Will the real IT cost please stand up?

- How firms identify and allocate IT cost

Preface

I would like to thank the people who in different ways contributed to this paper. First and foremost, I want to say a big thank you to all respondents who devoted their time to convey imperative knowledge to my study.

The subject was partly selected due to my own interest and in relation to what was desired from my principal Knowit IT Strategy. I would like to show my gratitude to the company partner Tobias Altehed who supported and inspired me during the research process.

I would also like to thank my supervisor Johan Magnusson for the constructive criticism and motivation he has given me throughout the research.

Gothenburg, May 28, 2014

_____
        Patrik Petersson

Abstract

Thesis in business administration, Gothenburg School of Business and Law, Management Accounting, Bachelor thesis, VT 14

Author: Patrik Petersson
Supervisor: Johan Magnusson

Title: Will the real IT cost please stand up? – How firms identify and allocate their IT cost.

Background and problem: Recent research has raised several questions regarding IT costs and benefits that must be addressed (Grover & Kohli, 2012). Carr (2003) argues that firms have spent too much on IT and overestimated the strategic value of IT. Xue et al. (2012) explains the "productivity paradox" of IT investments. Furthermore, the investment made in IT puts increasing pressure on management to justify the outlay by quantifying the business value of IT (Mukhopadhyay, Kekre, & Kalathur, 1995). Barua et al. (1995) states that an important management question is whether the anticipated economic benefits of IT are being realized. Researchers explain that the business value of IT is gained from synergies through cost savings and more flexible business solutions (van den Hoven , 2006; Cho & Shaw, 2009) but research has also highlighted that it is hard for firms to keep control of the IT costs (Brynjolfsson & Hitt , 2000) and it becomes even harder to keep control (Dyche, 2012).

Purpose: The purpose is to contribute to earlier research by answering the following research question: how do firms identify and allocate IT cost?

Methodology: Qualitative research is conducted. An initial literature review was made to establish a conceptual model for the semi-structured interviews. The result was then analysed according to a content analysis approach. Small sequences of the data were analysed at a time to be able to get in depth analysis.

Results and conclusions: There is a clear spread from no classifications of IT costs to several different categories corresponding to strategy and responsibility. There exist differences regarding the identification of direct IT costs throughout the firms, but the primary method of identification is made through invoices received. In traditional IT cost models indirect costs are often overlooked. Firms with an innovative IT cost model use several steps and methods for identifying IT costs to specific resources whereas traditional models only identifies such costs when there is an associated invoice. Allocation to cost centres involves several different important aspects to take into account and firms have incentives for increasing the IT cost transparency. A best practice model was developed to assist firms in their work.

Suggestions for future research: Future research may focus on the wider extent of the process of identifying and allocating IT cost. The proposed framework for categorizing firms regarding the maturity level of their IT cost model may provide an avenue for future research to explain differences in IT cost controlling performance.

Keywords: IT costs, identification, allocation, IT cost accounting, information technology.

Table of contents

Table of figures and tables

1. Introduction

Recent research has raised several questions regarding IT costs and benefits that must be addressed (Grover & Kohli, 2012). Carr (2003) argues that firms has spent too much on IT and overestimated the strategic value of IT. Xue et al. (2012) explains that the "productivity paradox" of investments in IT is the ambiguous correlation between IT spending and output increase. This has forced practitioners to increase their efforts in justifying investments in IT. Baker et al. (2008) explains that the question of the underlying link between IS investments and business value still is partly unsolved. Furthermore, the economic relevance of IS has not been identified and explained (Fink, 2011) and the value of IS investments are still questioned by researchers and business executives (Grover & Kohli, 2012).

The investments made in IT put increasing pressure on management to justify the outlay by quantifying the business value of IT (Mukhopadhyay, Kekre, & Kalathur, 1995). Barua et al. (1995) states that an important management question is whether the anticipated economic benefits of IT are being realized. Researchers explain that the business value of IT is gained from synergies through cost savings and more flexible business solutions (van den Hoven , 2006; Cho & Shaw, 2009) but research has highlighted that it is hard for firms to keep control of the IT costs (Brynjolfsson & Hitt , 2000) and it becomes even harder to keep control (Dyche, 2012).

To be able to address recent recognized issues like how much IT delivers in strategic value, how IT investment correlates with the output, to be able to establish the economic relevance of IS, its benefits and cost effectiveness, we need to find out how firms are controlling its IT cost. Thus, the aim of this thesis is to investigate how firms identify and allocate IT cost.

1.1 Purpose

The purpose is to contribute to earlier research by answering the following research question: how do firms identify and allocate IT cost?

1.2 Scope and limitations

The empirical selection is limited to medium and large sized firms. Medium firms are, according to the European Commission, firms with more than 50 employees, has a turnover equal or greater than 10 million euro and a balance sheet that is equal or greater than 10 million euro (European Commission, 2003). Large companies are according to the European Commission those with more than 250 employees, has a turnover equal or greater than 50 million euro and a balance sheet that is equal or greater than 43 million euro (European Commission, 2003).

In this thesis, only identification and allocation of IT costs are considered and not the process of cost identification and allocation. This is due to that the process itself involves a wider context. By focusing the attention solemnly on identification and allocation of IT costs a deeper understanding of this phenomenon is obtained and thus a foundation for future research about the process. Segatto et al. (2013) explains the wider context of business process management. The authors mean that it involves competence of managing and refining the organisation's business processes on an on-going basis. Furthermore, it is an on-going activity that requires performance measurement and it is, consequently, dependent on the alignment of business operations with organisational strategy, use of contemporary techniques and tools,

employee commitment. They highlight the horizontal approach that aims at meeting the client's requests best as imaginable. The roles in the design of the processes are plenty. For example it includes executive leadership, process design specialists, partners and interested third parties, clients, project managers, facilitators and owners of the process. Consequently, the broader perspective that is requested, when involving the process of identifying and allocating IT cost, would not be appropriate for the scope of this research. Instead, this research focus on the how cost is identified when entered the firm, on what ground it is allocated and the consequences of such model.

2. Structural disposition

The first section is the introduction. This section contains the background to the paper, which then culminates into the purpose and the scope and limitations. Then, previous research is presented. The chapter outlines the theories that the author considers to be relevant with the context of the problem statement, purpose and scope and limitations. It acts as a framework for the research. Next chapter is the method. In this chapter the author presents a view of the research process followed by the research design. Advantages and disadvantages of made method choices is described together with the credibility and generalizability of the research. Next, the author presents the results. This chapter outlines the collected empirical data. The empirical research begins with a literature review to create a conceptual model for the interviews. This is followed by interview tabulations and associated summaries. The following chapter presents a discussion of the collected empirical data using previous research. This section discusses how firms identify and allocate IT cost. The discussion is followed by conclusions. This chapter contains the conclusions of the author and suggestions for future research. In the next section, the appendix, the reader will find the interview questions and models produced by the author.

3. Previous Research

3.1 IT cost accounting
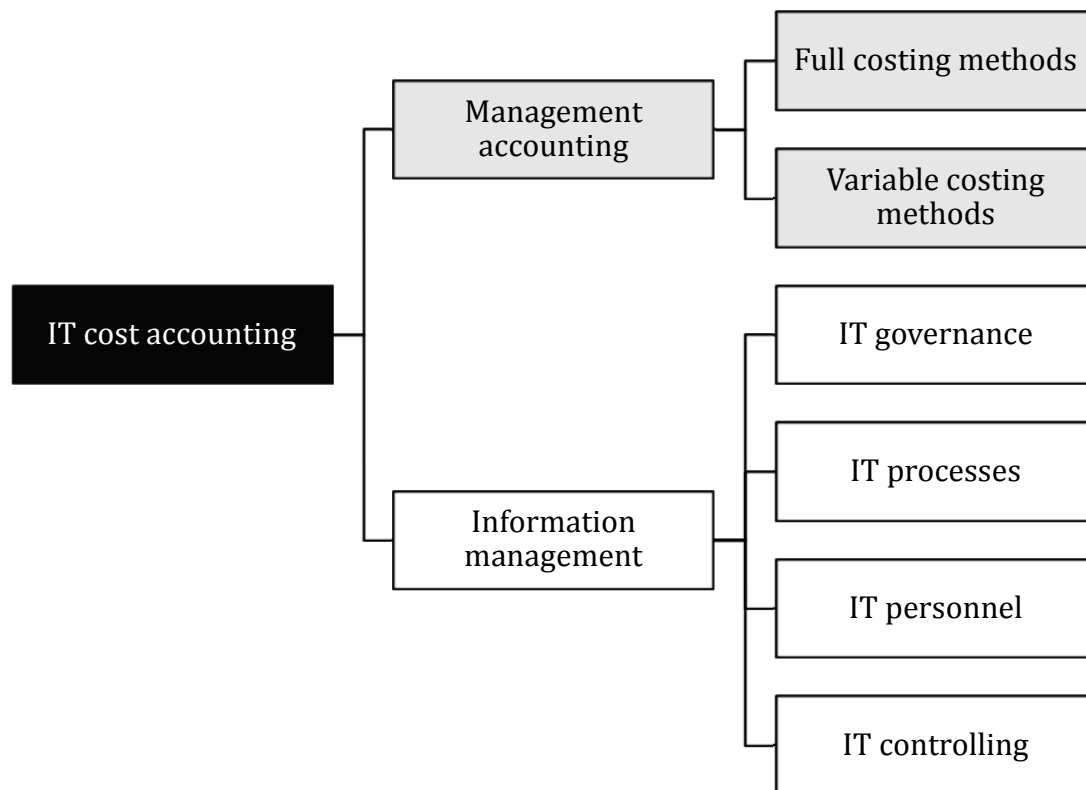
Figure 1: Overview of IT cost accounting. Adapted from (Lee & Mark, 2013; Detlor, 2010; Brandl, 2008; Krcmar, 2004).

Based on previous research (Lee & Mark, 2013; Detlor, 2010; Brandl, 2008; Krcmar, 2004) IT cost accounting can be broken down into management accounting and information management. In the following section this dichotomy will be presented in detail.

3.1.1 Management accounting
Management Accounting supports managers in planning and controlling the business operations (Lee & Mark, 2013). Management accounting addresses the internal needs of an organization such as motivating and assist managers in reaching the organisational objectives in a timely, efficient and effective way. Hutchinson (2013) explains that in contrast to financial accounting, that addresses the needs of external parties, the data needs to be transparent and defensible to internal parties. The main input type for Management Accounting is cost information. Cost accounting, as a part of management accounting, tracks, records and analyses the sources of which costs arise and the management utilizes the reports on costs related to products or activities for management decisions, planning and control (Owen & Law, 2005). Cooper and Kaplan (1991) emphasized how accurate product cost information leads to higher profit and good product mix decisions. However, recent research has found that this there is no definitive correlation between more advanced cost accounting systems and performance (Banker & Bardhan, 2008).

Direct and indirect costs
Cost accounting also involves the categorization of costs into direct and indirect costs. Direct costs arise by and can be directly tracked to a cost object or cost centre. Traditional examples of direct costs are direct wages or direct raw material in production. Indirect costs cannot in contrast to direct costs be directly traced back to a cost object or cost centre. These costs are instead occurred by numerous cost centres or cost objects (Ax, Johansson, & Kullvén, 2009; Love, Ghoneim, & Irani, 2004).

Fixed and variable costs
Costs can then be further organized as either fixed or variable costs. Fixed costs remain constant over a specific period of time whereas variable costs alter in proportion to the operating volume (Ax, Johansson, & Kullvén, 2009).

Costing methods
Costing methods can be divided into full costing methods or variable costing methods (Owen & Law, 2005). Full costing methods such as absorption costing method allocates the indirect costs of an organization to the production by the means of absorption. First, costs are allocated to cost centres, where they are absorbed using absorption rates such as rate per unit, rate per machine hours or a percentage on direct material cost (Owen & Law, 2005). Another full costing method is the activity-based costing (ABC) method. This method recognizes that costs rise by each activity that occurs within an organization and that customer or products should bear costs in line with the activities they use (Kaplan & Atkinson, 1998; Kaplan & Anderson, 2004).

Variable costing methods such as the marginal costing method is a decision-making technique that allocates only the variable manufacturing costs to the cost units. It handles the fixed costs as a lump sum than can be subtracted from the total contribution. Managers will then be able to obtain the profit or loss for the period (Owen & Law, 2005).

Process costing implies that costs are accumulated for the entire production process and that average unit costs of production are calculated at each stage. It uses average costing as a method of obtaining unit costs for items produced that have a high level of similarity. By dividing the total production cost by the number of items produced, the unit cost is attained (ibid).

Service departments
Kaplan and Atkinson (1998) points out that not all cost centres (departments) produce or supply organizational cost objects (output). Service department costs should be allocated to production departments to promote efficiency and cost control. This can be done by 1) giving incentives for performance by the managers of the service department, and 2) motivating careful use of the resources from service departments by the managers of the production departments. Kaplan and Atkinson (1998) also exercises that managers of the consuming departments who are charged for the services on a quality and quantity basis will exercise more control over the consumption of the service resource supplied. The mangers will also develop a cost consciousness and will compare costs of using the internal services with the costs of similar services that can be purchased externally. This internal price transfer should also motivate the mangers to communicate to the service department their desired

quality and quantity level of the services (ibid). Brandl (2008) implies that IT departments are typical service departments and their costs are normally fixed, as they stay constant in regard to the operating volume.

3.1.2 Information management
Along with account management, information management contains managerial functions that are influencing the way organizations work with cost identification and allocation of IT services. These functions can be divided into four different areas IT: governance, processes, personnel and controlling (Detlor, 2010). Krcmar (2004) explains that information management focuses on planning and controlling users' behaviours by cost allocation and chargeback of the usage of information systems. The aim of information management is to ensure the best possible use of resources in regard to the corporate strategy.

3.2 Definition of terms
In this segment concepts with possibly ambiguous meanings are specified. Throughout the paper company is referred to as the organization as whole and business unit a sub-division of the company. IT unit is the business unit in charge of the output IT services. An IT service is a service provided by an IT unit and supports the business processes of one or several customers (ITIL, 2011). Customer is referred to as a business unit that receives an IT service. A user is a person who uses the IT service on a day-to-day basis. An application is software that delivers functions that are required by an IT service. Each application may be a segment of several IT services. An application may run on one or several clients or servers (ITIL, 2011). An application system is thus a combination of several applications. Cost identification refers to the process of identifying actual costs for different IT services. This identification is often built on primary costing methods such as full costing method or variable costing method. Cost allocation is the process of supplying the costs to the business units. Cost recovery refers to the process of charging the business units for their usage of IT services (Blosch, Woolfe, & Grigg, 2003)

3.3 Cost identification and allocation of IT services
In this section the concepts cost identification and cost allocation are discussed in terms of benefits, potential problems and difficulties. Blosch et al. (2003) have recognized several benefits of cost identification. These are that it makes IT unit's costs visible; it enables setting a cost of IT services and it gives the fundamentals for cost control. Eventual problems with cost identification are that costs may be hidden in multiple budgets, there may be a discrepancy between the IT unit accounts and the Finance's and the charts of accounts has a lack of details.

