- **Complicated** is a domain in which a problem exists if the relationship between cause and effect exists, but requires analysis and/or application of expert knowledge to direct an implementation that solves the problem.
- **Simple** is a domain in which a problem exists if the relationship between cause and effect is trivial and should be known by everyone and a best practice can be applied.

Cynefin can also be thought of as describing how a problem evolves over time. Initially, most problems are Chaotic in nature. The first time a problem is encountered it is impossible to describe the exact problem clearly, or the solution. For example, prior to the introduction of a graphical operating system, the experts knew that they had to create something that was more user-friendly than the text-input based operating systems of the time, but were unable to formulate the exact problem or solution clearly. A typical solution to a chaotic problem is to assemble a small group of experts to discuss the topic. At some point, the problem will be reduced to a complex problem. To continue the example, employees at Apple at one point discovered that a graphical interface would be a viable solution. They did not know how well this would work prior to testing out the finished solution. Today, the problem of creating an operating system with the same specifications is complicated, or arguably even simple. This lifecycle can be used to think of Cynefin as a screw. A problem starts out as chaotic and eventually it is drilled down to simple.

Cynefin can be used to analyze knowledge management problems and situations. The two domains on the left-hand side, chaotic and complex, can be thought of as the unordered side of problems. The two domains on

27

the right-hand side, complicated and simple, can be thought of as the ordered side of problems. The diagram below visualizes this difference:

Figure 7 - Two-sided Cynefin

The knowledge required to solve these kinds of problems correlate well with the concept of tacit and explicit knowledge and by extension, personalization and codification strategies. Essentially a problem can be chaotic/complex or complicated/simple. In the first situation, tacit knowledge is essential and a personalization strategy is the best approach. On the other hand, a problem that is complicated or simple, essentially requires explicit knowledge and a codification strategy is the best approach.

2.6 – IT Consultancy

This section is based on conversations with an interaction designer, project leader and group leader in Company A.

IT consultancy in this study refers to the context in Norway. At the beginning of 2012 Norway lacked 16,000 engineers [21], which means that there is also a big lack of IT engineers. The Norwegian government has been aware of this fact for years and they are constantly seeking new ways to make IT and engineering degrees more lucrative. Many Norwegian companies have opted to hire consultants instead of trying to create a more solid IT department of their own. Because of the lack of engineers and IT graduates, they find that it is hard to compete with the more dedicated IT and consulting companies. The use of consultants for this kind of work has been the topic of much debate in Norwegian media [22].

The IT consultancy companies are competing for the best talents. It is not uncommon for graduates to sign contracts for employment several months before they complete their studies. The consultancy companies frequently have a lot of projects and their employees have to adapt and learn every time they encounter a new project. This has come to shape what is called the T-profile for consultants. Essentially, a consultancy company prefers to have employees whose competence is shaped like a capital T. They should have some knowledge of a lot of technologies, methodologies and best practices (representing the upper part of the T), while they are to be best at something specific (the lower part of the T). This makes consultants attractive in a lot of areas and it is not uncommon for consultancy companies to have high turnover rates, as employees seek higher salaries and better perks.

When Apple and Microsoft started their businesses in the US in the 1980s, the IT culture was at first very geeky [23]. Everything from dress code to working hours was based on the lifestyle these people had in college. Today, IT consultants are expected to be professional in how they appear and act. Consultancy companies teach their new employees how they want them to act and represent the company, which has essentially become a skill of its own. This does not mean that every consultant is expected to wear a suit every day and never have an opinion of his own, instead the consultants have to adjust themselves to the customer they are working for. Gone are the days when working in pajamas was normal, as well as working hours between 2pm and 3am.

Traditional consultancy models dictate a mathematical model where there are two people below every leading position. This creates a binary tree model for

the organization and allows the company to offer higher salaries to the employees further up. In Norway today, many companies have chosen a flatter model with a higher amount of leading positions. This is not sustainable for the high salaries allowed with the traditional models, and so these companies do not have the same career potential.

In Company A, the employees all belong to one of three departments. One is tasked with the business goals of the customers, another with the functionality and user experience and the last is concerned with the technology. Most of these work at the site of their respective customers, to allow for frequent communication and interaction. Whereas most of their time is spent there, they spend roughly 10% of their time building new knowledge. This includes weekly meetings with their interest group, which usually takes place at the Company's office. Because of this, virtual channels are vital for keeping in touch with other employees from Company A.

Chapter 3 – Methods and Materials

This chapter will detail the data used in the study and present how it was collected. Central validity threats will be discussed. Lastly, an analysis of the data will be presented.

3.1 – Context Selection

This section is divided into two parts: The first part will detail the context selection with regards to the forum and Socialcast, whereas the latter will detail the context selection with regards to the people that were asked to reply to a questionnaire.

3.1.1 – Forum and Socialcast Context Selection

The forum is divided into a lot of categories, and only the one called "Technology" was selected for this study. Although some other categories could potentially have been relevant, threads were selected solely from this category to make it easier to align the nature of the posts between the forum and Socialcast.

In a forum, the threads with the most recent replies will be on the top of the page. This inherently creates a bias towards popular threads on the first page of a specific forum category, as they will appear among the top threads as many times as there are replies before they die out. Additionally, in the transitional phase when Company A switched from the forum to Socialcast, the activity on the forum was below normal because some employees were actively contributing to Socialcast, thus lowering their forum activity. To account for these two biases, all threads selected for analysis were picked as follows:

- The "Technology" forum section was chosen
- The threads for the last couple of months were disregarded
- The threads chosen had no replies from the last three months prior to the introduction of Socialcast
- As the replies were older than three months (relative to Socialcast's introduction), the threads had all died out and as such did not suffer from the bias of momentary popularity

15 threads were chosen for this analysis. This number was believed to be sufficient to show any possibly significant differences based on a 95% confidence interval. This assumption proved to be true once the data had been collected and analyzed.

For each of these threads, a main category was assigned to allow an alignment to Socialcast. For example, a thread regarding a cross-site scripting (XSS) vulnerability was categorized as "Security". For each such

thread, a message was selected from Socialcast from the corresponding group, ensuring a one-to-one relation.

In Socialcast, the same problem exists with regards to the bias of momentary popularity as the message with the most recent answer will be displayed on top of the group feed. To account for this, the categories would be scrolled down to get older messages. All the messages chosen had replies which were at least one month old. As such, these messages would have died out, as is the case of the forum threads.

3.1.2 – Questionnaire and Interview Subjects Context Selection

The people that were asked to reply to one questionnaire were selected based on their roles in interest groups in Company A. In Company A, all employees are part of only one interest group at a time. Once a year they are free to swap from one group to another. Examples of such groups include "Java", "Web Architecture" and "Dynamic Languages". Each of these groups has a leader who is responsible for the overall group work and plans for knowledge development for each individual. As technology changes, some groups are terminated and new ones are established. The people that were asked had all been in Company A while the forum was active. This made for a homogenous group where the members all had several years of experience. Furthermore, they all had experience leading an interest group.

3.2 – Data Collection Methods

Company A had an analysis tool for the forum. This was a simple Java application which displayed a visualization of the members' activity over time. No equivalent to this tool was found for Socialcast. However, the application had data about the users and posts stored in a .tsv file. This allowed for the data to be extracted to Microsoft Excel. Socialcast comes with an analysis tool of its own, which is called Social Business Intelligence (SBI). These data were comparable, for example both tools could retrieve the total amount of posts made in the lifetime of the application.

For the posts analysis part, the work was done as follows:

- The initial post was copy-pasted to Microsoft Word, which automatically counted the amount of words.
- The amount of posts and contributors were counted manually
- These data were stored in an Excel spreadsheet and necessary calculations were performed

For the qualitative data, a questionnaire was made which consisted of open questions. This was done because the intention of the questionnaires was to look for trends. Furthermore, if any of the employees wanted to add anything of interest, this provided them with the opportunity to do so.

3.3 – Data Collection

This section is divided into two parts. The first part will detail the quantitative data (mainly the analysis from the online discussion forum and Socialcast), whereas the latter part will detail the qualitative data (mainly the data from the questionnaire and interviews).

For the analysis related to the forum and Socialcast, there were two parameters that were not considered: The amount of views on the forum for threads and the amount of likes on Socialcast for messages or replies. This is not because these metrics do not hold any value, but rather because there is no adequate parameter on the other platform. Socialcast does not track views and the forum has no "like" function.

3.3.1 – Quantitative Data Collection
This section is divided into two parts: the first part will detail an analysis of some threads from the forum and posts from Socialcast. The latter part will detail the activity on the forum and Socialcast.

3.3.1.1 – Threads and Post Data
15 threads were selected from the forum, along with 15 messages from Socialcast. As detailed in "Forum and Socialcast Context Selection" these

posts had a 1-to-1 alignment, based on an assigned main category. The distribution was as follows:

- 7 threads & messages were posted in "Java"
- 3 threads & messages were posted in ".NET"
- 3 threads & messages were posted in "Web Front-end"
- 1 thread & message were posted in "Security"
- 1 thread & message were posted in "Gadgets and Smartphones"

Note that this distribution was not based on how frequently users posted to a given group, but was determined from the categories of the 15 selected threads from the forum (see section 3.1.1 for details).

For each of the 15 threads on the forum and the 15 messages on Socialcast, the following data was gathered:

- Amount of words in the original post
- Amount of total posts (including replies)
- Amount of unique contributors to the topic

Following this data collection, three t-tests were performed to clarify differences.

3.3.1.2 – Activity Data

Based on a visual analysis program, it was clear that the forum had a few members who contributed a lot. Roughly a dozen people were easily recognizable as key members for the forum's activity. The diagram below displays this activity as follows: Each circle represents a forum member. The size of the circle represents the amount of posts the member has made. A dozen circles have been numbered to illustrate the key contributors.
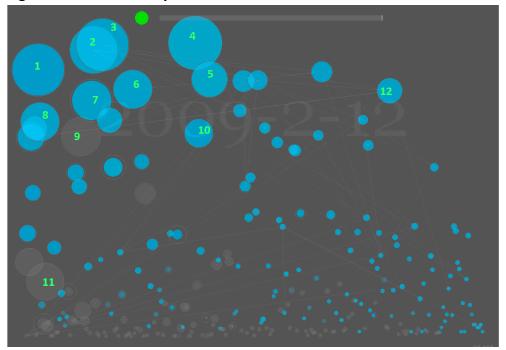
Figure 8 - Forum Activity Visualization

Unfortunately, no such program exists for Socialcast. It was decided to compare the users overall and present their activity as a bar graph, distributed on the amount of posts made. This would visualize the distribution of the members' activity and allow a comparison to be made.

One of the reasons why Socialcast was introduced to Company A was because some of its employees felt that the forum was used almost exclusively by the programmers. The amount of posts on the forum that belonged to the "Technology" category accounted for 68.9% of all the posts. For Socialcast, all technology groups were added together, and the posts there accounted for 29% of all the posts. Up till now, Socialcast has a total amount of 122 252 posts. This accounted for an average of 4 890.1 posts per month. The forum, in its lifetime, had a total amount of 36 272 posts. This accounted for an average of 447.8 posts per month. Accounting for the fractions, 68.9% and 29.0% for the forum and Socialcast, respectively, there was an average of 309 technology posts on the forum and 1 418 technology posts on Socialcast per month.

3.3.2 – Qualitative Data Collection

In total there were seven people who responded to the questionnaire. Below is a summary of their main points:

- Vital characteristics for knowledge sharing tools are easy to use and a low threshold for asking questions.
- The forum had more formal and in-depth discussions than Socialcast. The forum's text formatting options were central for this.
- The informal nature of Socialcast lowers the threshold for posting a message or reply for a new member.
- Socialcast has a more dynamic structure, which provides its users with a feel for what the rest of the users are doing.
- More people are active on Socialcast and there is more interaction across departments. There is also more social interaction than the forum had.
- The 'like' button is frequently used and employees who successfully finish a task are credited on Socialcast.

For an in-depth look at what they replied, see Appendix B – Questionnaire Replies.

The seven people who responded to the questionnaire display a lot of the same opinions. For example, they use the 'like' button on Socialcast is a lot and there is a consensus that the discussions on the forum were generally more in-depth.

3.4 – Data Validation

This section is divided into three parts. The first part will detail the validity threats for the quantitative data. The second part will detail the validity threats for the qualitative data. Lastly, the threats will be shortly discussed along with an overall analysis of the data validation.

3.4.1 – Quantitative Data Threats

The activity data was gathered directly from the analysis tools for the forum and Socialcast. The import to an Excel spreadsheet was triple-checked and subsequent calculations performed twice to reduce the risk of human error.

The data from the threads and messages were gathered manually. The word count import to Word was done twice, by way of copy-paste. The amount of contributors was counted twice, as was the amount of replies. As all these data were gathered manually, instead of extracted from a database, the risk of human error is greater than for the activity data.