Blosch et al. (ibid) have also identified several advantages with cost allocation such as it enables establishment of the business unit's performance and it improves forecasting and decision-making. The potential drawbacks with cost allocations are that there may be an incongruity over the choice of allocation method and it focuses on costs rather than on value. Barton (2006) argues that due to the variety of IT unit services that can be distributed, it is not easy to measure and thus causes a great challenge for the IT cost accounting and chargeback. Barton provides a map of an IT department, which contains 30 different functions.
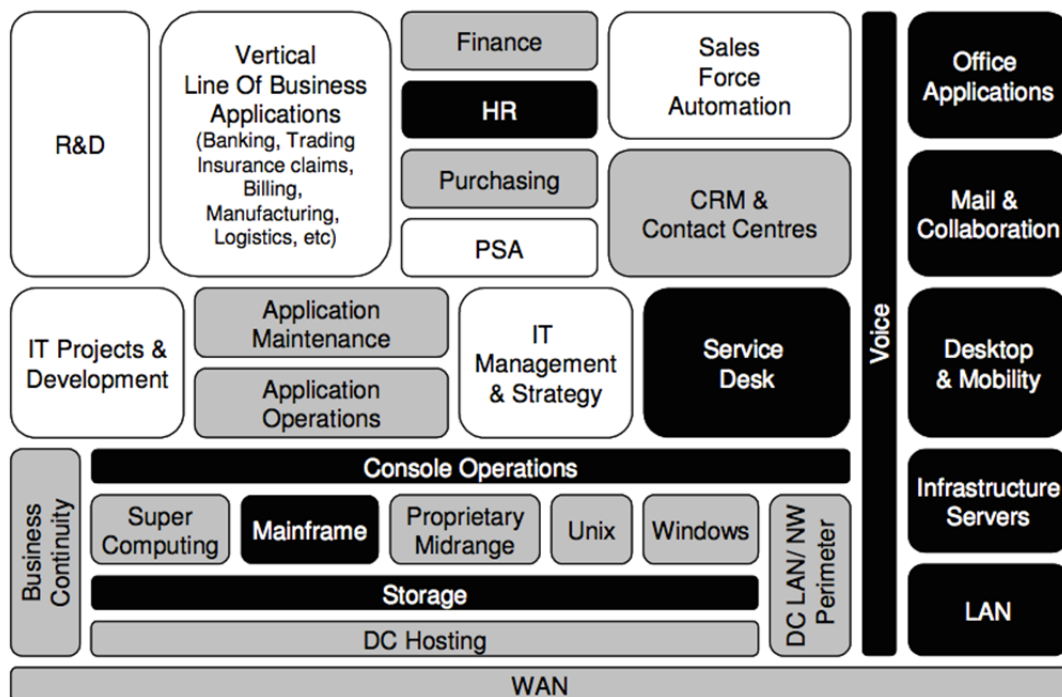
Figure 2: Map over IT department functions (Barton, 2006).

The black areas are functions that are usually evaluated and have a broad industry consensus of metrics. The grey functions are frequently attempted to evaluate but without a satisfactory result. The author explains that this is often due to the fact that there is no consensus of how to measure them or because the cost drivers of these functions are insufficiently comprehended. The white areas are functions that the author has seen few effective ways of benchmarking. He categorizes the black areas as "infrastructure" functions and the other areas as functions of IT with a high strategic effect on the organization.

Brandl (2008) concludes that Desktop-related IT services can be particularly well specified and costs can be allocated to the business units. But, he continues, it is more complex to allocate costs for the provision of central business application systems due to that each application systems has its own infrastructure, application and support requirements, an one instance of the application system can be used simultaneously by several customers. Brandl points out that infrastructure costs are related with a specific capacity level and resource consumption of applications are the main cost driver (ibid). Horngren et al. (2012) explains that allocation of support department costs can either be based on demand/usage, or capacity supply of the service.

3.4 Cost recovery and chargeback of IT systems
Chargeback approaches and processes are designed to directly or indirectly affect organizational objectives and decision-making (Hufnagel & Birnberg, 1989; Bahnub, 2010). Blosch et al. (2003) argues that chargeback is an influential tool of infrastructure controlling. It can influence anticipated behaviour but also lead to investment setbacks, political tensions and biased use of IT services.

Ross et al. (1999) argues that the untapped potential of IT chargeback is an intensive use of chargeback of administrative processes to inspire communication between IT and business. This is done through regular negotiations about rates, services,

communication of total costs and charges. This process supports a mutual understanding of requirements and costs that result in an improved business-IT partnership. Turney (1977) and Perkins (2008) means that the use of chargeback for services between divisions is a necessary method for profit centres where there are transactions between business units. Furthermore, the aim of profit centre control is to motivate business units to perform better and to make it easier to evaluate profit centres' performance. The authors also notes that chargeback should always be cost based and at a proper level of detail if it is to be used for decision-making.

The industry analyst firm Gartner implies that the allocation bases and method (see Table 1) must be customer oriented. They also assume that business managers use four criteria to evaluate governance mechanism of the different methods. These criteria are simplicity, fairness, predictability and controllability. They further argue that selecting a cost allocation method for an IT service depends on three different factors. The first factor is what behaviour to encourage. The second one is the needs of the business units, and third, the administrative abilities of the chargeback group (Blosch, Woolfe, & Grigg, 2003; Gomolski, 2005)

Table 1: The table shows a summary of cost allocation methods. Adapted from Blosch et al. (2003) and Gomolski (2005).

Method	Allocation Base	Areas where suited
Market-based pricing	Per measured unit of service	For distinct, end-to-end services. These are often offered on the market
Negotiated flat rate	Estimated service usage	Project that are well defined
Tiered flat rates	Service accessibility, whether the service is used or not	Application maintenance, help desks or data centres
Measured resource usage	Measured consumption of resources	Telecoms, storage or e-mail
Direct cost	Assigned resource ownership	Assigned projects or application development
Low-level allocation	Specific IT service costs that is based on the size of the user	IT architecture, IT overhead, desktops or strategy
High-level allocation	Overall IT costs that is based on the size of the user	All of IT is included under this level of allocation

Within the accounting literature cost allocation methods are generally accepted to be more accurate. But Zimmerman (2011) argues that cost allocation methods, such as the reciprocal method of service departments, are not often used. Lee and Mark (2013) explain that the contradiction can be explained by the conviction that more accurate cost exists and the researchers are left to contemplate the absurdity of why practitioners are using traditional costing systems.

3.5 IT costs

Brandl (2008) means that IT costs are in some part direct and can be allocated to the departments incurring the costs. Love et al. (2004) explains that the key difficulty related with IT costing is associated to the identification of indirect costs. The authors also points out that the indirect cost often are proportionally larger than the direct costs and that managers often are unaware of these or simply overlooks them to get support from the senior management by reducing the cost portfolio. Love et al. (ibid) have also studied the field of IT/IS cost taxonomies. They have concluded the following classifications:

- Financial/Non-financial activities.
- Initial/On-going costs.
- Direct/Indirect: human and organisational cost.
- IS cost divisions – management, employee, finance and maintenance.
- Initial investment/On-going costs.
- Development/Hidden costs.
- Social subsystem costs.
- Acquisition/Administration: control and operations costs.

Love et al. (ibid) argues that management time is one large share of indirect costs followed by cost for training employees to developing new skills and revised pay scales and benefit packages to be able to retain employees. Mohamed and Irani (2002) have developed a two-tier system for classifying indirect human costs. First tier is consisting of management, employee, financial and maintenance. The second tier recognises indirect costs components with a number of cost classifications.

Table 2: Table of first and second tiers in classifying indirect costs. Adapted from Love et al. (2004).

First tier	Second tier
Management	Time
Employee	Learning
Financial	Costs of resistance
Maintenance	Effort and dedication
	Cost of redefining roles
	Missed-costs
	Reduction in knowledge base
	Moral hazard
	Deskilling

Love et al. (2004) have developed a conceptual framework for indirect cost identification. They concluded that indirect cost components consist of the following:

Table 3: Indirect cost components. Adapted from Love et al. (2004).

Indirect cost components	
Loss of Productivity	Disruption
Staff turnover	De-skilling

Redundancy	Salary changes
Resistance	Role redesign
Moral hazard	Learning
Integration	Time

Brandl (2008) points out that even if indirect costs are identified and allocated, the problem lies in finding the appropriate allocation keys such as per revenue share, per employee or per usage. The author also conclude that a random apportion base may lead to biased product costs and management decisions.

4. Method

4.1 The research process
The research was conducted in the following steps:
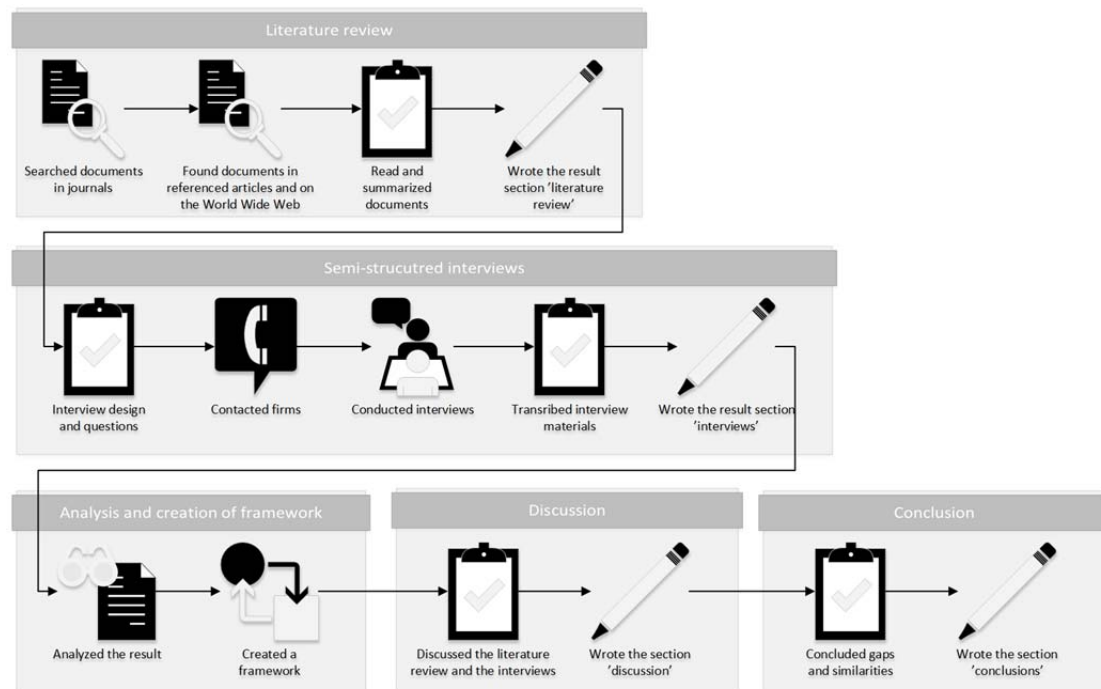
Figure 3: The research process.

To be able to establish the charge-d'affairs within research, the research began with a literature review. The study was conducted by a selection of available documents on the topic IT cost identification and allocation. The documents contained information, data, evidence and ideas written from the viewpoint of critical analyses of one or several approaches of the topic. The documents were mostly found by searches in eight information system journals. The Senior Scholar's subjectively selected the journals, which also have ranked them as the top eight information system journals (Venkatesh, 2010). Earlier work was also found by reading referenced articles in the literature and searches on the Internet (see chapter 4.4).

As second step, an empirical selection was made (see chapter 4.3) followed by semi-structured interviews conducted with key stakeholders of IT. The duration of each interview was roughly one hour. Each interview was carried out on a one-to-one basis

(see chapter 4.4). Each interview was recorded and key words were written down. This approach was selected since it increases the reliability due to the fact that the author can return to the collected data during the research. Then the interviews were transcribed, translated into English and the content separated into different topics.

The collected data was analysed by starting with a close inspection of the data. Next, small sequences of the data were analysed at a time to be able to get in depth analysis. Instead of analysing small fragments of the interviews, the author focused on sequences to be able to retain any indications to other parts in the discussion. From this point, provisional hypotheses were being created. Throughout the analysis these hypotheses were challenged and possibly revised. Then, noteworthy subjects in the interviews were being associated with the findings of the literature study to be able to assess similarities and gaps (see chapter 4.5). The findings of the literature review and the empirical result of the interviews were then connected and formed the basis for the final discussion and conclusions.

4.2 Research design

Silverman (2011) explains that strength of qualitative research is that it uses natural data to find the sequences in the participants' sayings. This enables the researcher to find the 'how' and 'what' in the participants' meanings. Having established this phenomenon, the researcher can continue to answer 'why' questions by examining the wider context. Considering that quantitative research is unable to assess the 'how' and 'what' in the participants' meanings, and that these findings play a key role in assessing how firms identify and allocate IT costs, the performed research is having a qualitative approach. Furthermore, descriptive qualitative research is aimed at obtaining unparsed descriptions where the researcher's goal is to interpret the results (Kvale, 1997). Thus, the descriptive approach is considered in this research since this study wishes to investigate how firms identify and allocate IT costs. It is not the interviewer's intention to encourage the respondent to analyse its own operations.

The purpose of interviews is to describe and understand the central subjects that the respondent perceive and relate to. In relation to this, a qualitative survey of semi-structured interviews is being made where it is spoken about the topic (Kvale, 1997). This is regarded as the most appropriate choice of method since it gives a depth of details in relation to quantitative survey methods.

4.3 Empirical selection

Kvale (1997) explains that in interview studies it is common that the number of respondents is 15±10. This number changes in relation to the amount of time and available resources. In this research ten respondents were interviewed, being key stakeholders of IT in Swedish firms. The industrial fields of the firms are financial institutions, telecom, insurance, energy, supplier and retail. The empirical selection is limited to medium and large sized firms (see definition above). Seven large firms and three medium sized firms were selected. This division of firms makes it possible to put medium and large firms against another regarding how the firms identify and allocate IT costs. The principal mediated two firms; one firm was selected through a personal contact; the other seven firms were selected on a random basis through the Orbis database with the search criterion 'Swedish firms', '> 250 employees', 'turnover ≥ 50 million' and 'balance sheet ≥ 43 million'.

4.4 Data collection

Literature review

Searches in eight IS journals resulted in documents for the literature review. Search words that was used was 'information technology cost identification', 'information technology cost allocation', 'information systems cost identification', 'information systems cost allocation' and 'IT cost accounting'. In total 20 documents were selected, reviewed and summarized. Three key areas were identified in the literature review: IT cost accounting in general, identification of IT costs and allocation of IT costs.

Interviews

A total of ten interviews were conducted with key stakeholders of IT at ten different firms. The interviews lasted approximately one hour and were based on an interview guide with 13 semi-structured questions (see Appendix A). The questions treated the three areas identified in the literature review. During the interview notes were taken and all of the interviews were recorded and transcribed.

4.5 Method of analysis

Literature review

The literature was analysed using a grounded theory approach where inductive theories where developed from the collected data and checked against subsequently interviews (Silverman, 2011). The purpose of the analysis was to create a conceptual model and apply it to the succeeding semi-structured interviews.

Interviews

The collected data was analysed according to a content analysis approach (Silverman, 2011). The first step was a close inspection of the data where the researcher read the transcribed material and made notes. Small sequences of the data were analysed at a time to be able to get in depth analysis. Then the material was categorized and analysed together with the conceptual model concluded in the literature review.

4.6 Categorization of firms

A framework was created based on the literature and interviews to be able to categorize firms regarding their IT cost model maturity level.
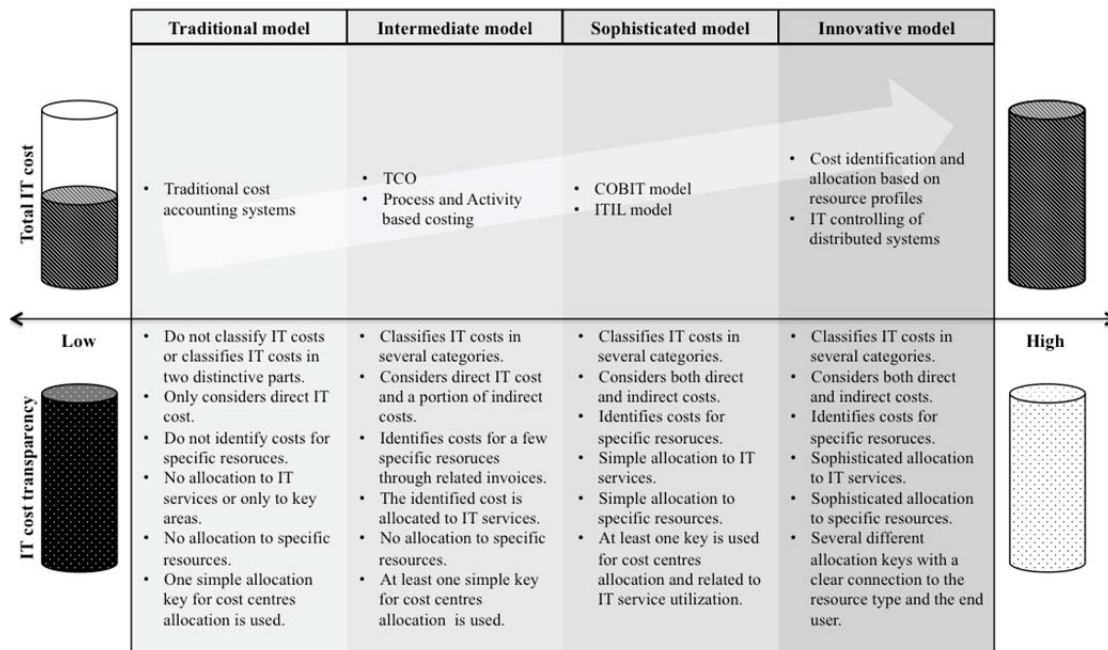

Traditional model	Intermediate model	Sophisticated model	Innovative model
• Traditional cost accounting systems	• TCO • Process and Activity based costing	• COBIT model • ITIL model	• Cost identification and allocation based on resource profiles • IT controlling of distributed systems
• Do not classify IT costs or classifies IT costs in two distinctive parts. • Only considers direct IT cost. • Do not identify costs for specific resources. • No allocation to IT services or only to key areas. • No allocation to specific resources. • One simple allocation key for cost centres allocation is used.	• Classifies IT costs in several categories. • Considers direct IT cost and a portion of indirect costs. • Identifies costs for a few specific resources through related invoices. • The identified cost is allocated to IT services. • No allocation to specific resources. • At least one simple key for cost centres allocation is used.	• Classifies IT costs in several categories. • Considers both direct and indirect costs. • Identifies costs for specific resources. • Simple allocation to IT services. • Simple allocation to specific resources. • At least one key is used for cost centres allocation and related to IT service utilization.	• Classifies IT costs in several categories. • Considers both direct and indirect costs. • Identifies costs for specific resources. • Sophisticated allocation to IT services. • Sophisticated allocation to specific resources. • Several different allocation keys with a clear connection to the resource type and the end user.

Figure 4: Firm IT cost model categorization framework.

Firms were categorized in four different categories according to their maturity level of six identified criteria. These criteria are IT cost classification, consideration of direct and indirect IT cost, cost identification for specific IT resources, allocation of cost to IT services, allocation of cost to specific IT resources and allocation to cost centres.

4.7 Credibility and generalizability

Silverman (2011) lists criteria that research must satisfy in order to be regarded as credible. The first one is that the study should be based upon existing knowledge. To increase credibility regarding this criterion, an initial literature study was conducted. The second criterion is that the study must contain a clearly articulated connection between data and theory. Here, the author has separate areas in the thesis for data and theory so that the reader easily can separate them apart. In the discussion, the author follows a system of presenting data, applying theory and then a discussion. Next criterion involves a description and explanation of case selection. This description and explanation is presented under the method section. The fourth criterion to increase credibility is to pay attention to alternative explanations and negative cases. Regarding this, criticism about the identification and allocation of IT costs given by researchers is presented as a part of the literature study. Another criterion is to provide detailed and clear descriptions of both data collection and data analysis techniques. This is presented in the research process section. Furthermore, to increase credibility the researcher should also describe the intellectual, social and political significance of the research. This matter is addressed during the introduction as a way of justifying this research. The researcher should also discuss significance or generalizability beyond the selected cases. The author of this thesis discusses generalizability in detail next. The last credibility criterion is to predict potential reviewer objections and specify the limitations of the research. Such matters are discussed under method criticism.

18

After considering the above issues of qualitative research the next thing is to assess the generalizability of the study. Silverman (2011) argues that small qualitative samples can produce important insights since it studies the processes rather than the facts. Furhtermore, studies show that it is possible to generalize through a single case study (Hillebrand, Kok, and Biemans, 2001; Modell, 2005). Thus, the author argues that the research explores in-depth the related dimensions of identification and allocation of IT costs. In contrast, such dimensions are often overseen in large quantitative research. Furthermore, in line with Hillebrand et al. and Modell, the author points out that this research can be generalized into for example other fields and industires.

5. Results
The research is performed in two stages where the literature review provides a conceptual model for the subsequent interviews.

5.1 Literature review

5.1.1 Cost allocation based on resource profiles
Brandl (2008) presents a cost allocation model based on resource profiles. He points out that client/server architectures are predominant in today's data centres, and so his model focuses on this kind of architecture. He also points out that because of their heterogeneous and distributed nature it complicates the determination of usage-based cost shares.

The model differentiates the application systems and operation modes into two categories: 1) online transaction processing (OLTP) and 2) online analytical processing (OLAP). They are then divided into batch and interactive.
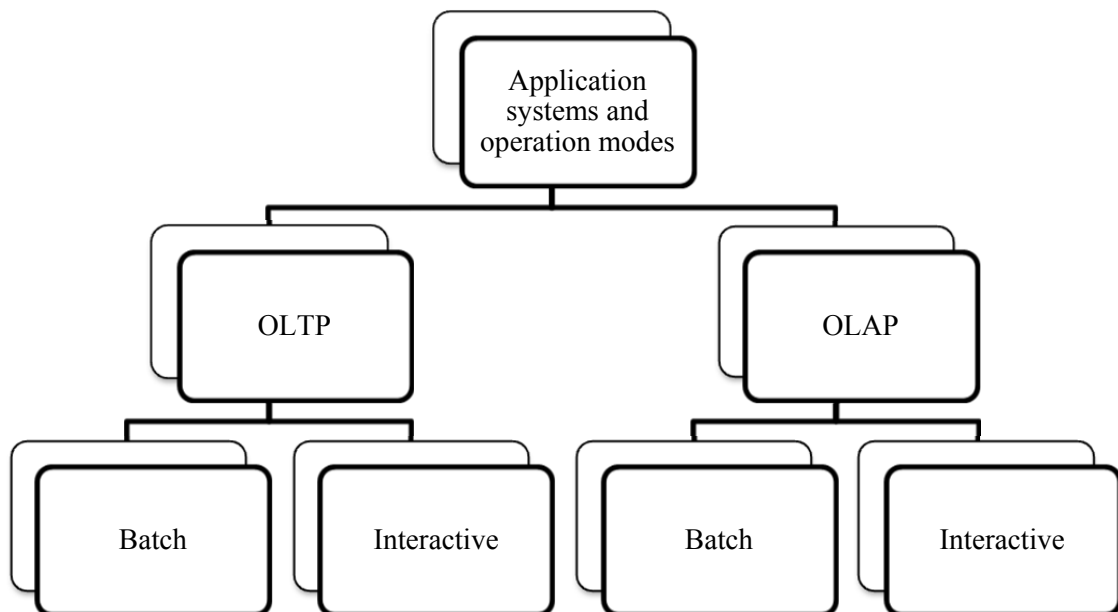

Figure 5: The differentiation of application systems and operation modes. Adapted from Brandl (2008).

The model has a customer point of view on information and communication technology. The users are grouped into business units (internal customers), which use services accessible through user interfaces that in turn are built on backend applications, application systems, software and hardware infrastructure resources. Thus, the model uses services and their usage as a basis for cost allocation (ibid).

Brandl (2008) further explains how to measure the service usage through a resource profile. The usage is measured by the following metrics:

- Communication: Amount of transferred data (bytes).
  This metric focuses on networking and communications equipment.

- Computing: Processing time (seconds).
  This second metric emphases processing time at different servers.

- Storage: Amount of transferred data (blocks).
  This metric excludes disk space because Brandl explains that it is usually allocated a priori to a specific application or a database. He continues clarifying that besides this constraint, the storage input/output (I/O) of database servers is typically a bottleneck in OLTP systems.

The model uses an approach consisting of three steps for apportioning infrastructure costs:

Figure 6: Three steps for apportioning infrastructure costs. Adapted from Brandl (2008).

The model defines cost identification as direct and indirect infrastructure costs that are allocated to the accounts of different resources. These resources are for example UNIX server operations. Each resource has a consumption metric, for example processor time. Then, cost per consumption units (for example processor second) are calculated based either on forecasted or on past consumption levels (Brandl, 2008).

Brandl (2008) explains further that cost allocation to service means that for each service a resource profile, that contains the estimated consumption at the different resources, is determined. The cost shares per service are then calculated by multiplying the cost per consumption unit. The infrastructure costs are then allocated to customers. These customers can either be cost centres (e.g., business units), cost units (e.g., products) or business processes. To arrive at the customer IT service cost, the measured forecasted or estimated number of service invocations are multiplied by the cost shares of the service (ibid).

There are three assumptions in this model. First, the total resource consumption is composed of two elements. 1) The resource composition of background activities and 2) the resource consumption caused by invocations of services. Second, the resource consumption that is caused by service invocations consists of both a load-independent share and a load-dependent share. The last assumption is that the cumulated resource consumption of a service rises linearly with the number of simultaneous or subsequent service invocations (ibid).
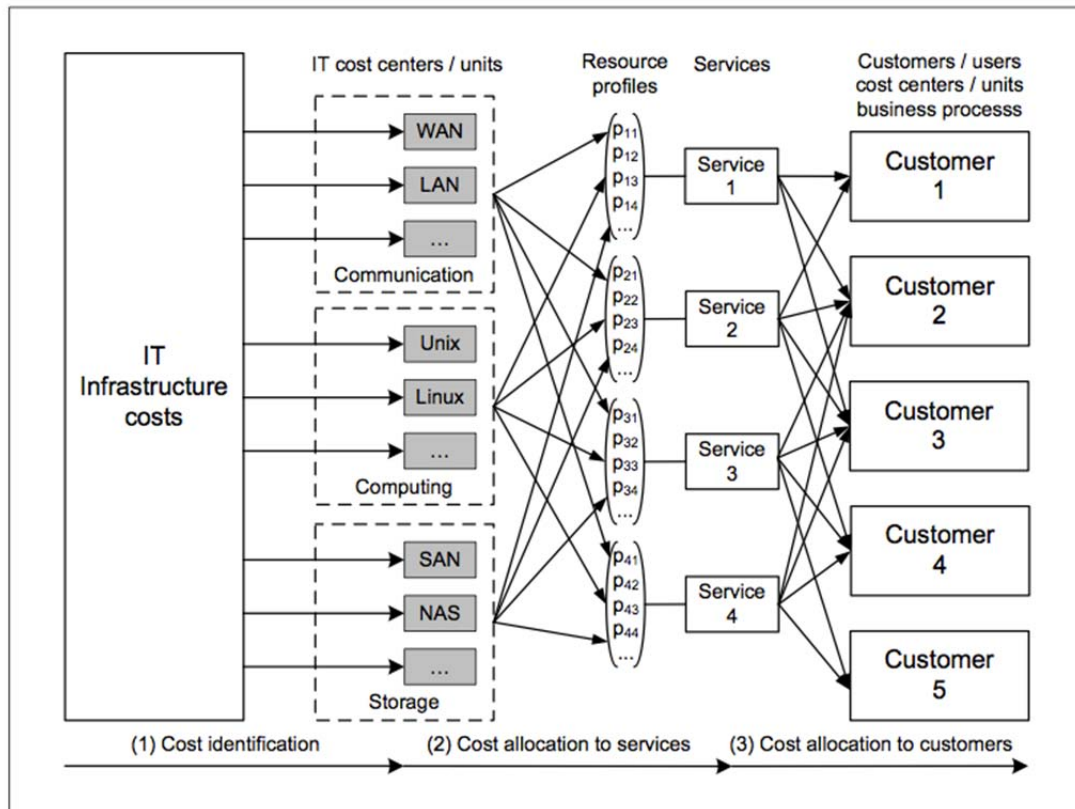
Figure 7: Cost allocation by services and resource profiles (Brandl, 2008).

The drawback with this model is that there are several processes that cannot be controlled that increase the resource consumption. This occurs eventhough the users do not utilize the service. This uncontrolled consumption is the resource consumption of the background activities. For obvious reasons, this biases the allocation and the author cannot establish how much this resource consumption is relative the total resource consumption.

5.1.2 IT controlling of distributed systems

This model is founded on technical metrics of IT cost allocation of shared infrastructures. Business process support services (IT services) and performance benchmarks could be used to allocate the operations costs to the resource users. The drawbacks with such a model is that it is not oriented around the customer which means that it does not take into account their metric such as quality of service or required capacity. To overcome this problem, managers should use cost tables that include both operational and investment costs. Thus, they should be able to estimate the required capacity and resource costs for several alternatives (Brandl, 2008).

5.1.3 Information technology infrastructure library (ITIL) model

For allocating costs of shared resources this model recommends determining, during the annual planning, standard unit costs per IT resource (per processor time, per stored GB). The cost centres' expenditures are then observed and determined each month. The model claims that only an absence of information should make chargeback to be based solemnly on the utilization of resources (Office of Government Commerce, ed. 2001). The drawback with this model is that it requires high measurement efforts and the benefits of such a measurement process must be weighted against the benefit (Brandl, 2008).

Control objectives for information and related technology (COBIT) model
This model is based on a framework to be used in IT governance and audit practices. It defines four objectives (IT Governance Institute, ed. 2005):

Table 4: The four objectives of the COBIT model. Adapted from IT Governance Institute (IT Governance Institute, ed. 2005).

Objective	Description
Definition of services	Identification of all IT costs and assesses them to specific IT services in order to develop a transparent cost model. The services should be in line with business processes so that it is possible to identify related service billing levels.
IT Accounting	The objective is to capture and allocate actual costs in line with previous cost model. Differences between actual and forecasted costs should be analysed.
Cost modelling and chargeback	Based on the definition of services, define a cost model that includes direct and indirect costs of the services. The model must also support the calculations of chargeback rates per service.
Cost model maintenance	To maintain model relevance it should be regularly be reviewed and benchmarked to assess the appropriateness of cost and chargeback levels in regard to the evolving IT activities.

5.1.4 Process and activity-based costing model

Miller and Vollmann (1985) first introduced the activity-based costing (ABC) approach in 1985 and Johnson and Kaplan (1987) then revisited it in their work *relevance lost* in 1987. Horváth and Reinhold (1989) introduced their operationalized activity-based costing and adapted this to the process costing method.

Bahnub (2010) means that fixed overhead costs are traditionally not allocated or apportioned between the cost centres. Gerlach, et al. (2002) states, in line with previous author, that overhead costs are traditionally either wrongly absorbed by IT departments or equally charged out to the business units without taking their individual consumption into account. If the company is predominated by overhead costs then the per-unit cost is probable to be biased (Brandl, 2008) and will lead to

suboptimal organizational performance (Gerlach, Neumann, Moldauer, Argo, & Frisby, 2002). Bahnub (2010) argues that a possible solution to this problem is the Activity-based costing (ABC) approach.

Overhead costs are first allocated to the activities (processes) which actually cause the costs and then, in a second step, to the end-products depending on their usage of these activities (processes) (Horváth & Reinhold, 1989; Gerlach, Neumann, Moldauer, Argo, & Frisby, 2002; Bahnub, 2010). Although, the concept was first developed as a costing model for production environments with physical goods (Hutchinson, 2013), several authors have proposed a way of applying this method to data centres (Gerlach, Neumann, Moldauer, Argo, & Frisby, 2002; Bahnub, 2010).

Activity-based costing of IT services
Cooper and Kaplan presented ABC, in the management literature, as alternative method compared to traditional costing systems. This method quickly became a popular focus for consultants and researchers (Lee & Mark, 2013; Kaplan & Atkinson, 1998). Gerlach et al. (2002) and Bahnub (2010) explains that the ABC approach to costing IT services identifies how resources are consumed by the IT division different support activities. First, the approach identifies major IT division groups and then maps the general ledger costs through common activities that support the IT services.