The context selection was based on the assumption that the most recent activity would be biased by popularity. As such, all posts gathered were selected based on the assumption that they had died out. It is possible that some posts never die out, although it is highly unlikely. These posts would never have made it into the study.

The data selected from the forum were chosen from a specific time period, which only stretched over a couple of months. If anything major happened in Company A during this period or to one of their major projects, this could have impacted the data. The users' activity analysis showed that a few key players contributed a lot to the forum and if they were for example on a leave in this period, the data could be biased.

Lastly, although the data collected showed significant differences according to a 95% confidence interval, there is a 5% possibility that this result is simply random. The exception here is the activity data, which accounted for the entire usage history of the forum and Socialcast.

3.4.2 – Qualitative Data Threats

The data was gathered from a questionnaire that purposefully used open-questions to allow the selectees to convey what they considered important. Different persons may have interpreted the various questions differently. Some might have misunderstood the questions. Furthermore, the questions were asked in English whereas all the selectees have Norwegian as their native language. This was done to ensure that the terms would match the ones used in this study. The abstract and theoretical nature of the questions is also uncommon for pragmatic consultants as they are used to solve problems.

An important threat to consider for the questionnaire is the Rosy Retrospection phenomenon [24]. Essentially, psychology studies have shown that our recollection of a positive experience is often more positive than the perception there and then. It was well known in Company A prior to the study that several members had a positive experience with the forum and its thorough discussions, aided by the text formatting options, with code snippets in particular being a valued option. The quantitative

data did indeed reveal that the posts had, on average, more replies on the forum than on Socialcast, which most likely means that the discussions were more thorough. However, with the Rosy Retrospection the actual experiences of the members could be exaggerated when asked to reply to the questionnaire.

3.4.3 –Data Validation Evaluation

The data which was extracted directly from the analysis tools is highly unlikely to be corrupted. This is because there were few instances to double-check and they were all checked at least twice. There is a higher chance of inaccuracy in the manual data. However, this was also double-checked at all instances. Furthermore, there is no reason that a systematic error would occur. As such, it is likely that any inaccuracy anomalies would be small and cancel each other out, instead of systematically contributing to shifting the result.

The specific time period for the extracted threads from the forum is probably a normal period for Company A. No indication points to the contrary. The active members had contributed in the threads selected. If anything out of the ordinary occurred during this period of time, it is unlikely that it would significantly impact the forum activity.

The quantitative data all points in the same direction, which implies that they have either all been systematically shifted or that any inaccuracies are too small to make a major impact on the result.

For the questionnaire, the English questions did not seem to be a problem. All the employers who replied displayed above average English skills. They all have a university degree of minimum three years, and several courses used English material, such as books and articles. Furthermore, they had no problems understanding the terms and questions. Although they work as consultants today, they all come from an academic instance where abstract terms and theory are vital parts of their education. The discrepancy in the respondents' answers is most likely due to their different views of what they consider important and interesting. The questions were deliberately open-ended for this reason. It was vital to discover what the employees viewed as important in order to get the big picture and put the quantitative data in the right context.

The Rosy Retrospection phenomenon likely makes a difference here. In reading the various replies, it is evident that some of the employees miss the forum to a certain degree. However, the replies were short and

concise. Furthermore, they were consistent among the various employees. The awareness of the phenomenon, coupled with knowledge relative to what parts of the forum is missed, means that exaggeration can largely be singled out and ignored, if necessary. For example, the forum was known for its in-depth discussions with long threads and replies, often comprised of lots of code snippets and thoroughly described points of view. However, this was known prior to the study and the quantitative data supports the fact that there were more replies per thread on the forum than there are replies per message on Socialcast. Furthermore, when the questionnaires were sent out the 15 threads and 15 messages were checked for code snippets. The forum posts had more code snippets than those Socialcast, and the average amount of code was bigger per snippet. For these reasons and because the questionnaires were sent out to look for trends instead of accurate specifics, the final impact of the Rosy Retrospection phenomenon is likely insignificant.

3.5 – Data Analysis

The following tables present the data of the posts which were analyzed in this study. Both tables are sorted on the amount of posts.

Figure 9 - Forum Posts Data

Forum ID	Start post length (words)	Amount of posts	Amount of contributors
1	198	35	12
7	184	26	10
10	225	24	9
15	6	23	13
11	214	11	5
2	120	10	4
4	121	9	5
6	12	8	4
13	37	7	4
12	75	6	4
14	45	5	4
3	85	3	2
5	129	3	3
9	59	3	2
8	83	1	1

Figure 10 - Socialcast Posts Data

Socialcast ID	Start post length (words)	Amount of posts	Amount of contributors
27	147	17	10
16	31	16	5
29	186	12	5
18	40	6	2
19	46	6	4
22	34	5	5
28	83	5	4
21	79	4	4
25	43	4	2
30	86	4	2
17	135	3	3
23	25	2	2
24	412	2	2
26	21	2	2
20	16	1	1
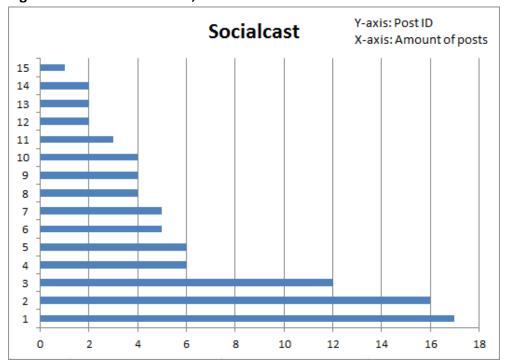
The tables show that there is a difference between the amount of posts per thread on the forum and messages on Socialcast, as well as contributors, which is significant. Furthermore, there seems to be a connection between the amount of posts and the amount of contributors. This is no surprise, as a post with only one reply cannot have more than two contributors, and a post with two replies cannot have more than three contributors.

The following graphs show the distribution between the amount of posts for the forum and Socialcast:

Figure 11 - Amount of Posts, Distribution for the Forum

Figure 12 - Amount of Posts, Distribution for Socialcast
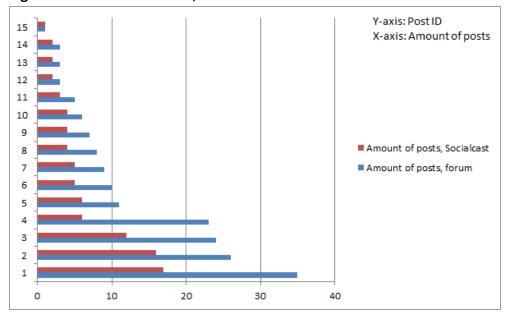
Figure 13 - Amount of Posts, Distribution for the Forum and Socialcast

The diagrams show the differences from the tables clearly. In particular, the posts with IDs 1 through 4 show the big difference between the amount of posts on the forum and Socialcast.