The first step in ABC is to allocate cost of resources to the different activities. The second step is to assign activity costs to cost objects (IT services). Gerlach et al. (ibid) means that the critical decision in the ABC model is to define the activities at an appropriate level of detail. They further explain that detailed activity modelling is needed for operations planning and process improvement though other more general activity models are enough for cost management.

In their work with ABC model cost drivers for labour were determined by each employee's monthly duties, based on the percentage of time each employee directs toward each of the activities. Instead of using resource-consumption drivers for the activities that consumes hardware, software and physical space the authors assigned these non-dedicated resources to the activities using labour's activity drivers. This allocation assumes that the IT division's general usage of these resources is proportionally spread across the different cost objects (Gerlach, Neumann, Moldauer, Argo, & Frisby, 2002). Then activity drivers for cost object are assigned. The authors emphasizes that meaningful activity drivers are founded on an understanding of what factors would cause activity costs to rise considerably. The driver should capture both the frequency of an activity and its intensity. The ABC assignment of each cost object is then calculated by adding each of the matrices of activity drivers to the activity costs. Finally, the direct allocation and the ABC allocation are summed to be able to compute the total cost for each cost object. The cost object now represents the total cost of providing that service. Chargeback methods can ultimately be used to collect and cover the cost (ibid).
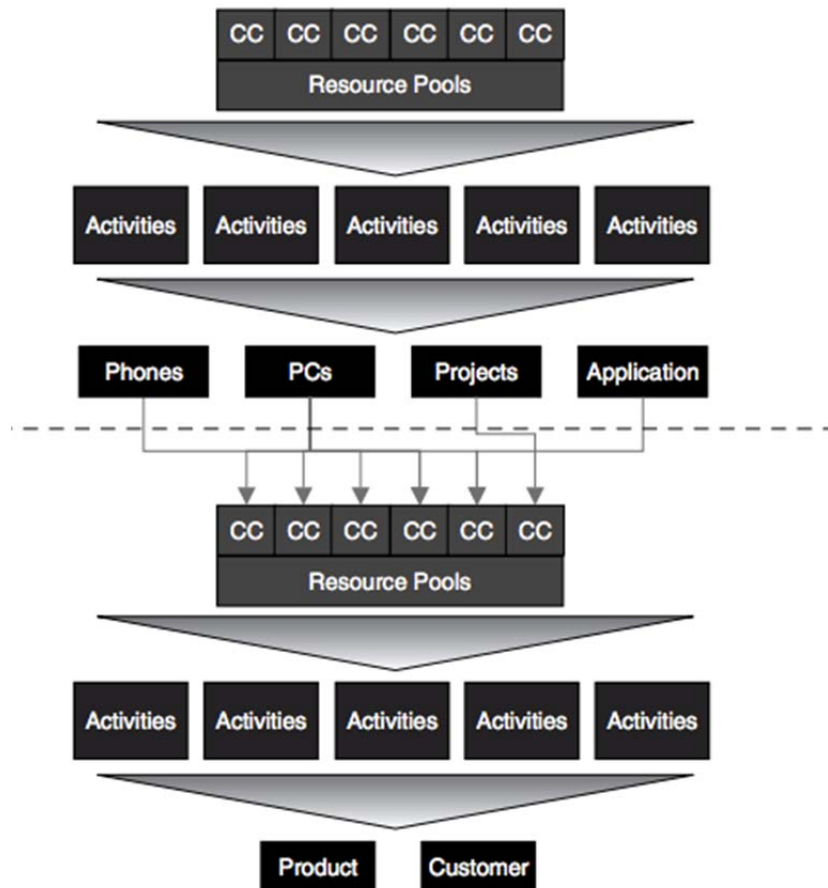
Figure 8: Shows the ABC application assignment – applications as resources (Bahnub, 2010).

Process ABC on shared data centre infrastructures
Fürer (1994) has an additional approach to the ABC model. He first used data centre services that are divided into three activity centres (Output, Processing, Storage). Secondly, he analyses the workload and the scarce resources to be able to detect potential bottlenecks. After that he assigns each activity centre one cost driver. For example processing: number of I/O operations, storage: size of attributed space, output: amount of printed pages.

Fürer (ibid) uses the total budgeted operating costs for an activity centre divided by the forecasted usage and gets a cost share per cost driver unit, for example costs per printed page. The author then divides applications into transactions that he considers as business sub-processes. For each transaction, he determines the average number of consumption units of the cost-driving resource by analysing historical data. He derives cost shares per transaction and, by measured or forecasted amounts, the total costs for business processes.

Adversity factors for ABC of IT services
Lee and Mark (2013) explains that the emphasis, from the beginning, was on management decision-making, more precise product cost was always considered as a basis for better decision making. ABC was designed to give more precise information

24

about product costs so that management could concentrate its attention the products and processes with the best influence for increasing profits. In practice, however, few firms have actually implemented ABC, and a large majority of those have later abandoned it (McGowan & Klammer, 1997). Lee and Mark (2013) explains that despite its well-documented tendency to give an inaccurate view of production costs, in practice between 75 and 80% of firms continue to use the legacy costing systems.

Krumwiede and Roth (1997) stresses that many companies have unsuccessfully adopted ABC due to lack of implementation. They explain that ABC is a radical IT innovation and the unique behavioural and political aspects need to be recognized in the implementation stages. Kaplan and Anderson (2004) would later recognize the failure of ABC to really establish itself in firms. This failure was assessed to that it is troublesome to completely and accurately trace all overhead activities to all products. The author argues that this difficulty often leaves large amounts of manufacturing overhead unallocated. However, they claim that ABC will be more precise if properly implemented.

5.1.5 Total cost of ownership of an IT system
The information technology research and advisory company Gartner has defined the total cost of ownership (TCO) as "a comprehensive assessment of information technology (IT) or other costs across enterprise boundaries over time. For IT, TCO includes hardware and software acquisition, management and support, communications, end-user expenses and the opportunity cost of downtime, training and other productivity losses" (Gartner, 2014).

In the context of their article, David, Schuff and St. Louis (2002) defines TCO as "all expenses related to owning and maintaining a personal computer or workstation within an organization". Emight (1999) argues that TCO has been recognized in the information technology field since Bill Kirwin, vice president and research director at Stamford at Gartner Group, first used the model on desktop systems in 1987. He continues pointing out that Gartner is now applying the model on various information technology related objects such as client/server software, LANs, telecommunications, mainframe data centres and so forth.

The model essentially supports companies to determine whether it wins or loses from specific technology implementations. For example, it determines whether an implementation is good or bad by considering the overall impact of the implementation. Cost is the numerator and the denominator might be customer satisfaction, productivity, service or quality levels (ibid). TCO is not a static measurement or an absolute value, but rather a method for analysing several scenarios. It is argued that the more scenarios that is analysed, the better strategically results will be acquired (Dalrymple & Kelly, 2003).

In the TCO model costs are typically broken down into categories such as acquisition costs, control costs and operations costs (David, Schuff, & St. Louis, 2002) or capital cost, technical support, administration and end-user operations (Emigh, 1999).

Table 5: Example of TCO cost factors. Adapted from David et al. (2002).

Cost category	Cost factor

Acquisition costs	Hardware
	Software
Control costs	Centralization
	Standardization
	Support
	Evaluation
	Installation/upgrade
	Training
Operations costs	Downtime
	Futz
	Auditing
	Virus
	Power consumption

David et al. (2002) points out that centralization and standardization are two complementary ways of reducing TCO. The authors call this the "TCO trade-off" and claim that a successful investment in centralization and standardization (infrastructure, user buy-in, IT planning) reduces the TCO and at the same time increases the service level. The authors argue that the costs associated with the following activities are reduced with this strategy: support, evaluation of new software, application control, training, futz and auditing. Although there are several uncertain service level benefits, the authors notes that the degree to which the costs and service level is affected, depends on how well the implementation of centralized policy and homogeneity is executed.

A company can measure the level of which a policy of greater control might work by assessing its own infrastructure, level of user buy-in, and level of IT planning. In summary, for a company to be able to simultaneously reduce costs and maintain or increase service levels, they must carefully assess their network infrastructure, obtain user buy-in, and develop a comprehensive implementation strategy (ibid).

Drawbacks with TCO of an IT system
According to a study by Forrester Research Inc. 78 % of all IT administrators admits that they cannot document wether or not desktop costs are increasing since they do not track TCO (Emigh, 1999). David et al. (2002) argues that reducing TCO can negatively affect IT service levels since IT costs are considered to be directly proportional to IT service levels. The authors points out that in order to maximize the value of IT expenditures, companies needs to, at the same rate, reduce their TCO and retain or increase IT service levels. Brandl (2008) points out that the TCO of an application system develops questions about appropriate allocation keys for shared infrastructure resources with multiple application systems. The author points out that in contrast to costs for application support and maintenance that uses cost drivers such as per change request or per help-desk call, the infrastructure cost drivers are associated with the resource consumption of applications.
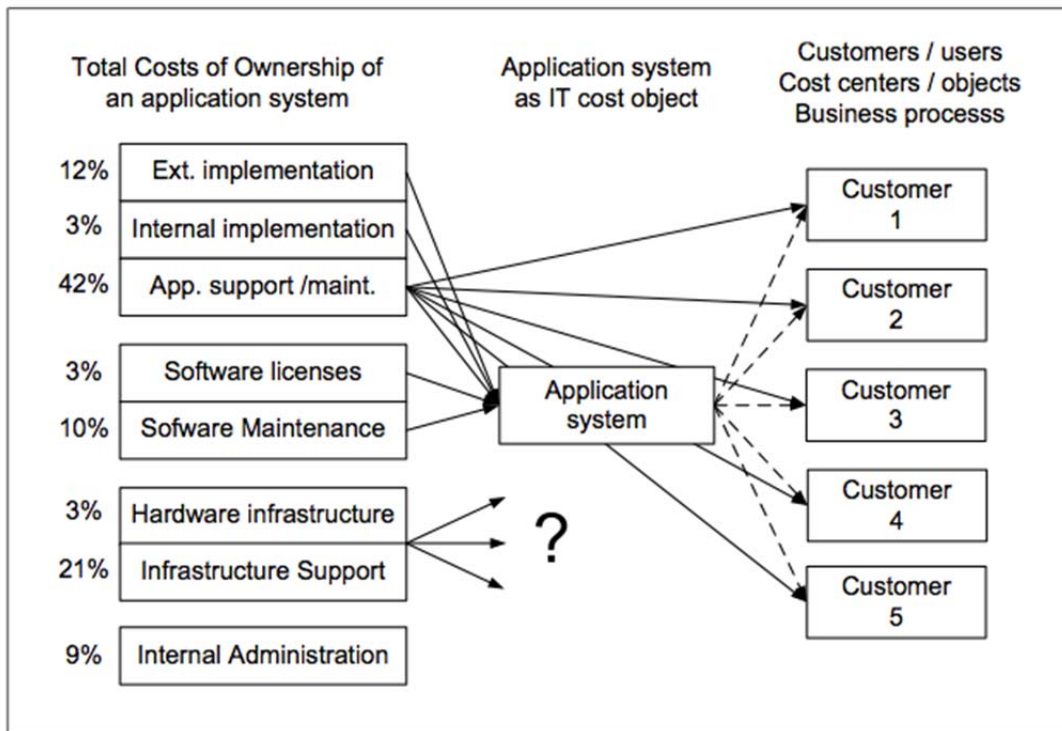
Figure 9: TCO of an IT system creates questions about appropriate allocation keys (Brandl, 2008).

The advantage with TCO, compared to traditional cost accounting systems, is that it can shine light on hidden costs (Emigh, 1999).

5.1.6 Traditional cost accounting systems
Primarily aimed to determine costs for services with a high share of variable costs. Fixed indirect costs are either not allocated or distributed among the cost centres by using for example fixed percentages, production volumes or measured usage rates (Gerlach, Neumann, Moldauer, Argo, & Frisby, 2002). The drawbacks with such an approach are that, if indirect costs dominate, the per-unit cost is likely to be biased, causes free-rider behaviour, political tensions and biases management decisions (ibid; Brandl, 2008)

5.1.7 Critique of cost-based IT investment decision-making
Irani et al. (1997) have identified and classified several evaluation techniques that are used to justify capital investments in IT/IS. The authors believe that traditional evaluation techniques are no longer appropriate due to the intangible benefits, along with the complexity of direct and indirect cost implications. They claim that traditional justification processes are based on underestimated direct costs and that more significant indirect cost is often excluded from the decision making process. These implications questions the value of such processes and the actual sucess of many IT/IS implementations. Pavlou et al. (2005) argues that cost-based approach for measuring the return on IT accurately captures the cost of IT but is not a surrogate for revenue at a sub-corporte level. Instead, the first step is to assess how existing revenue can be allocated to productive assets to be able to trace IT-driven revenue back to its origins.

5.2 Conceptual model

Figure 10: Conceptual model for the semi-structured interviews showing the operationalization of how firms identify and allocate IT costs.

This model operationalizes how firms identify and allocate IT costs and was used as a basis for the subsequent semi-structured interview questions. The model starts with the classification the total IT cost. Then direct and indirect IT costs are identified. The model then concentrates on how firms identify and allocate costs related to specific resources. Question 2.2 issues if the firms consider resource costs when consolidating costs for specific IT services. Onwards, the model focuses on how firms allocate IT costs to specific IT services and finally how these IT service costs are allocated to customers (cost centres). The model can be divided into four major steps: 1) cost identification, 2) cost allocation to resources, 3) cost allocation to services and 4) cost allocation to customers.

5.3 Interviews

5.3.1 Tables of interviews

Table 6: How does the firm make classifications of IT costs.

		How does the firm make classifications of IT costs?
Intermediate	Firm B	Costs are classified in line with the TCO method.
Traditional	Firm C	No distinction is made.
Traditional	Firm E	Running and investment costs. Running costs are divided into licenses and consulting costs.
Traditional	Firm A	Distinction between investment costs and running costs.
Sophisticated	Firm D	Running, management and development costs.
Innovative	Firm F	1) The IT costs can be classified as overhead, resource units (deliver hours), shared functions and infrastructure. 2) Functional organizational structure that is a resource organization / functions. Virtual organization for how we conduct activities, projects, management, operations and infrastructure. At the end, costs are classified as management, development, operations or external databases. 3) Running: upholding, mandatory, and optional. Investment: new development.
Intermediate	Firm G	Only direct costs are classified, does not account for indirect costs. 1) ERP (costs for new ERP). 2) IT common (management functions, IT security). 3) IT development. 4) IT operations (operating costs).
Sophisticated	Firm H	1) Running costs.

		2) Growth. It is about growth products.
		3) Transform. This classification is about it the firm has for example five data warehouse systems and the intention is to get one system. This may not have a big impact on the business but is about change the IT platform, an efficiency process of IT. Transform operations aims to reduce rationalise current systems and to reduce running costs. The focus is to reduce running cost to be able to do growth projects.
		This classification is also three ways of talking decisions. Growth and transform are management level decisions while running is decisions concerning the daily operations.
Innovative	Firm I	1) Development.
		2) Application management.
		3) Operational (test and development environments).
		4) End user (with related platforms)
Innovative	Firm J	Input factors are time and expense (operational expenditure and capital expenditure).
		Running costs is the costs of maintaining and keeping current service levels.
		Growing costs consists of cost for all changes. The threshold is that costs related to secondary faults are not growing costs.

The firms have a broad range of how they classify their IT costs. Some firms do not classify them at all while other classifies them in several categories in line with responsibility and strategy.

Table 7: How does the firm identify direct IT costs.

		How does the firm identify direct IT costs?
Intermediate	Firm B	Direct IT costs are identified through the TCO process. It uses tenders and benchmarking to assess the lowest total cost. It is a part of the procurement process.
Traditional	Firm C	Now and earlier, direct IT costs are identified through invoices.
Traditional	Firm E	It is identified through invoices and project accounts of external resources in the general ledger.
Traditional	Firm A	Direct IT costs are identified by the procurement process, that identifies the initial investment cost, and the on-going running costs through contracts, invoices and project costs.
Sophisticated	Firm D	The direct IT costs are identified through invoices.

Innovative	Firm F	Costs are identified through invoices and then categorized according to a category code.
Intermediate	Firm G	Direct IT costs are identified through the general ledger and are structured to different cost units. The main direct IT cost is employee hours since they mainly do in-house system development. All costs associated with IT department employees, such as education costs, are seen as direct IT costs.
Sophisticated	Firm H	These are recognized through the invoices organized in the general ledger. The total IT department is organized in that way. The respondent experience that they have very few direct IT costs if allocated to per product or product area.
Innovative	Firm I	Through cost objects. It can be project or application, to which the firm relates different resources such as prices working hours, software licences, sourced services from a third party. These are identified through different allocations. The costs are identified through invoices and time tracking.
Innovative	Firm J	When something is ordered the firm receives an invoice that is then identified and allocated to a chart of account. This process is automated through an ERP. When an invoice and costs are received, they are identified by the system. This is then, by the manager's approval, allocated to a pre-specified target.

The firms' uses different methods of identifying direct IT cost. The main way of identifying is through invoices and often categorized through the general ledger.

Table 8: How does the firm identify indirect IT costs.

		How does the firm identify indirect IT costs?
Intermediate	Firm B	Indirect IT costs are identified and estimated through the TCO process.
Traditional	Firm C	Earlier, indirect IT costs were identified through a simple IT service utilization calculation of shared IT infrastructure. Now, no indirect IT costs are identified.
Traditional	Firm E	Indirect IT costs are not identified. These costs are believed to be negligible and are not prioritized. Respondent focuses on personnel time tracking as an identification method of indirect IT costs.
Traditional	Firm A	Indirect IT costs are not identified because they are not considered in either the budget, investment cost nor running cost.
Sophisticated	Firm D	Development: hourly rate per employee times hours spent on a certain project. Running: Consumption oriented where technical metrics are used such as CPU time, amount of GB and so on. Transform these metrics to a certain service.

Innovative	Firm F	Employee and odd activities are the primary indirect costs and is classified as pure overhead costs. These overhead costs are related to a certain cost centre. These costs are then allocated to a resource centre using the number of employees per resource unit, the resource cost centres which are then included in the hourly rate of the resources. It is included in the total cost of the resources. Resources that are an indirect cost, and the costs that are related to resources (education, etc.) are also calculated into the hourly rate. Then, on the basis of time reporting, the indirect costs are allocated to various activities. Indirect cost of shared infrastructure is identified through time reporting of the architecture employees. The employees that time report to a certain project, their hourly rate should cover all employee expenses of the shared infrastructure. Here, the firm is looking for another solution.
Intermediate	Firm G	Indirect IT costs are identified through the general ledger and at each cost unit.
Sophisticated	Firm H	The firm identifies indirect employee cost by categorizing them as IT employees; these employees are not working on a particular system. If they are working with a particular system, their time is tracked and thought of as a direct cost of what they are working on. Indirect management labour IT costs is identified through the general ledger and allocated on a general basis. Costs that are general in their character are generally allocated.
Innovative	Firm I	Instead of viewing costs as indirect, the firm chooses to allocate them in several steps in order to transform these into direct costs. For example: Indirect costs for shared infrastructure depends on the organizational structure, if it is shared resources throughout the group or part of the group, costs of different resources can be collected at the different organizational units and then allocate a cost from these units. There could also be shared objects, for example projects that the firm allocates in two different steps. First to the project and then to a project portfolio and then forward throughout the group with a key depending on whom is utilizing it. The respondent means that it is hard to establish who is using a certain application or some parts of the infrastructure.
Innovative	Firm J	Time is tracked. The firm has employee and consulting costs corresponding to 51 % of the total IT cost. Time reporting on a corresponding chart of accounts. When people produce time, these are reported to a certain activity. No other indirect costs are "identified" in this step, rather allocated to a specific IT service.

The methods of identifying indirect IT cost are several. Some firms do not identify indirect IT cost whereas other uses established models such as the TCO. The firms identifying the most indirect IT cost uses employee time reporting and ways of measuring resource consumption. Some respondents emphasizes that the indirect IT costs is negligible while others explains that it is hard to establish who is utilizing a certain application and explain that the indirect IT cost is considerably larger than the direct ones.

Table 9: How does the firm work on compiling cost of a specific IT service.

		How does the firm work on compiling cost of a specific IT service?
Intermediate	Firm B	IT costs of a specific resource are not considered, only for services as a whole.
Traditional	Firm C	Now and earlier, identification of IT costs related to a specific resource is identified in those cases when there is an associated invoice.
Traditional	Firm E	Software costs are identified through invoices. No other specific resource costs are identified.
Traditional	Firm A	The IT department is using a few specific information systems and identification of direct IT costs is through contracts, received invoices or specific project costs. There is no benefit in doing a more segregated identification since there is no interest from stakeholders. They clump together specific services into a few key service areas in line with the organizational design of the IT department.
Sophisticated	Firm D	The direct cost of a specific resource is identified through invoices. The indirect cost of a resource is identified through consumption of shared resource, i.e. CPU second of mainframe usage.
Innovative	Firm F	Identification of IT costs of a specific resource is made through a categorization process of invoices: direct cost, cost centre, account, and category code. Depreciation (when it is applicable) is considered when assessing the internal price for a resource. Indirect cost is allocated through the resource centre and allocated to specific resources.
Intermediate	Firm G	Identification of IT costs of a specific resource is done in the investment phase. The running costs are monitored through quarterly prognosis. Manual ad-hoc analysis can be made to capture costs for a specific resource. Activity based costing has been up to discussion, but due to the system change, this will first be put in use after the implementation. The respondent believes that this would be a better way of identifying costs of a particular resource since the allocation is made in advanced and ad-hoc analysis can be avoided. The incentive for a more sophisticated IT cost model is to be able to monitor IT costs of a particular resource over time, to see how effective the IT department is, the resource's cost development and to set cost targets. Such information benefits the decision makers and the IT controllers.
Sophisticated	Firm H	Initial product costing identifies the costs of a specific resource. No running costs are identified.

Innovative	Firm I	The firm uses a multistep resource related allocation model. If you have an application that consumes capacity or storage from different servers, an allocation from each one of the hardware is taken place to that application, and the next step two is allocated that cost further. The firm identifies how many objects that drives and consumes resources. This should be made on different levels and to different receivers. Another challenge is to assess how often these calculations should be made. In traditional ABC models there are standard costs. And how often are these standard cost revised? If there are external costs these can directly be applied into the model, or a standard cost can be used and then measure how well that cost matched the actual one. Although, the firm avoids allocating on a too detailed level and allocates on an aggregated level instead, taking business processes and user structures into account.
Innovative	Firm J	Identification of resources are not made specifically, but rather allocated in a later step.

The firms have three rough ways of compiling cost of a specific IT service. First, they do not compile cost of a specific IT service. Second, the only compile IT costs to certain key areas, or three, the firm uses a multistep resource related allocation model.

Table 10: How does the firm allocate IT costs to specific IT services.

		How does the firm allocate IT costs to specific IT services?
Intermediate	Firm B	Cost is allocated through the TCO of a specific service and is assessed to cost centres which utilizes that service.
Traditional	Firm C	Earlier, direct and indirect costs where allocated to a specific IT service based on the number of employees that utilizes each specific service on a yearly basis and the IT service utilization of the shared infrastructure. Now, direct or indirect costs are not allocated to specific IT services or key services areas due to IT service outsourcing. All IT costs are direct associated to the specific user who utilizes the third party IT service.
Traditional	Firm E	No allocation of IT costs to specific IT services is made. The firm considers only IT costs as a total sum.
Traditional	Firm A	Direct costs are allocated to key service areas through contracts, invoices or specific project costs. Indirect IT costs are not allocated.
Sophisticated	Firm D	Assess yearly the total cost of one (including direct and indirect costs) service and divide it by the number of yearly transactions.

Innovative	Firm F	Allocation of direct IT costs is made through a categorization process of invoices: direct cost, cost centre, account, and category code. These are then arranged together to create a total IT service cost. License example: First step is to identify which type of license it is: 1) Is it packaged into another service or 2) is it related to PC and base clients etc. or 3) is it a license that is directly related to a certain application. The firm works with three types of cost units, which also gives information about who's going to pay the cost. And it is 1) management objects with associated system 2) large development projects or 3) IT users.
		If you take a service like PC or telephony, etc., then IT cost unit is a user, and the user's cost centre, tells who is going to be charge backed. If you take a management object and associated systems, the firm has identified who it is that owns or pays on the business side of a particular system or management objects based on who has the benefit of it. Allocation of indirect IT costs is made through the specific cost centres, to resource centres based on the number of resource employees. The indirect cost is then regarded as the total resource cost that is allocated based on hourly prices to certain activities. If you have a license that is direct related to a certain application, then it is assessed to the application and the management object that it is included in. Then, the he owner or payers for administrative object or system pays for this license. The user of that particular PC will pay the license that is related to a specific workstation and PC cost. An hourly rate of resource costs are allocated based on estimated employee hours of a certain IT service.
Intermediate	Firm G	Development: The total IT development cost is allocated to a specific IT service through time reporting where development hours for different projects are charged. Operating: Not allocated to specific IT services.

Sophisticated	Firm H	The firm is allocating per systems, not per activity or such. The firm makes a distinction between what kinds of service or resource costs that is supposed to be allocated. The respondent argues that one allocation method (such as ABC) is not appropriate for all sorts of costs such as ERP or shared IT costs (monitoring or business administration systems). It is a shared cost and revenues or the number of employees cannot be used to divide it. The respondent argues that there is no really appropriate key cost driver for such costs.
		The respondent experiences that the current cost allocation model is too rough and needs be overlooked to get better and more appropriate allocation keys that are more relevant. The allocation keys needs to be based on drivers that can influence the behaviour and thus the cost. When one self can influence its own cost base, if cost allocation is not relevant then the users will receive a fixed cost each month without the ability to influence it. When one driver is found it should only be used to allocate relevant cost to the driver or the firm will not get much use if this allocation. This problem is something that is currently getting more attention at the firm since the cross border organizational focus is changed to a country organizational focus and the cost needs to be better and fairer allocated between the countries and to the products that are used.
Innovative	Firm I	In general it depends on the type of resource. Time tracking and consumption of certain hardware is used for allocation. Direct costs are allocated directly whereas indirect costs are allocated to the IT services based on different keys such as turnover, number of employees and so on depending on the cost type. The firm strives for as objective allocation as possible. It is to increase the cost transparency. The respondent emphasizes that IT resources has different natural transparency. The respondent also argues that IT services received from external parties are often compressed into one cost that is hard to transpire.
Innovative	Firm J	Using an internal chart of accounts (spend towers). There are several purposes within the group IT for how the allocation is made, but all transaction has certain related attributes that is in line with the group account coding and the firm has a number of laws to consider. The internal books of the IT department are balancing with the group.
		The allocation is based on a hierarchy of the IT services. There is a definition of IT services at the beginning and a more detailed and specific charts of account. It is based on the IT departments cost types. These are not direct IT services but rather direct and indirect components of the IT services. Cost and time is grouped.

The respondent experiences that the granular charts of accounts was too detailed and they are now reducing the amount of details. The firm spent too much time and costs for figuring out which accounts the overhead costs should be allocated to. There were cases with a lot of discussions when these cost not where correct allocated. The respondent experience that they were too ambitious regarding the level of detail of the charts of accounts.

The problem was that they had not ensured the model and was unsure that they received the correct data. When trying the model, they constantly received different numbers. It was an inability to be exact and track these costs, and be stable over time. The granular of the chart of account only made this problem worse. It resulted in discussions about where to put different costs since it was hard to categorize the costs into distinctive accounts.
Another component of the problem was also that this model putted high demands of a controller to have high competence of different tools and keep in mind what the plan was, what had been said, what the forecast is and so on. So there were a lot of dimensions to track in each component. Furthermore, they did not use all of the accounts in the granular chart of account, even though it was to be considered as a fair allocation for the internal customer.

The respondent also emphasizes that their definition of overhead (or internally called governance) is wider than how it usually is defined. There are more indirect costs to be covered than IT services that are eligible for consumers.

The keys are based on certain logic for specific resources depending on how they are utilized of a specific IT service. Depending on the service branch you work in, your costs are more or less direct. For example if you have further down the IT stack to a service; databases, servers, and other things, they are more indirect. So the entire service operations (operation unit) have almost only indirect costs.

For example a server, which is seen as an indirect cost of an IT service, the firm catches time and materials related to servers. These are then linked to all the services that consume servers, application services and internal servers. Here the linkage keys are resource utilization based on CPU and RAM memory.Another example is managed workplace (MWP). In this case the firm catches the time and material that is connected to different aspects of MWP. Then these are allocated per device.

Another example is storage. Time and material is captured related to storage. This is allocated related to the amount

of storage that is utilized.

The guideline of the linkage keys is fairness. What is the fairest formula to allocate costs to a service? The firm assessed the keys and were selected based on the ownership of these keys.

The respondent argues that there are two important purposes for monitoring the utilization of for example storage utilization. First, to control IT. Control IT is something that you want to do in real time. You want to capture costs as soon as possible. The firms monitoring is based on this principle and they can watch ratios change in real time. Second, another purpose is to charge for the IT services you produce. Here, you wants to be predictable and stable. You want to show the development over time. The IT department uses quarterly internal invoices and within this quarter they do a 'show back'. To be predictable and stable the IT department, on a yearly basis, sets costs responsibilities and standard costs. The variation is then affecting their profit or loss. This is done for the standard supply of IT services. Then they are sending invoices with an actual cost for development and projects that are directly demanded from the business.

This creates some implications due to the variations that are affecting their profit and loss. The respondent believes that this is an interesting area since there is no definitely answer to how often the measurement, which is the basis for the chargeback, should be done.

Allocation of IT costs to specific IT services is tackled in several different ways at the firms. Some firms do not allocate IT cost to specific services at all. Others uses simple allocation keys to allocate the cost, for example is cost allocated to a specific IT service through time reporting where development hours for different projects are charged. Another firm allocates direct costs directly whereas indirect costs are allocated to the IT services based on different keys such as turnover, number of employees and so on depending on the cost type. More advanced methods of allocating IT costs to specific IT services by first using internal chart of accounts and then apportion costs to these accounts by several different allocation keys specifically related to the kind of resource that is occurring the costs.

Table 11: How does the firm allocate IT costs to specific resources.

How do you allocate IT costs to specific resources?

Intermediate	Firm B	They do not allocate costs of specific resources. Costs are only allocated to IT services.
Traditional	Firm C	No allocation of IT costs to specific resources is or was made. Costs were solemnly allocated to IT services.
Traditional	Firm E	No allocation of IT costs to specific resources is made.
Traditional	Firm A	No allocation of IT costs to specific resources is made. Instead, the firm clump together specific services into a few key service areas in line with the organizational design of the IT department. There is no benefit in doing a more segregated allocation since there is no interest from stakeholders.
Sophisticated	Firm D	Consumption based allocation keys.
Innovative	Firm F	Same model as to specific IT services.
Intermediate	Firm G	No allocation of IT costs to specific resources is made.
Sophisticated	Firm H	No allocation of IT costs to specific resources is made.
Innovative	Firm I	Same process as the cost identification of a specific resource.
Innovative	Firm J	Same process as for allocation to IT services but less one step.

Six firms do not allocate IT costs to specific resources while others uses consumption based allocation keys or uses the same process as allocation to specific services.

Table 12: How does the firm allocate IT costs to cost centres.