The following graphs show the distribution between the amount of contributors for the forum and Socialcast:
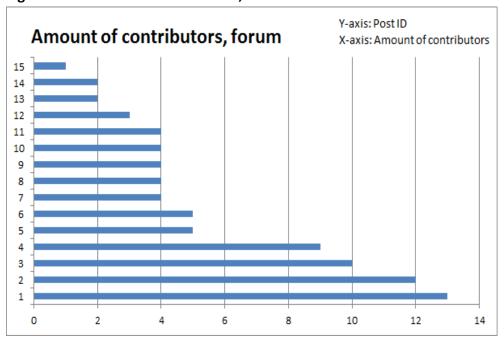
Figure 14 - Amount of Contributors, Distribution for the Forum
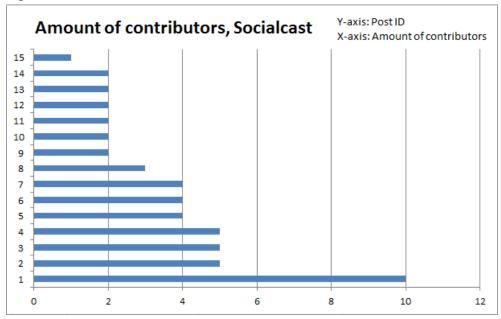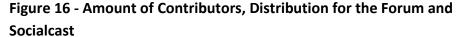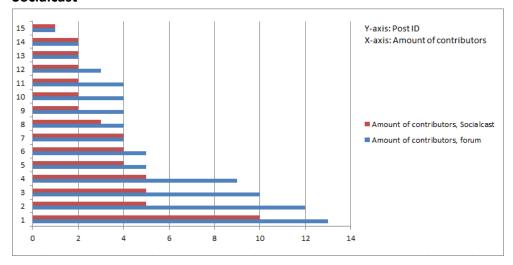
Figure 15 - Amount of Contributors, Distribution for Socialcast

Figure 16 - Amount of Contributors, Distribution for the Forum and Socialcast

The diagrams above are similar to the ones displaying the amount of posts: The forum has significantly more contributors per thread than Socialcast has per message. Again the posts with IDs 1 through 4 show major differences.

Three t-tests were run to determine if there were significant differences between the forum and Socialcast, with a 95% confidence interval. The diagrams below display the results (all three diagrams are output from a Minitab, a statistics program):

Figure 17 - t-test Output for Start Post Length

```
Two-Sample T-Test and CI: Start post length (words)
                                     N    Mean  StDev  Mean
Start post length (words, forum)     15  106,2   72,1    19
Start post length (words, Socialcast) 15    92    102    26

Estimate for difference:  -13,9
95% CI for difference:  (-80,4; 52,5)
T-Test of difference = 0 (vs not): T-Value = -0,43  P-Value = 0,670  DF = 25
One-tailed P-Value = 0,335
```

*The P-Value has been halved because the test is only looking for cases with one tail. The same applies for all three t-tests. The resulting one-tailed P-Value of 0.335 is **not** within a 95% confidence interval.*

Figure 18 - t-test Output for Amount of Posts

```
Two-Sample T-Test and CI: Amount of posts


                             N  Mean  StDev  SE Mean
Amount of posts (forum)      15  11,6   10,3      2,7
Amount of posts (Socialcast) 15  5,93   5,02      1,3

Estimate for difference:  5,67
95% CI for difference:  (-0,52; 11,85)
T-Test of difference = 0 (vs not =): T-Value = 1,91  P-Value = 0,070  DF = 20
One-tailed P-Value = 0,035
```

The one-tailed P-Value of 0.035 is within a 95% confidence interval.

Figure 19 - t-test Output for Amount of Contributors

```
Two-Sample T-Test and CI: Amount of contributors; Amount of contributors_1


                                   N  Mean  StDev  SE Mean
Amount of contributors (forum)     15  5,47   3,72     0,96
Amount of contributors (Socialcast) 15  3,53   2,23     0,58

Estimate for difference:  1,93
95% CI for difference:  (-0,39; 4,26)
T-Test of difference = 0 (vs not =): T-Value = 1,73  P-Value = 0,098  DF = 22
One-tailed P-Value = 0,049
```

The one-tailed P-Value of 0.049 is within a 95% confidence interval.

Because significant differences were found for the amount of posts and the amount of contributors, the effect sizes were calculated. For the amount of

posts, the effect size is **0.70**. For the amount of contributors, the effect size is **0.63**. The following table shows how significant an effect size is:

	Trivial	Small	Moderate	Large	Very large	Nearly perfect	Perfect
Effect size	0.0	0.2	0.6	1.2	2.0	4.0	Infinite

An effect size accounts for the variance and sample size. Given enough samples, one can almost always prove a significant difference. However, if the effect size is low, the significant differences do not necessarily imply anything. The effect sizes found here are both considered moderate according to the table, and as such the differences show an effect and not just a statistically significant difference.

For the qualitative data, the following trends were identified based on the points elicited in Appendix B – Questionnaire Replies:

- Vital characteristics for knowledge sharing tools are easy to use and a low threshold for asking questions.
- The forum had more formal and in-depth discussions than Socialcast. The forum's text formatting options were the main reason for this.
- The informal nature of Socialcast lowers the threshold for posting a message or reply for new members.
- Socialcast has a more dynamic structure, which provides its users with a feel for what the rest of the users are doing.
- More people are active on Socialcast and there is more interaction across departments. There is also more social interaction than the forum had.
- The 'like' button is frequently used and employees who successfully finish a task are credited on Socialcast.

The points above correlate well to what the quantitative data show. There has been a major increase in the interaction and activity. The user activity distribution also shows that there are more active members now, whereas the forum had a lot of members who were mostly inactive. The fact that the forum had more posts and contributors per thread than what Socialcast has per message suggests that the discussions there were more in-depth.