		How does the firm allocate IT costs to cost centres?
Intermediate	Firm B	Allocation of IT costs to specific business units are used less and less and is concentrated at one cost centre. Striving for as little chargeback as possible. Full cost is allocated to the cost centre (BU) that is the key user of that system. A general cost allocation to business units is being made for shared IT services.
Traditional	Firm C	Earlier, direct and indirect IT costs where allocated to each business units on per employee and amount of storage basis. Now, direct IT costs of a specific third party IT service is allocated to the subsidiaries on a per user variable costing basis. No indirect costs are allocated.
Traditional	Firm E	IT costs are allocated to subsidiaries as a flat rate, based on the number of users, for example ERP users. The allocation key "per user" is though of as reasonable. It is a compromise between a fair representation and simplicity. The IT costs are recalculated each year and are charged as a flat rate to the subsidiaries on a monthly basis. There is currently no demand from the top-management for a more advanced model.

Traditional	Firm A	The IT cost is allocated through non-full negotiated standard costs of the services to the business units/subsidiaries. This internal transaction is made between the parent company and the business units/subsidiaries. This is due to that if full costing chargeback were being made, the cost for example one workstation would be to high to be able to motivate that price. When a specific IT investment is being made, that is mainly created by a certain subsidiary, it costs are allocated to that subsidiary. The cost is identified through the procurement process and no indirect cost is being allocated. Shared IT infrastructure cost is not allocated.

There is no further allocation due to the perceived cost-benefit of this process. The IT department have no incentive to allocate any further because they are perceived as being cost effective. Due to the flat organizational structure with quick logical decisions, there is no need of further IT cost allocation. The respondent believes that if the future IT costs is accelerating or if they do not agree with the rest of the business of what is important or not, there could be a benefit of -further cost allocation. |
| **Sophisticated** | Firm D | It is service or resource specific. Mainly, identified indirect and direct costs of a resource or service are allocated to business units as a flat rate corresponding to what the actual service or resource cost is. The cost is allocated based on the number of services or resources the business units utilizes.

Storage is allocated based on consumption; this is due to the fact that users have increased their average storage. Older platforms have experienced a price increase to motivate managers to perform a transition to newer systems. Business units is having a hard time influencing their IT costs. |
| **Innovative** | Firm F | Shared management objects are allocated based on negotiated terms by a project committee related to the business units benefit of that particular project. They can negotiate the IT costs down to the different IT cost classifications such as upholding, development etc. There is a big table of all the management objects that keeps track of who is the customer. Cost units are identified by the system utilization/consumption. Utilization and consumption is based on application type. The firm has no intention to allocate end user costs based on transactions. Cost units used different applications, depending on the required total capacity (storage, CPU, network) of these applications, this capacity cost is allocated to these application which in turn are then allocated to the cost units.

The platforms are classified as small, medium, large packages that cost units buys related to required capacity of the applications. The final cost allocation percentage to cost units is based on negotiated terms based on benefit levels of that application. The core of this allocation is to be able to connect all the IT costs to a certain management area and |

a specific system. The business side can then relate to these costs and it is possible to calculate the IT cost per business transaction i.e. The firm wants to connect the value of IT to the business side's processes. All IT costs should be related to system and management objects, development or end users. It is a way of assessing IT cost versus the IT benefit.   The business side will be able to on their own assess the value of IT related to their business processes.

Intermediate   Firm G   Development: The costs that is not activated in the general ledger, is allocated to the business units based on their percentage of the total turnover.

Operating: Respondent experience that their cost allocation of their operating IT costs is not fine-tuned. This costs is allocated to each business unit based on their percentage of the total turnover. Furthermore, the respondent believes that they could use a more sophisticated allocation instead, for example per utilization, to create certain incentives for the business units. T

he benefit of a 'percentage of total turnover' allocation is that it is easy. The drawbacks with such an allocation model is that it does not reflect the business units utilization of IT services. The respondent believes that the cost-benefit of a more sophisticated allocation must be taken into account.

Sophisticated   Firm H   The firm uses a 'management fee' (corresponding to shared IT infrastructure) and allocated this to the business units through their share of total sales. When the allocation is regarding server function, the firm allocates on the basis of how much t storage the business units utilizes. The respondent means that in this case there is an obvious cost driver. This storage utilization is measured once a year and allocated each month. The firms is now going to measure the utilization each month, but the respondent believes that this will not significantly affect the amount of cost allocated. The respondent emphasizes the necessity of a dialogue, explain the cost model and discuss how the cost is allocated and why and what the business units pays for. Many managers seek the best allocation method, but without this dialogue about what it is, and that the right person understands what it is, and how it drives costs, it does not matter. Without the dialogue, the managers can claim that the allocation is right and some business units are satisfied and others not. This will not accomplish a change in the business units behaviour, which is the goal of cost allocation.

The respondent argues that the industry is characterized by large quantities of transactions and this translates into large fixed IT costs. This implies that, in many areas with large fixed costs, it is not that interesting to find the perfect allocation.

Innovative	Firm I	The respondent claims that the more transparent IT cost the easier it is to allocate it to the cost centres in order for them to manage their IT cost. The firm can then choose between to do it or not to do it. This is the firm's ambition; this can be done on the development side. On the management side it is demanded that, but the things needs to work. There are more incarceration mechanism in the operational side compare to the development side, unless there are release changes and so on.
Innovative	Firm J	A new set of keys. These are called apportion keys. Even in this case is the justice principle guiding. Depending on the service, we try to find a sensible way to break the consumption that occurs. It can be per user that is the base, per number of employees per sales or per transaction. There are many different apportion keys. Where we can use from quite granular data to more serious assumptions. We bill then the other operating units, so very large counterparties. There are seven customers, including ourselves. These keys are communicated and agreed with the customers. As a response to a question about subjectivity principles when allocating IT cost to business units the respondent answers that their allocation is fact based and if you introduce too much subjectivity, there are no buyers, everyone want this for free and no one want to pays for it voluntarily. A CEO can possibly require that business units take on costs, but beyond this scenario, there is always a desire to avoid costs.

Firms allocate IT costs to cost centres in several ways. One firms strives to minimize the allocation to cost centres while another only used third party IT services and the cost is directly allocated to the subsidiaries on a per user basis. One firm uses a percentage of the total turnover a an allocation key while some firm uses a flat rate based on the number of users. This allocation key "per user" is often used and the IT costs are recalculated each year and are charged on a monthly basis. One firm uses so called apportion keys and depending on the service, they try to find a sensible way to break the consumption that occurs. It can be per user that is the base, per number of employees per sales or per transaction.

Table 13: Additional discussed topics.

		Additional discussed topics
Intermediate	Firm B	N/A
Traditional	Firm C	Internal prices for IT services were too high so we took the decision to outsource the IT department instead This department was shut down due to too high internal IT service prices. No allocation of indirect costs even if they still bear shared infrastructure costs.

Traditional	Firm E	different business units are responsible for their business units-specific IT service. They are best acquainted with the related IT service cost, but have no cost responsibility.

Respondent focuses on personnel time tracking as an identification method of indirect IT costs.

The allocation key "per user" is though of as reasonable. "It is a compromise between simplicity and a fair representation."

There is no demand from the top-management for a more advanced model.

Investments: pre calculus, investment costs + running costs = yearly cost (5 year depreciation). Cost of capital => net present value calculation. On the plus side there is "increased number of sales transactions" through the IT service. Estimating revenues is hard. It is hard to relate if the new investment created new opportunities or not.

General comment: Made a distinction between accounting and the IT industry. Accounting is a highly regulated business field whereas the respondent experience that the IT industry is immature regarding project management. The respondent believes that the IT business is immature due to its legacy of unstructured IT agents as a result of the IT boom and due to that it still is a quite new business function compare to accounting.

Traditional	Firm A	The budget is a guessing game because they do not know, but they always meet the budget close. This is more due to coincidence than anything else.

They do not evaluate investments in retrospect.

If the full costs of shared infrastructure costs are allocated to the chargeback of a PC, it will produce such a high costs that it will be cheaper to externally buy the PC. "We strive for minimizing administration irrelevance".

The respondent believes that if the future IT costs is accelerating or if they do not agree with the rest of the business of what is important or not, there could be a benefit of further allocation.

Sophisticated   Firm D   High cost insight but do we have the same insight in the underlying criteria's? Relevance lost?

Allocation base to business units is used as a political tool.

Critics: many people work with the cost allocation, but the costs are not variable, it is only a matter of how to allocate them. Overall, the total cost is more important than the allocation keys. Symptom of that IT is hard to control; business model is used to control IT. But what is the value of it?

Trend: Go towards a model of identifying total cost of licences and running costs and allocate them through a flat rate per employee. "What the business can influence, it must also understand", "Must find things that the end users can influence, the firm can not control what the business can not influence", "Business can not influence software CPU time"

Legal tax requirements that require the firm to show how the IT costs are allocated.

Internal vs. external costs: It is more logical to use different allocation keys for external. The firm has the internal cost regardless of how it is allocated.

Development costs: IT costs is one of the few things a management can, in the short term, influence. Thereof it is also under high management control.

The business units managers does not experience that they own the IT costs, rather they experience "it gets what it gets". The respondent means that it is more appropriate for the top management to put pressure on the IT department regarding the total cost of IT rather than on focusing their attention on small shares of IT costs at each individual business units. It is more appropriate if the IT function is outsourced.

The respondent also points out that it is dangerous to have too advanced internal IT cost models. Because there will be more talk about the allocation keys rather than the total cost of IT.

Discrepancy between internal prices vs. external prices: External consult costs vs. internal employee cost. External

costs have been constant the last five years, whereas internal employee costs have risen. The problem lies in what is included in the internal cost? (Premises etc.).
The respondent experience that the internal vs external paradox is now decreased.

The respondent raises important areas of IT costs such as: How do you take investment decisions?
Business case: aims to calculate and visualize the benefits, risks and value in relation to costs. The method can therefore be used in complex sales situations such as the complex system sales.

How do you decide which business units is allowed to make IT investments? The firm has chosen to limit the supply of IT, how do you do a sound distribution? Calculation of BC, ROI, need of simpler calculations and a more transparent link to venture areas rather than to individual projects.

Value of business case: It is more important to really follow up what was determined in the business case when the delivery is complete, rather than have an advanced model. Costs are often quite good estimated, but tend to overestimate the revenues. The respondent means that this is due to that revenues are more complex to measure since they occur after the project delivery and costs occur during the project.

The respondent also believes that it is easier to focus on the running costs since they are always ticking on, but sponsors for investments come and go and it tends to happen a lot during these projects. The respondent also points out that some projects can in retrospect be seen as hygiene factors and not as projects that have had a chance to stand up against return on investment calculations. It is a question about if the project aims to protect revenues or create new revenues.

There is an enthusiast that represents a certain project and lobby for it, and unsuccessful projects tend to be the ones when the enthusiast deviates from the project.

Difference between financial institutions and producing companies: IT is core business in financial institutions but not for producing companies. This gives IT a more important role in financial institutions. IT is a more support function in producing companies.

Innovative   Firm F   When the firm had a mainframe the transaction costs for different transactions which then where assessed to a certain end user.

Response to fine tuned allocation: the business units are not interested in knowing if their costs are from CPU seconds or not, they want to be able to assess their IT cost in relation to their business process and will be able to say if it is to high costs. They should not say that CPU are to expensive, rather that it is expensive, do something! IT department should work as a medium of IT costs and have an open discussion with the business side what to do, and which applications to change. The business side need to comprehend the IT cost from their point of view. They know their systems and which routines are good or bad, and which routines that helps them. If they can achieve a price that is almost true, then they can take a stand. But they do not need to know the cost per CPU. They want to criticise it in relation to what they do with it in their world.
Who can do something about it? The first thing is to create a cost consciousness about how much it costs. Norway vs. Baltics development. But at the same time have an organization that works together and do something about it rather than blame on each others. It is not the amount of information that is important, rather what you can do to it.

The respondents means that managing per transaction creates wrong management effect since the end users cannot control their IT costs by reducing their amount of transactions since this also means that they i.e. needs to reduce their number of customer handlings. The responsibility of IT costs is on the wrong person (end user) since he/she do not understand what it is, cannot do something about it. Wrong management effect. But the IT costs needs to be allocated so that it lands on a system owner, or system area so that a manager gets a overview of the systems and its processes, to establish if the cost if low or to high and assess what the problem is. Right information to right employee.

Response to total cost: The important thing is that the allocation reflects the responsibility and that the firms know what they want to achieve with the allocation. And the one who is affected by the IT cost can do something about it! It should not be a resource manager who attends customer all day long, but a manager with a system responsibility and who is involved in different investment decisions. These should work with the IT costs.

Rationalization of IT: It is easy to adopt new IT without reduce the legacy. What is the cost of the complex of having several different IT solutions or having different IT solutions? This is something that the firm wants to add into the

decision discussion. Earlier, the business side have been enthusiastic about a system but the IT department have not been able to assess the total cost of that system, they want to be able to give such accurate information to the business side decision maker fully is aware of what it actual costs and can make a decision on that basis.

"To be able to connect decision and cost monitoring responsibility"

Response to cost conscious and hygiene investments: It is important that the business decides and prioritize what shall be done, but How it does and the efficiency of how it does in regard to an IT investment, the IT development has a great responsibility (Agile). It is on focus areas that not only look at costs but also assess what the firm gets out of it. Look at other KPIs, How fast do we deliver; do we deliver as fast as we need to? What quality do we deliver?

"Costs is not the only important thing, but efficiency need also to be considered"

Intermediate   Firm G   The incentive for a more sophisticated IT cost model is to be able to monitor IT costs of a particular resource over time, to see how effective the IT department is, the resource's cost development and to set cost targets.

The benefit of a 'percentage of total turnover' allocation is that it is easy. The drawbacks with such a allocation model is that it does not reflect the business units utilization of IT services.

The respondent believes that the cost-benefit of a more sophisticated allocation must be taken into account.

Sophisticated   Firm H   Comment on IT close to the business organization: Understandable. The firm has almost the same organizational structure with their local ERPs departments. It is dangerous when it becomes static too long with one organizational structure. If people are in one corner and do their things and are too far away from the business, maybe they are too far away. Then the pendant maybe needs to turn, and then the IT department becomes closer, then the cost is always increasing and benefits of scale is decreasing but you get closer to the market, time to market decreases, this is the benefit. Our firm is doing this transition right now, the costs are about to go up but we will be perceived as a quicker player. It is not black and white; everything has its benefits and drawbacks.

Innovative   Firm I   Comment on we against them experience: It depends on how large share IT is on the customer services. It also depends if IT is seen as a resource or as a necessity. If IT is seems as an enabler, then the question is 'how do we dot his as best as possible together?'. IT consists of some automated business process that supports the business, and the question what share is supported in the business process, how well is this done and how well is this automation following the business process changes? This creates a constructive structure to be able to assess this dialogue. You have to look at what IT is supporting.

Comment on IT close to the business organization: The firm needs to consider both economies of scale and the supportiveness of the business process. The IT department must also map the demand and todays demand is not the same as three years from now. The IT department must consider how fast the development is on a certain business line. The respondent experiences that there are large differences regarding the development speed.
The drawback is that the more alternatives the firm has, the more it costs.

Comments on a fine tuned allocation: it depends on how allocation is experienced. If allocations are used as a base for decisions, and if the firm has relative high cost transparency, then this is a good base for a decision, with some assumptions. But if the firm does not have a high cost transparency, then the allocation process can be questioned. How big share of transparent direct cost do I have regarding what I am currently doing, and then you will get different answers depending on the transparency level. In general, too many details are not good, but this can be different considering different organizations.

IT as core vs. support: This cant be answered, N/A. What is generating the correct decision making basis, it is on that level.

Comment on negotiated allocation: The question is then what the firm means with transparency and objectivity versus how subjective management the firm wants. In some part this is beneficial; to avoid stagnation. But you have to look at what level this is management in the group organizational structure.

Optimal allocation level: it would be interesting to measure how much the operational costs is versus how much it would cost to replace it. But how fast does the underlying IT structures change? How fast does the hardware platforms change in contrast to the software that runs on them, and then also the application life cycle. Looking back

five years, how much has not the telephone area developed, with iPhones and androids, windows. Some have long life cycles and some has very long life cycles, so what do you want to measure and what kind of decision-making base is you aiming for? It can vary very much, depending on the usage area. You have to put it in the right context and assess how long I the life cycle in this context, and then, describe what do we need to measure during this horizon, and how much does it cost, and what benefits does it generate in the long run. The question is, how constant is the life cycle in the IT area? And how constant is the business process? And how great is the conversion pressure for the business processes? IT is an automated part of the value creation process, it creates possibilities, the question is what the value is of these possibilities and how fast you can capitalize on them.

Rationalizing running cost to improve development cost: constant development and improvements. Do not comment running cost levels.

Regarding costs monitoring as decision-making base: Needs to consider what level you look at. Looking at application level, this could be true, but what area dose it support? And in which context? Business case is done. It depends on the scope.

Comment on hygiene investments: there are several dimensions to this. 1) Pure business investments, 2) compliance investments and 3) legal investments. Some investments just need to be done. There are other legal factors that drive investments.

Innovative   Firm J   Comment on IT close to the business organization: There is much energy spent to discuss how you are going to be organized.

There are various proponents of so much central as possible, against as much decentralized and out in the operations as possible. My line is that organizational issues will not solve the problem. Making use of information and technology, IT is actually two separate letters, requiring multiple parties. Go where you need to understand to apply the information in the proper place, that is where it has its place and uncheck where it has its place, same with technology. Technology can be amazing in some places but useless elsewhere. It involves many choices.
Once you have made your selections, and then when you will implement and take advantage of values and investments you make so you have to change and adapt, so there are no obvious answers. You have to mix several different skills, you need to make them work together and all this stuff you cannot organize under a single flag. It is impossible for it all meets below the CEO. So it is a matter of how you choose to place resources depending on where you come from. The key is that you have the right competences. As for people who both understand the business and technology, they are placed at the IT department. Earlier, the firm sought ways but did not really know how. I put up a proposal and since then we have been best at developing these kinds of skills. It is this strategy background with a number of tools that you need to master in a reasonable manner. You need to be good to interact with people in a sensible way. It does not matter where you are placed. It is within the IT organization here at we have been best at developing such kind of knowledge and skills. I am allergic to the approach when you think about it is business and IT, it is actually a common dance to use and utilize technology and information in a good way. I think people forget about it many times and end up in a organizational structural issue that will never solve the problem if you do not have the competence in place. Where you are missing competence, put it under the leadership that can develop the competence best and make sure that it is process and routines that creates the ability.

We against them experience: Organizational affiliation creates we against them feeling, no matter where you draw the line, you will create a gap. You have to draw that line with a consciousness, and then try to compensate for the gap. The simple debate of what is the best practice, or try to solve it with an organizational way is too narrow and a little stupid.

Stakeholder model: The user has been a driven part of the model.

Top down a basic driver "create more with less – always". IT ends up in distress. If I can invest in technology I can send over the cost to IT. Then I free up a lot of values of this investment for me. I do not have to kick anybody, but I free up time and energy on my staff and take technology to perform a boring task, and it will cost over there. Freeing values for me, send the cost to someone else and then claim, "what are they doing over at the IT department, how expensive they are." It is absolutely critical to have the tools to deal with this kind of statements. From what I have responsibility for last year, I run this house more efficient this year than last year. We have made the maintenance needed. Then you 've built a garage here is something that you have been added. We do this also in the same orderly manner, but if you compare last year with just the house and the house plus the garage so it is clear that there is a difference. We got out some synergies in the transition but it is obvious that the cost is higher. It is absolutely crucial to be able to show this to the stakeholders to be remaining at your position over time.

It is not desired from the top management but chosen for the respondent.

It is crucial to be able to demonstrate changes in the base line. This was my start position; this is my end position, cleared of everything else.
I can also demonstrate, this have we invested in, in the coming decenniums, IT is becoming more core business for everybody, and there is a underlying growth in IT and there is at the same time an underlying expectation to always reduce the IT cost, and I must be able to respond to this expectations. I can do more with less with the same base line, and then we add things and I must be able to demonstrate these two things. You must protect your base line or you will never be successful.

Principles: Chargeback, time, widened the overhead for that some things happens and it is not associated with a price tag.

This section consists of topics discussed outside the semi-structured interview questions. Some of the topics are general comments, future research suggestions, the discrepancy between internal and external costs, IT as a core or support service, the organization of the IT department to reduce the 'we against them' scenario, and investments as a hygiene factor.

6. Discussion

s Classification of IT costs

Firms that uses a traditional IT cost model either use a two-part classification or none at all. The two-part classification divides the IT costs into running and investment costs. Whereas firms with an intermediate IT cost model classifies IT costs in several categories for example development, operations, management functions and new investments. Love et al. (2004) have concluded that there are several ways of classifying IT costs. David et al. (2002) argues that the TCO model breaks down IT costs into categories such as acquisition costs, control costs and operations costs or capital cost, technical support, administration and end-user operations (Emigh, 1999). It appears that IT costs can be classified in several different ways, but one important matter is that the costs actually are classified in a way so that the firm receives a rough division of their costs to increase transparency. Firms with an intermediate IT cost model classifies IT cost in more detail than firms with a traditional approach, which is in line with the literature. The firms with a sophisticated IT cost model classify the IT costs in several categories. The respondents have underscored the following classifications: running, management and development; or running, growth and transform. One respondent elaborated the transform category:

> Transform operations aims to reduce and rationalise current systems and to reduce running costs. The focus is to reduce running cost to be able to do growth projects.

It is obvious that the aim is to be more effective on how the firm is utilizing their existing IT stack and to be able to increase the spend for new investments. The respondent explained further that:

> This classification is also three ways of taking decisions. Growth and transform are management level decisions while running is decisions concerning the daily operations.

It is apparent that the firm is incorporating their IT cost classification into their IT strategy. Depending on what the cost relates to it will later on be identified as either under management level or daily operations. These three ways of taking decisions transpires the IT costs a little bit further compared to the intermediate IT cost models since this, at an initial phase, shows the managers what total IT cost they are responsible for. Firms with an innovative IT cost model also classify IT cost in several categories. In general the firm has a running category and an investment category. Some firms make distinctions of the running costs into for example applications, operations and end user or upholding, mandatory or optional.
In summary, there is a clear spread from no classifications of IT costs to several different categories corresponding to strategy and responsibility.

6.2 Identification of direct and indirect IT cost

Blosch et al. (2003b, in Brandl, 2008) have recognized several benefits of cost identification. These are that it makes IT unit's costs visible; it enables setting a cost of IT services and it gives the fundamentals for cost control. Eventual problems with cost identification are that costs may be hidden in multiple budgets. It is apparent that

proper IT cost identification brings important benefits to the firms. A common way of identifying direct IT cost is through invoices received. Other ways of identifying direct IT costs are through project costs and through the procurement process. The difference depends on how the firm classifies IT costs. It is evident that firms use the established process of billing. Some firms use their ERP for automated processing of invoices for identifying direct IT costs. Invoices are undoubtedly the most commonly occurring method of identifying costs from external and internal parties. One respondent explains that:

> The identification process is automated through an ERP. The costs are then allocated, by the manager's approval, according to a pre-specified code to the chart of account.

In firms with an intermediate IT cost model identifies direct IT costs through the procurement process or through the general ledger. These are then structured to different cost units. One firm uses in-house system development and the main direct IT costs are considered to be the IT employee labour cost. All costs associated with IT department employees, such as education costs, are seen as direct IT costs. Gerlach et al. (2002) explains that ABC method first identifies major IT division groups and then maps the general ledger costs through common activities that support the IT services. It is apparent that the firm with an intermediate IT cost model, in line with the ABC approach, makes a more detailed categorization in the general ledger, or through the procurement process, than the firms with a traditional IT cost model. Fürer (1994; in Brandl, 2008) has an additional approach to ABC model. He first used data centre services that are divided into three activity centres (Output, Processing and Storage). Secondly, he analyses the workload and the scarce resources to be able to detect in example potential bottlenecks. The potential gap between literature and practice is that the workload analysis is not made in practice. Instead, the firms focus their attention to the activities or cost units that drives the cost.

The sophisticated IT cost model COBIT involves identification of all IT costs and assesses them to specific IT services in order to develop a transparent cost model. (IT Governance Institute, ed. 2005). In accordance with the preceding sentence firms need to identify every part of the IT costs to be considered as a firm with a sophisticated model. The respondents of firms with a sophisticated IT cost model explain that they identify direct IT cost through invoices. In fact, one respondent experience that they have very few direct IT costs if they are to be allocated to per product or product area. Love et al. (2004) points out that the indirect cost often are proportionally larger than the direct costs. This shows that the firms with a sophisticated IT cost model are able to assess the large share of indirect IT costs that are associated with the IT stack. How this is done is discussed later in this section.

What characterizes the innovative IT cost models is that it aims to connect a cost responsibility to that originator who initiated that specific cost and obtain a clearer connection between cost and value. As one respondent said, "If you want something you should also be ready to pay for it". Brandl (2008) means that eventual problems with cost identification are that costs may be hidden in multiple budgets, there may be a discrepancy between the IT unit accounts and the Finance's since their charts of accounts have a lack of details. To deal with this problem, one firm explains:

> … all transactions have certain related attributes that is in line with the group account coding … the internal books of the IT department are balancing with the group.

The firms with an innovative IT cost model identify the direct IT cost through invoices and time tracking. The costs are then allocated according to a pre-specified code to the chart of accounts. In some cases, this process is automated through an ERP. The direct IT cost can also be identified through cost objects. These objects can be a project or an application, to which the firm relates different resources such as prices working hours, software licences, and sourced services from a third party. In summary, there exist discrepancies regarding the identification of direct IT costs throughout the firms. Although, the primary method of identification is made through invoices received.

Indirect costs are not considered in firms that use a traditional IT cost model as these can be seen, as the respondents putted it "negligible and not prioritized" or "costs are not identified because they are not considered in either the budget, investment nor running cost". Gerlach et al. (2002) explains that traditional cost accounting models mainly identify costs for services with a high share of variable costs. Love et al. (2004) explains that the key difficulty related with IT costing is associated to the identification of indirect costs. The authors points out that the indirect cost often are proportionally larger than the direct costs and that managers are often unaware of these or simply overlooks them to get support from the senior management by reducing the cost portfolio. It is obvious that indirect IT costs can be overlooked in traditional IT cost models due to unawareness and as an agenda to get senior management support. It may be so that the respondent's answer that indirect costs are believed to be negligible can be interpreted either as lack of knowledge or as a political agenda of not dealing with such costs. Irani et al. (1997) claims that traditional justification processes are based on underestimated direct costs and that more significant indirect cost is often excluded from the decision making process. It is obvious that the ignorance of indirect cost also can be interpreted as a way of justifying IT investments since the total cost of these investments is lowered.

Opposite the traditional IT cost models, a firm with a sophisticated IT cost model identifies the indirect IT costs. This can be done by first separating the indirect costs into development and running costs. Under the development category the hourly rate per employee is multiplied with the hours spent on a certain project. The running indirect costs are identified through a consumption-oriented approach where technical metrics are used such as CPU time, amount of GB and so on. These metrics are then transformed into a certain service. Another firm uses time reporting for the IT employees and the general ledger to identify IT management labour cost. The ITIL model means that allocating costs of shared resources should be made by determining, during the annual planning, standard unit costs per IT resource (per processor time, per stored GB). The cost centres' expenditures are then observed and determined each month. (Office of Government Commerce, ed. 2001). It is evident that the sophisticated IT cost models identifies a higher share of the IT costs in contrast to the traditional IT cost models. Furthermore, the sophisticated IT cost model follows the ITIL model regarding the identification of costs based on consumption of resources. One recognized gap between the literature and practice is the duration between the occasions when the firm observes the cost centre's expenditures. Some firms argue

that they do it on an annually basis while others do it quarterly or even occasionally. While the ITIL model recommends monthly observation, the respondents that are working in firms with either a sophisticated or innovative IT cost model emphasizes the importance of this matter:

> Our storage utilization is measured once a year and allocated each month. The firm is now going to measure the utilization each month, but I believe that this will not significantly affect the amount of cost allocated.

> Another challenge is to assess how often these calculations should be made. In traditional ABC models there are standard costs. And how often are these standard cost revised? If there are external costs these can directly be applied into the model, or a standard cost can be used and then measure how well that cost matched the actual one.

Brandl (2008) points out that the drawback with this model is that it requires high measurement efforts and the benefits of such a measurement process must be weightened against the benefit. Apparently, the respondents have not experienced that the benefits of monthly measurements exceeds the higher efforts that it entails.

Firms with an innovative IT cost model are characterized by a high indirect cost awareness compared to less transparent models. One respondent had determined that their employee and consulting costs corresponds to 51 % of the total IT cost. These indirect employee costs are mainly identified through time reporting and then allocated to various cost centres. One respondent explains that indirect costs of shared infrastructure are depending on the organizational structure. If the resources are shared throughout the group or part of the group, costs of different resources can be collected at the different organizational units and then a cost share are allocated from these units. There could also indirect costs related to objects shared, for example projects. These objects are allocated in two different steps; first to the project itself and then to a project portfolio. The next step is to allocate the cost throughout the group with a key depending on who is utilizing it. The respondent means that it is hard to establish who is using a certain application or parts of the infrastructure. According to the cost allocation based on resource profiles model, cost identification of direct and indirect infrastructure costs are allocated to the accounts of different resources (Brandl, 2008). Even though there are some differences in treating the IT costs in the innovative IT costs models it is obvious that they treat them in the right amount of detail to assess the indirect IT cost correctly. It seems that both the literature and practice treat the identification of indirect IT costs similar.

Regarding the indirect IT costs there is a clear difference between the firms with a more traditional model that do not account for the indirect IT cost at all, to the firms with an innovative model that aims to account for all of the indirect IT cost. Apparently, depending on how much of the total IT cost that is identified it gives different basis for decisions and benchmarking. Obviously, a firm that only identifies half of the total IT costs compared to other firms with a more innovative IT cost model can think of themselves as cost effective. But, undoubtedly, the benchmark gives them a biased result.

6.3 Identification of IT cost of resources

In general, firms that use a traditional IT cost model identifies IT costs related to a specific resource in those cases when there is an associated invoice. One firm also used, in addition to invoices, specific project costs that only are related to certain resources. Brandl (2008) explains that traditional IT cost models do not identify costs regarding all their specific resources. Such identification process occurs only at more sophisticated models. One reason for not identifying such costs was given by a respondent:

> There is no benefit in doing a more detailed identification since there is no interest from stakeholders. Instead, we clump together specific services into a few key service areas in line with the organizational design of the IT department.

Clearly, this response to the necessity of IT cost transparency can be interpreted as that there is currently no need for the IT department to explain and clarify their operations to neither the top-management or to the end users. Under this circumstance, such process can then be experienced as unnecessary administrative work.

In intermediate models, two approaches of identification of IT costs of resources have been emphasised. Either are costs of specific resource not considered at all or the identification is done in the investment phase and the running costs of these resources are then monitored through quarterly prognosis. In the last method, manual ad-hoc analysis can be made to capture costs for a specific resource. Gerlach et al. (2002) explains that instead of using resource-consumption drivers for the activities that consumes hardware, software and physical space the authors assigned these non-dedicated resources to the activities using labour's activity drivers. This allocation assumes that the IT division's general usage of these resources is proportionally spread across the different cost objects. In one firm, activity based costing has been up to discussion. The respondent believes that the ABC method would be a better way of identifying costs of a particular resource since the allocation is made in advanced and ad-hoc analysis could be avoided. It seems that the firms with an intermediate IT cost model uses ad-hoc analysis to estimate the cost of a specific resource that requires a lot of manual work. Furthermore, there seems to be a gap between literature and practice. The respondent argues that ABC approach would be a better way of estimating such costs and the literature means that such costs are not precisely considered but instead dedicate to labour's activities.