Based on the differences between the amount of posts and contributors, a distribution graph was made where the 30 selected posts were plotted to look for differences between the amount of posts relative to the amount of contributors. A linear regression was applied to both samples as well. The diagram below displays the result:
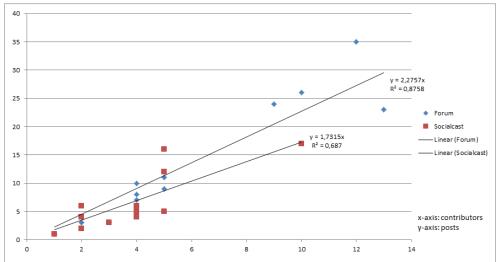
Figure 20 - Amount of Posts as a Function of the Amount of Contributors

The diagram displays the amount of posts as a function of the amount of contributors.

The hypothesis was that on the forum, there would be more in-depth discussions between the members. This should create a steeper curve than for Socialcast, where it was believed that more members participated with less replies. Although the diagram above points in this direction (the forum's function graph shows that y is proportional to 2.28x whereas Socialcast's equivalent is 1.73x), it was decided that the R² value for Socialcast was too low to draw any conclusions. In other words, the linear regression fit was not sufficient to provide reasonable grounds for comparison.

This led to the question of whether linear regression is the correct approach. How do posts evolve? Is an exponential function a better fit? The points in the graph that were the farthest away from the regression function were more thoroughly analyzed. This revealed that perhaps the most important part of a post's distribution is its nature. Some posts were fairly specific questions to a problem, for example how to solve a JavaScript error occurring only in one version of the Opera browser. Others, however, were more probing questions, for example one post simply asked whether

any employees had any experience with iOS development. The diagram below highlights four of the most diverging posts:
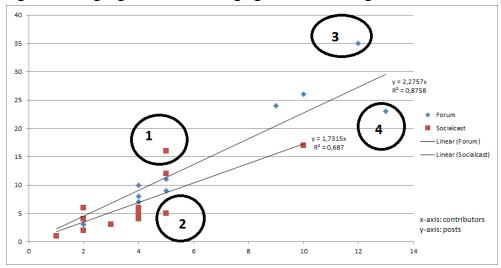
Figure 21 - Highlighted Posts Diverging From Linear Regression

Point number 1 was initially a probing question where the author asked for experiences with an analysis tool. The post then evolved into a discussion between a few people who posted multiple posts each, which explains the high amount of posts to the contributors.

Point number 2 was a link to a news article detailing how a website had been hacked. All contributors left a single post, which explains the low amount of posts to the contributors.

Point number 3 was an in-depth discussion on Microsoft's Visual Studio 2010 and .NET 4.0. Although many contributors were involved, some of them posted multiple times, which explains the high amount of posts to the contributors.

Point number 4 was a probing question where an executive asked if anyone in Company A had any experience with iPhone application development. Most of the contributors made a short reply detailing their experiences and a few follow-up questions were asked.

The four points discussed above show the complexity of how different the posts can be. It is the author's opinion that, in order to analyze regression such as the one attempted here, we must analyze a dataset consisting of posts of a similar nature. To this end, it was decided that the regression model could not be used to draw any conclusions.

Chapter 4 – Results and Evaluation

This chapter will describe the results of the study, as well as provide an evaluation.

4.1 – Results

This section will detail the results of this study. It is divided into four parts for overview purposes.

4.1.1 – Post Activity

The post activity analysis showed that Socialcast has roughly ten times as many posts per month as the forum used to have. The percentage of posts in the technology section has decreased from 68.9% with the forum to 29% with Socialcast. This accounts for roughly 300 posts per month in the technology section for the forum, compared to roughly 1400 posts per month for Socialcast. The data was as follows:

Figure 22 - Forum and Socialcast Post Activity

	Forum	Socialcast
Average amount of total posts per month	448	4 890
Amount of posts in the technology section	68,91 %	29,00 %
Average posts per month in the technology section	309	1 418
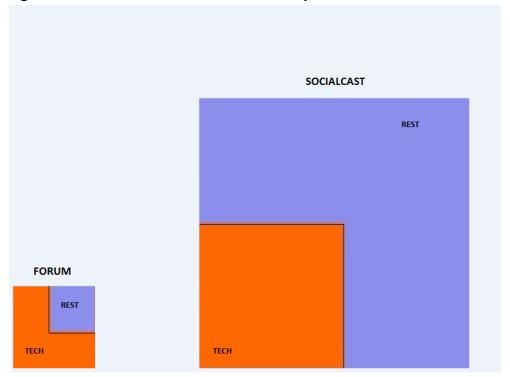
Figure 23 - Forum and Socialcast Post Activity Visualized

The orange part of the two squares represents the amount of posts made in the technology section. The blue part represents all the posts which were not posted to the technology section.

4.1.2 – User Activity

The user activity analysis for Socialcast showed that there was no significant difference between the most active and the least active users.

However, the middle section saw a lot more active users on Socialcast than we saw on the forum.
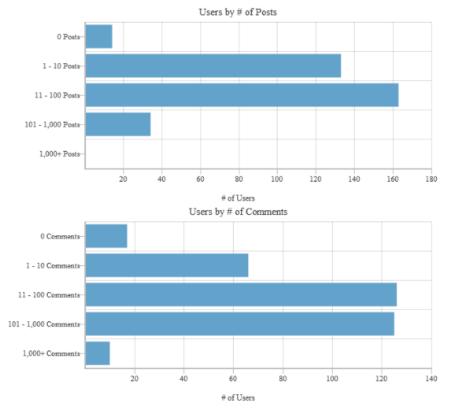
Figure 24 - Socialcast User Activity Distribution

The term 'Comments' refers to replies
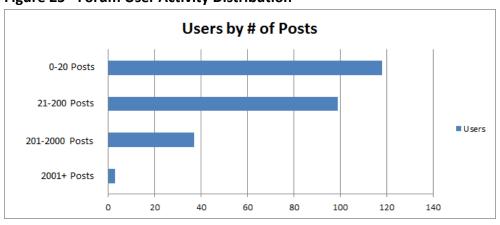
Figure 25 - Forum User Activity Distribution

This diagram had its ranges set to twice the selection of Socialcast, because there was no way to separate threads and replies with the forum data.

As figures 24 and 25 show, there are a lot of users with very few posts on the forum, whereas the majority of the users on Socialcast are more active. This is despite the fact that these diagrams show the amount of the total data, and the forum was active for several years longer than Socialcast has been. The decision to use the total data instead of taking a set period of time was made due to difficulties extracting the data relative to a period of time, as well as the fact that the forum and Socialcast were never active at the same time.

4.1.3 - Post Analysis

15 sample threads were collected from the forum, along with 15 messages from Socialcast. These were compared with regards to start post length, amount of posts and amount of unique contributors.

Figure 26 - Forum Threads Analysis

FORUM

Average post length:	**106,20**	words
Average amount of posts:	**11,60**	posts
Average amount of contributors:	**5,47**	contributors
Post length standard deviation:	72,10	words
Amount of posts standard deviation:	10,32	posts
Amount of contributors standard deviation:	3,72	contributors

Figure 27 - Socialcast Messages Analysis

SOCIALCAST

Average post length:	**92,27**	words
Average amount of posts:	**5,93**	posts
Average amount of contributors:	**3,53**	contributors
Post length standard deviation:	102,12	words
Amount of posts standard deviation:	5,02	posts
Amount of contributors standard deviation:	2,23	contributors

A t-test was run to see if there were any significant differences according to a 95% confidence interval. The tests yielded the following results:

- Post length: no significant differences were found
- Amount of posts: the forum had more posts per thread
- Amount of contributors: the forum had more contributors per thread

Section 3.5 details the t-tests further.

4.1.4 – Questionnaire Results

The qualitative data revealed a few common points across the seven employees who replied. These points correlate well with the quantitative data. The most central ones are as follows:

- Vital characteristics for knowledge sharing tools are easy to use and a low threshold for asking questions.
- The forum had more formal and in-depth discussions than Socialcast. The forum's text formatting options were central for this.
- The informal nature of Socialcast lowers the threshold for posting a message or reply for a new member.
- Socialcast has a more dynamic structure, which provides its users with a feel for what the rest of the users are doing.
- More people are active on Socialcast and there is more interaction across departments. There is also more social interaction than the forum had.
- The 'like' button is frequently used and employees who successfully finish a task are credited on Socialcast.

Additionally, some points were made by only one responder, but were considered to be important as well.

- Socialcast offers strong mobile support with a tailored interface, which allows users to more efficiently use the service on the go.
- External services such as Google and StackOverflow are frequently used when a specific question with a presumably simple solution is encountered.
- The company culture with regards to sharing knowledge is more important than the tool itself.

Together, these points form a concise and clear image of how the employees in Company A view the different tools and how they utilize Socialcast today.

4.2 – Evaluation

This study looked at two different tools whose aims were to help the employees of Company A share their knowledge. Post and user activity data was analyzed and an in-depth analysis of 30 select posts was performed. Lastly, a questionnaire was sent to fourteen selected interest group leaders to aid the quantitative data analysis. This section will present an evaluation of central points from the study.

4.2.1 - Activity

The results in 4.1.1 showed that the activity on Socialcast is greater than what the forum activity used to be. The total activity is roughly ten times greater. As per August 2012, there were roughly three times as many employees in Company A compared to August 2005. Company A has grown continuously since 2005 to 2012. Because of this, the mean value of active members' ratio between Socialcast and the forum will be less than three. Even if we assume that the ratio is three, the activity has more than tripled per member. The technology section, which had a smaller relative increase than the other areas, is more active today considering this factor. In addition to this, since there were more replies to a start post on the forum than Socialcast, there are considerably more messages on Socialcast than there were threads on the forum. The discussions are more frequently started and less frequently evolving into big issues through the tool itself. The activity increase, in particular in light of the huge rise of non-technology posts, means that there is more interaction across the various departments and interest groups. This results in a better overview of who knows what throughout Company A, which was supported by the questionnaire replies as several of the responders mentioned this as a vital part of Socialcast.

4.2.2 - User Distribution

The user distribution analysis revealed that there is a large group of employees who are active on Socialcast. The amount of highly active users, measured in percentage, is roughly the same between the forum and Socialcast. However, whereas the forum had a large group of inactive users, this has changed. Coupled with the overall activity increase, it is clear that the employees of Company A are now interacting a lot more than they did with the old tool. This effectively makes people better

acquainted and the perceived threshold of posting issues or comments is lowered. Furthermore, the replies to the questionnaire confirmed that there is more informal communication occurring through Socialcast than on the forum, which further reduces the threshold to post.

4.2.3 - Effectiveness and Usage Situations

It appears that the employees of Company A use Socialcast frequently. However, the replies to the questionnaire suggest that the time spent using it is usually short. This correlates well with how most people use modern, social services such as Facebook and Twitter. This means that it is ideal to check during breaks. As such, the tool is used effectively without compromising the employees' effectiveness with regards to their jobs. The same principle applies for mobile usage and Socialcast's mobile support fits perfectly in here.

4.2.4 - External Channels

Since the inception of the forum in Company A there has been a huge rise in the popularity of open, online communities dealing with technical problems and questions. Person 1 replied to the questionnaire that Google and StackOverflow were commonly used tools for solving specific questions. Indeed the term 'googling it' has become an official verb and services like StackOverflow have millions of page views per week. What these channels do, which they have become increasingly good at, is to solve problems primarily in the simple domain of Cynefin (see 2.5 for details on Cynefin). With the high activity and widespread adoption of popular technologies, almost all problems that are encountered have been encountered before with regards to programming.

4.2.5 - Knowledge Management in Company A and Cynefin

All problems discussed in this section are discussed in the context of the Cynefin framework. See 2.5 for details.

The forum was based on a widespread template which was originally made for discussing any topic. While its text formatting utilities helped the programmers to format their code, there is no functionality present which was designed explicitly for knowledge management purposes. However, the forum was well suited for helping people solve simple problems and to a certain degree, complicated problems. The problem is that, as the

analysis and evaluation have shown, to help people with chaotic and complex problems, other properties and functionality are needed. The left side of Cynefin problems correlates well with personalization strategies, whereas the right side of Cynefin problems correlates well with codification strategies. External channels such as StackOverflow have become big and active, thus serving the need for a tool to help solve simple and complicated problems. This would imply that the forum is largely obsolete, assuming that the external channels cover the same areas as those used on a daily basis by the employees of Company A.

What about the chaotic and complex problems? When the forum was first introduced, Company A was much smaller and as such, a natural way for the employees to become acquainted would be through real life activities such as department conferences. However, as the company grew, this became increasingly hard. Three of the traits recommended by Hansen et al. [15] for a personalization strategy are:

- Develop networks for linking people so that tacit knowledge can be shared.
- Reward people for directly sharing knowledge with others.
- Invest moderately in IT. The goal is to facilitate conversations and the exchange of tacit knowledge.

These traits correlate very well to how Company A uses and perceives Socialcast. Because of this, the change from the forum to Socialcast was a natural one to facilitate an increase in the amount of employees while maintaining a high level of competence and problem-solving potential throughout the company. The questionnaire reply from Person 4 pointed to the fact that once a particular individual had been found, contact was typically initiated by way of phone or mail. With the way Socialcast is used, finding the right individual(s) is easier than it used to be when the forum was active.

Chapter 5 – Conclusion and Lessons Learned

This chapter will detail the conclusion of this study, as well as outline its implications for practice and further research.

5.1 – Conclusion

The problems described in this section are all described in the context of the Cynefin framework.

Today's IT consultants experience a variety of technologies, methodologies and customer relationships across the various projects they work on. This heterogeneous situation means that an IT consultant will continuously encounter new problems of varying domains.

5.1.1 - Context, Problem and Domains

A problem can simultaneously exist in multiple domains. The domain of a problem depends on the context it is in. A problem that is chaotic for one customer may be complex for another as discussions with experts have provided a clear problem description and desirable solution traits. The knowledge involved here will largely be tacit, as the problem has been reduced by ways of context analysis, which will be unique and impossible to codify and re-use in another context. However, if somebody participated in the reduction of a problem from chaotic to complex, they will likely be able to contribute to the same problem in another context, which may still be chaotic. Effectively reducing a problem from chaotic to complex is part of solving the problem. In the heterogeneous situations IT consultants experience, these situations are bound to occur quite often.

5.1.2 – Knowledge Management Strategy

Considering that external channels are so effective for solving simple and complicated questions, the primary need for an internal knowledge management tool for Company A should align with a personalization strategy. Chaotic and complex problems continuously arise and Socialcast is a tool which effectively serves to aid a personalization strategy. Coupled with its use, which this study has confirmed matches the traits elicited in 2.4, Socialcast helps Company A to deal with unordered problems in a better way. In particular, the reduced thresholds for use, the 'like' functionality and the informal culture help people communicate more and better.

5.1.3 – Research Questions Answers

Having evaluated the trends and data presented in the results, the research questions will be answered.

- **RQ1. How did the change from an online discussion forum to Socialcast impact the information flow between employees in Company A?**

More people are interacting than before. The total post activity is higher than before. There are fewer contributors who participate per message than before and there are fewer replies per message than before. However, since there is an overall higher activity, the increase in messages is even bigger than the general activity increase.

Socialcast is more informal than the forum used to be and people perceive the posting threshold to be lowered. This is an important fact which contributes to more people being active, but it also means that people can more easily understand and become a part of the company culture. Furthermore, increased activity means that it is easier to get to know people, at least partially, from solely discussing with them online. Because of this, making contact in a real life social situation will be easier and is likely to occur more frequent.

The personal feel of Socialcast, which is achieved partly by its functionality such as the 'like' function and partly by the way Company A employees use it (such as having a profile picture policy) makes it an integrated extension of the company culture.

- **RQ2. Is Socialcast a better knowledge management tool for Company A than an online discussion forum? By better, this study means how well the tool is aligned with the optimal knowledge management strategy.**
  - **RQ2.1. If Socialcast is better than a forum, why and how is it better? If not, why not?**

With the drastic improvement of external channels regarding quality, activity and availability, the need for a knowledge management tool to handle ordered problems has been drastically reduced. However, Socialcast seems to be a perfect fit as a personalization strategy tool, which

helps a company spread its tacit knowledge and therefore solve unordered problems easier. A typical unordered problem solving cycle is to find the right person on Socialcast, contact him via mail or phone and meet him in person for discussion. If this can contribute to reducing the problem, for example from chaotic to complex, a partial solution has occurred.

The study concludes that as of today, Socialcast is a better tool for Company A than an online discussion forum would have been.

5.2 – Implications for Practice

In an environment where companies are constantly competing for the best talents, the employees can cherry-pick where they want to work based on salary, terms and perks. Different companies have different visions and ideology and as such, focus on different things. For a company who wants to facilitate informal communication, the focus should be on providing incentives for people who enjoy sharing, learning and participating in discussions. This study has shown how this activity increased by changing from an online discussion forum to Socialcast, which implies that aligning the culture and tools with a personalization strategy accomplishes this goal.

For IT-consultants today, it is quite common to work on several projects within a year. In particular, user experience experts and interaction designers tend to switch projects frequently and can often find themselves working on multiple projects simultaneously. This implies that they experience a lot of different contexts and meet a lot of different people. As far as tacit knowledge is concerned, knowing who to ask is vital. Because of this, getting people who switch projects involved in discussions is important as they can help facilitate the right connections. This study has shown how this occurs more frequently in Company A with Socialcast than it did with the forum. Socialcast provides a number of groups which people can freely join, regardless of their specialties. Even without joining a group, anyone can participate in a discussion which has been posted to that group. The availability of the service, coupled with how easy it is to use as well the low threshold for participating, makes it perfectly suited for interaction across departments and interest groups.

People's perception of a company is usually based on how they interact with it. Typically, big companies can be perceived as corporate and hierarchical. This can be the case for customers as well as employees. In the latter case, this perception effectively creates a barrier for informal communication. If a company wants to avoid this as it grows, its culture and tools need to facilitate a more informal communication. To this end, a tool like Socialcast, coupled with the right culture, can help a company to keep a personal feel as it grows larger. If the company typically solves chaotic or complex problems, Socialcast has the effect of aligning with a personalization strategy.

It is important to remember that the emergence and growth of online services such as StackOverflow help anyone to solve simple problems. This is an important factor, because it largely covers a need which companies previously had to deal with internally, for example by having a knowledge sharing database.

This study points to a single fact from various points. In a modern IT consultancy company, facilitating more informal communication through company culture and tools is a successful knowledge management strategy.

5.3 – Implications for Research

In the post analysis part of this study, the start post length was analyzed without finding any significant differences between the forum and Socialcast. Considering that a lot of the replies to the questionnaire pointed to the fact that the discussions on the forum were more in-depth, an interesting analysis would be to see if there are significant differences here. It was originally hypothesized that the forum start post length would be bigger, which was proven to be incorrect. However, the discussion itself usually takes place in the replies. Is there a significant difference in the reply length? How big is it?

The nature of the posts was not analyzed, as it was outside the scope of this study. However, with a proper text mining tool or simple manual inspection, a better understanding of how people communicate could be reached. What did people talk about on the forum? What are people talking about on Socialcast? What are the main differences?

This study's conclusion and evaluation have focused on the importance of external services to help solve simple problems. Researching how people use these services, including their activity level, time spent and problems looked up would provide a better understanding of the problems IT consultants face on an everyday basis. This would help analyze the problem distribution, which in turn could help companies decide how to align their knowledge management strategies and assess their dependency on external services.

The availability of Socialcast is one of its important perks as a service. Availability today is almost synonymous with good mobile support. How many people use the mobile interface? How much of the total visits and active participation is performed through the mobile interface? Answering these questions would allow enterprise social network vendors to better tailor their products and focus their efforts where needed. Furthermore, it would provide insight into the mobile habits of IT consultants.

Although this study shows that people interact more across departments and interest groups than before, the specifics are not known. How much interaction takes place across group boundaries? Is any group over- or underrepresented? Researching these questions would reveal who the biggest contributors are with regards to creating networks of networks between employees. This would provide a better understanding of the various roles in IT consultancy companies.

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Appendices

The appendices include the questionnaire and an overview of its replies.

Appendix A – Questionnaire

The questionnaire which was sent out to members of Company A in this study looked as follows:

- How would you define knowledge and knowledge sharing?
- When and how do you share your knowledge with others in Company A?
- In your opinion, what are essential characteristics of tools used for simplifying knowledge sharing?
- What did you gain from the online forum? Please state details on valuable functionalities and insufficiencies of the forum.
- What do you gain from Socialcast? Please state details on valuable functionalities and insufficiencies of Socialcast.
- In your opinion, are there any major differences in sharing knowledge through the forum compared to Socialcast? If yes, what are the differences and why?
- How do you use Socialcast to support and encourage your team members?
- To what extent do you use Socialcast to give people positive feedback?

Appendix B – Questionnaire Replies

The following is a summary of the seven replies which were received:

Person 1

- Knowledge is a combination of background knowledge and novel knowledge
    - o Novel knowledge is more frequently the type that is shared, as people can read up on background knowledge on their own.
- Shares knowledge through interest groups and related work primarily.
- Essential characteristics for a knowledge sharing tool are that it is fun and useful to use.
- The forum had more formal discussions whereas Socialcast is more informal. The modern format of Socialcast is appreciated. Points to Google and StackOverflow as typical services used for asking a specific question.

- Uses the 'like' button.

Person 2

- Participates in knowledge sharing primarily through digital discussions and presentations.
- Good search capabilities, filtering options, look and feel, mobile support and easy to use are important features for a knowledge sharing tool.
- Search, quote-functionality and code-formatting were positive features from the forum. Lacked mobile support. Socialcast gives a broader insight to what the rest of the employees in Company A are doing, humor and work are mixed and the mobile support is good. Thinks Socialcast is good for social interaction and it is a good tool to give people credit for their work. Socialcast lacks structure such as headings for posts and text formatting as well as having a poor search.
- Thinks the forum was more of a competence store whereas Socialcast is "more of a social site giving you a constant stream of information".
- Uses Socialcast less than the forum was used.
- Mentions people on Socialcast when they have done cool things on a project.

Person 3

- Uses Socialcast primarily during breaks or while surfing the web and something interesting comes up.
- Points to easy to use, easy to find, easy to give feedback and tagging as essential characteristics of a knowledge sharing tool. Also feels that correct personal information such as name and picture is vital, instead of having a nickname and picture of a favorite football player.
- The forum was fast with lots of activity between a few people, but lacked personal interaction such as a 'like' button, was clumsier to navigate and did not look very nice.
- Socialcast looks good, feels more personal and involves more people in the company. Can be messy, slow and lacks code highlighting.

- More people joining in and increased personal interaction such as tagging are vital differences.
- Actively tags people and gives them credit for a job well done.

Person 4

- Thinks of knowledge as having a skill or understanding a subject. For knowledge sharing, it is critical that people have the confidence to open up and ask a question which could reveal the fact that they know nothing about the topic.
- Mostly shares knowledge on a face to face basis instead of online.
- Availability, easy to use and easy to navigate are essential characteristics for knowledge sharing tools.
- The forum had more in-depth discussions and longer posts were easier to read and write. Thinks the forum fit well because Company A had fewer employees when the forum was active.
- Socialcast provides a broader knowledge of who does what. Easy to stay up to date on who knows what, so that when a problem arises it is easy to find the right people to ask. Typically uses mail or phone to contact them, once they have been found by Socialcast.
- Finds that more people are active on Socialcast and believes it is easier to start contributing for new employees. Easier to start a discussion with someone you do not know.
- Credits people on Socialcast by posting replies like "well done on the blogpost".

Person 5

- Primarily shares knowledge with the development team on a day to day basis. Uses Socialcast for complex questions which cannot be solved within the team, as well as posting interesting technology articles.
- Points to "simplicity over tooling" as an essential characteristic for a knowledge sharing tool and elaborates that if the tool makes it feel like an effort to share, another channel will likely be chosen instead. A sharing tool should also be informal.
- The forum was easy to use and provided a decent overview, however it required "quite a lot of effort to participate".
- Socialcast is simply more modern. The format with streams, groups, tags and likes work well.

Person 6

- Thinks of knowledge and knowledge sharing in the context of being a consultant as follows:
    o Knowledge is knowing how to solve a particular problem or knowing how to acquire necessary knowledge
    o Knowledge sharing is having the collective knowledge in a company available for everyone
- Shares knowledge through a plethora of channels, both online and face to face. Thinks there is a very low threshold for asking a question in Company A.
- Essential characteristics for a knowledge sharing tools include having a low threshold for asking questions and availability for everyone. Points to the fact that the company culture is the most important part, not the tool.
- The forum had in-depth discussions, however these implicitly raised the threshold for asking questions. Thinks low transparency, such as lacking a live stream, might have been a factor as to why the various departments did not share externally, but only internally.
- Socialcast has a very low threshold for posting a question or comment and an even lower threshold for pressing 'like'. High transparency through the streams. Lacks code formatting options. Socialcast lets people stay up to date on what others are doing in Company A.
- More activity on Socialcast and in particular across departments and social areas.
- Uses 'like' a lot and gives positive feedback to interest group members who have finished their tasks.

Person 7

- Knowledge is a combination of knowing facts and analyzing them in order to accomplish something.
- Having a tool which makes it easy to share and discuss is vital. It becomes part of a daily routine instead of something which is used only when a problem occurs.
- The forum was nice for simple questions and answers problems. Code formatting was nice and there was an active, stable base of members contributing.

- Socialcast has a variety of post types, such as sharing information and discussing something rather than Q&A style problems. More informal talk and dynamic layout makes it easy to spot new posts, but also means one can miss out on something if the activity is high.
- Uses the 'like' feature a lot.