Firms with a sophisticated IT cost model mainly identify the direct IT costs related to a specific resource through invoices and the indirect cost through consumption of the resource, i.e. CPU second of mainframe usage. Another firm uses initial product costing but do not track costs for specific resources over time. As mentioned earlier, the ITIL model involves identifying costs for specific resources to be able to assess a standard unit costs per IT resource (Office of Government Commerce, ed. 2001). Evidently, there is a gap between literature and practice in the case when the firm only assess the resource cost by initial product costing. Such cost should instead be measured by a consumption-based method.

Innovative IT cost models identifies IT costs to specific resources through a categorization process of invoices, or application consumption; an allocation from

each one of the hardware is taken place to that application, and the next step is to allocate that cost further. The firm identifies how many objects that drives and consumes resources. This should be made on different levels and to different receivers. Indirect cost is allocated through the resource centre and allocated to specific resources. Depreciation is considered when assessing the internal price for a resource when it is applicable. One respondent argued that the firm avoids allocating on a too detailed level and allocates on an aggregated level instead, taking business processes and user structures into account. The cost allocation based on resource profiles model explains that resources are for example UNIX server operations. Each resource has a consumption metric, for example processor time. Then, cost per consumption units (for example processor second) are calculated based either on forecasted or on past consumption levels (Brandl, 2008). According to the respondents' statements and the literature, there is a consistency between what is done innovative firms proposed in the literature. Regarding the consumption levels one respondent argued:

> There are two important purposes for monitoring for example the storage utilization. First, controlling IT. Control IT is something that you want to do in real time. You want to capture costs as soon as possible. The firms monitoring is based on this principle and they can watch ratios change in real time. Second, another purpose is to charge for the IT services you produce. Here, you want to be predictable and stable. You want to show the development over time. The IT department uses quarterly internal invoices and within this quarter they do a 'showback'. To be predictable and stable the IT department, on a yearly basis, sets costs responsibilities and standard costs. The variation is then affecting their profit or loss. This is done for the standard supply of IT services. Then they are sending invoices with an actual cost for development and projects that are directly demanded from the business.

It is evident that the firms with an innovative IT cost model use several steps and methods for identifying IT costs to specific resources. The resource costs are then allocated and summated into specific IT service costs. Once again there is a clear transition from the traditional IT cost models that only identifies the direct costs for specific resources in those cases there is an associated invoice. On contrast, the more sophisticated the IT cost models become, the more costs are identified to specific resources and can be allocated to specific IT services.

6.4 Allocation of IT cost to services and specific resources

Respondents from firms representing a traditional IT cost model states that they do not allocate costs to specific IT services or they allocate direct IT costs to key service areas. Furthermore, in line with the identification of IT costs to specific resources, the firms do neither allocate IT costs to such resources. This fact harmonizes with the literature. The literature predicts that traditional cost models only allocate to cost centres (Gerlach, Neumann, Moldauer, Argo, & Frisby, 2002). Firms with an intermediate IT cost model allocate IT costs to services in different ways. First, allocation is done through the TCO of a specific service and is assessed to cost centres which utilize that service. Second, one firm makes a distinction between development and operating costs. The total IT development cost is allocated to a specific IT service through time reporting where development hours for different projects are charged, while operating costs are not allocated to specific IT services. Gerlach et al. (2002) means that an important step in the ABC model is to assign activity costs to cost

objects (IT services). A critical decision in the ABC model is to define the activities at an appropriate level of detail. It seems that both firms assign costs to different services but with different level of detail. The first approach allocates the identified cost in the TCO process to a specific service as a whole, considering several cost categories. The other firm, which mainly uses in-house system production, uses time reporting of the IT developers to allocate their hourly rate to different projects. Fürer (1994) means that firms need to assign each activity centre one cost driver. For example processing: number of I/O operations, storage: size of attributed space or output: amount of printed pages. As for the cost allocation by time reporting, the firm could also use different cost drivers for resources that the IT service consists of. In the TCO perspective, the cost is measured once or on rare occasions and not driven by a certain driver. In the other case, there are probably additional costs (other than the hourly rate) that can be allocated to a certain IT service by the use of different cost drivers. It seems that the total cost of an IT service is not considered. In fact, according to a study by Forrester Research Inc. 78 % of all IT administrators admits that they cannot document weather or not desktop costs are increasing since they do not track TCO (Emigh, 1999). Brandl (2008) points out that the TCO of an application system develops questions about appropriate allocation keys for shared infrastructure resources with multiple application systems. The author points out that in contrast to costs for application support and maintenance, that uses cost drivers such as per change request or per help-desk call, the infrastructure cost drivers are associated with the resource consumption of applications. It is apparent that to be able to allocate cost for shared infrastructure, the firms using TCO as a method needs to track the resource consumption and not only the total cost of the resources since this will complicate the procedure of cost allocation to specific services. Firms with intermediate IT cost models do not allocate costs to specific resources. As in line with previous discussion, the consumption of specific resource are often not considered in firms with an intermediate IT cost model such as TCO or ABC.

The firms with a sophisticated IT cost model use several different simple allocation methods and allocation of IT cost to specific resources are either made by consumption based allocation keys or no allocation at all. One respondent stresses that they yearly assess the total cost of one service and allocate it by the number of yearly transactions. Another respondent emphasizes that they do not allocate per activity or such but they allocate per system and costs that are general in their character are generally allocated. The COBIT model emphasizes that firms need to capture and allocate actual cost and the difference between actual and forecasted costs should be analysed. In this research, the respondents in firms with sophisticated IT cost models have not emphasized the need to compare actual and forecasted costs. Rather they have stressed the usage of appropriate allocation keys:

> One allocation method (such as ABC) is not appropriate for all sorts of costs such as ERP or shared IT costs (monitoring or business administration systems). Shared cost and revenues or the number of employees cannot be used to divide these IT costs. There is no really appropriate key cost driver for such costs.

This can be seen as a beginning of a deeper awareness of the complexity of allocating IT costs to services and the correct application of allocation keys. Regarding allocation of costs to specific resources, these should be identified, as mentioned by the ITIL model, and it is reasonable to argue that firms with a sophisticated IT cost model also should be able to allocate them. The difference from the innovative IT cost

models is that the respondents do not have a proper solution for how to allocate all sorts of IT costs. In firms with an innovative IT cost model, the IT services are defined before beginning the allocation process. Then, the allocation of IT costs to services is seen as an extension of the identification process. One respondent explains that there are not direct IT service costs but rather direct and indirect components of the IT services and that the input factors are cost and time. These inputs are then arranged through spend towers, which are more detailed charts of accounts, to contribute to the total IT service cost.

Regarding indirect costs, there are a few different approaches. In general it depends on the type of resource. Time tracking and consumption of certain hardware is used for allocation. The indirect cost may also be allocated based on different keys such as turnover, number of employees and so on depending on the cost type. The keys may also be based on certain logic for specific resources depending on how they are utilized by a specific IT service. Brandl (2008) points out that because of the client/server architecture's heterogeneous and distributed nature it complicates the determination of usage-based cost shares. Respondent confirms and explains the dimensions of complexity regarding IT cost allocation to IT services:

> We strive for an as objective allocation as possible to increase the cost transparency. The IT resources have different natural transparency and the IT services received from external parties are often compressed into one cost that is hard to transpire.

> Depending on the service branch you work in, your costs are more or less direct. For example if you have further down the IT stack to a service databases, servers, and other things, they are more indirect. So the entire service operations (operation unit) have almost only indirect costs.

Clearly, the firms with an innovative IT cost model are aware of the complicated nature of IT costs and are using several methods deal with such complexity and to identify and allocate the IT cost properly. The cost allocation model based on resource profiles has a customer point of view on information and communication technology. Users are grouped into business units (internal customers), which use services accessible through user interfaces. These services are in turn built on backend applications, application systems, software and hardware infrastructure resources. Thus, the model uses services and their usage as a basis for cost allocation (ibid). In line with this model, the firms with an innovative IT cost model identifies and allocates costs of services based on the utilization of resources as a basis for their cost allocation to cost centres. A respondent gives three allocation methods related to different resource types:

> For example a server, which is seen as an indirect cost of an IT service, the firm catches time and materials related to servers. These are then linked to all the services that consume servers, application services and internal servers. Here the linkage keys are resource utilization based on CPU and RAM memory.

> Another example is managed workplace (MWP). In this case the firm catches the time and material that is connected to different aspects of MWP. Then these are allocated per device.

> Another example is storage. Time and material is captured related to storage. This is allocated related to the amount of storage that is utilized.

Brandl (2008) further explains how to measure the service usage through a resource profile. The usage is measured by the following metrics: amount of transferred data (bytes), computing: Processing time (seconds), amount of transferred data (blocks). This metric excludes disk space because that it is usually allocated a priori to a specific application or a database. He continues clarifying that besides this constraint, the storage input/output (I/O) of database servers is typically a bottleneck in OLTP systems. The cost shares per service are then calculated by multiplying the cost per consumption unit. As seen from the examples above, firms typically allocate resource costs to services through the utilization of seconds and bytes. They normally do not consider blocks to be a primary basis for allocation. Since the author above has recognized such storage to be a typical bottleneck, this is an important metric that firms should take into account while allocating resource costs.

Gartner argues that selecting a cost allocation method for an IT service depends on three different factors. The first factor is what behaviour to encourage. The second one is the needs of the business units, and third, the administrative abilities of the chargeback group (Blosch et al., 2003b; Gomolski, 2005, in Brandl, 2008). Several respondents have stressed these three factors. Regarding what behaviour to encourage one respondent said:

> The allocation keys needs to be based on drivers that can influence the behaviour and thus the cost. When one self can influence its own cost base, if cost allocation is not relevant then the users will receive a fixed cost each month without the ability to influence it. When one driver is found it should only be used to allocate relevant cost to the driver or the firm will not get much use if this allocation.

Regarding the second factor, the need of the business units, one respondent emphasized:

> The core of this allocation is to be able to connect all the IT costs to a certain management area and a specific system. The business side can then relate to these costs and it is possible to calculate the IT cost per business transaction i.e.. The firm wants to connect the value of IT to the business side's processes. All IT costs should be related to system and management objects, development or end users. It is a way of assessing IT cost versus the IT benefit. The business side will be able to on their own assess the value of IT related to their business processes.

> The business units are not interested in knowing if their costs are from CPU seconds or not, they want to be able to assess their IT cost in relation to their business process and will be able to say if it is to high costs. They should not say that CPU are too expensive, rather that it is expensive, do something! IT department should work as a medium of IT costs and have an open discussion with the business side what to do, and which applications to change. The business side need to comprehend the IT cost from their point of view. They know their systems and which routines those are good or bad, and which routines that helps them.

The third, and last factor, was emphasized by a respondent who said:

Our granular charts of accounts were too detailed and we are now reducing the amount of details. The firm spent too much time and costs for figuring out which accounts the overhead costs should be allocated to. There were cases with a lot of discussions when these cost not where correct allocated. We were too ambitious regarding the level of detail of the charts of accounts.

The problem was that we had not ensured the model and was unsure that we received the correct data. When trying the model, they constantly received different numbers. It was an inability to be exact and track these costs, and be stable over time. The granular of the chart of account only made this problem worse. It resulted in discussions about where to put different costs since it was hard to categorize the costs into distinctive accounts.

Another component of the problem was also that this model putted high demands of a controller to have high competence of different tools and keep in mind what the plan was, what had been said, what the forecast is and so on. So there were a lot of dimensions to track in each component.

Furthermore, we did not use all of the accounts in the granular chart of account, even though it was to be considered as a fair allocation for the internal customer

Obviously, the administrative abilities need to be considered when developing and choosing an IT cost model. In this case, their too detailed model and inability to maintain it properly resulted in unwanted discussions and problems that may have been avoided with a less detailed model.

6.5 Allocation of IT cost to cost centres

In firms with a traditional IT cost model allocation of the identified IT cost to cost centres is made through one allocation key or in total to a specific cost incurring cost centre. The firms in this research used per user variable cost, flat rate per user and a non-full negotiated standard cost when allocating cost to the business units. As one respondent putted it: "the allocation key 'per user' is thought of as reasonable and a compromise between simplicity and a fair representation". The literature explains that traditional cost accounting models uses for example fixed percentages, production volumes or measured usage rates for cost allocation to business units (Gerlach, Neumann, Moldauer, Argo, & Frisby, 2002). Even though authors have identified several drawbacks with such a simple allocation base the respondent had several arguments for justifying their method of choice. One respondent said "there is currently no demand from the top-management for a more advanced model". Once again the respondent claims that at least one of the stakeholders has no interest in allocating the IT costs with a higher transparency and a more advanced allocation method may be seen as unnecessary administration. Furthermore, respondents claimed that:

This is due to that if full costing chargeback were being made, the cost for example one workstation would be too high to be able to motivate that price.

If the full costs of shared infrastructure costs are allocated to the chargeback of a PC, it will produce such a high costs that it will be cheaper to externally buy the PC. We strive for minimizing administration irrelevance.

Internal prices for IT services were too high so we took the decision to outsource the IT department instead.

Naturally, the cost of the shared IT infrastructure affects the price of workstations when allocating the firm's total IT cost. As a response to this, a respondent working in a firm with a sophisticated model argued:

> External costs have been constant the last five years whereas internal employee costs have risen. The problem lies in what is included in the internal cost? Facility cost and so on. I experience that the internal versus external paradox now has decreased due to the constant information from the IT department what this added cost consists of.

It can be argued that to avoid the negative attitudes of too high prices, for in example workstations, firms need to communicate what the extra cost consists of and perhaps at the same time use more appropriate allocation keys. A respondent at a firm that uses a traditional cost model expressed that:

> Shared IT infrastructure cost is not allocated. There is no further allocation due to the perceived cost-benefit of this process. The IT department have no incentive to allocate any further because they are perceived as being cost effective.

This argument has two dimensions. First, there is no perceived cost-benefit of a further allocation. Second, the IT department are perceived as being cost effective from their stakeholders. The cost-benefit perspective implies that the cost of allocating is higher than the benefit that is received from that process. The sophisticated ITIL model points out that the drawback is that it requires high measurement efforts and the benefits of such a measurement process must be weightened against the benefit (Brandl, 2008). It is apparent that the respondent's concern is justified. The allocation process involves measurement process related costs and these must be contrasted to the potential benefits. One respondent at a firm with an intermediate cost model have identified several benefits with a more transparent model:

> The incentive for a more sophisticated IT cost model is to be able to monitor IT costs of a particular resource over time, to see how effective the IT department is, the resource's cost development and to set cost targets. Such information benefits the decision makers and the IT controllers.

The potential benefits of further cost allocation can be argued to be to know which business units, services or resources drives costs and be able to control them. Furthermore, taking correct decisions about for example liquidating a certain IT service with disproportional costs, without damaging business value, can be a potential benefit that may exceed the cost of allocation. The argument that the IT department is perceived as being cost effective turns once again the attention to the stakeholders and if correct share of IT costs is considered when benchmarking. When asked when there could be a potential benefit for the firm to use a more sophisticated allocation method the respondent answered:

> I believe that if the future IT costs is accelerating or if the IT department do not agree with the rest of the business of what is important or not, there could be a benefit of further cost allocation.

It is apparent that a more sophisticated cost allocation model is beneficial when a foundation for decision-making is needed. Furthermore, stakeholders' expectations of cost transparency seem to be an important decisive factor if the firm adopts a more sophisticated model or not. As a respondent working in a firm with an innovative IT cost model putted it regarding the stakeholder perspective:

> A basic driver for managers is 'create more with less – always'… Due to this fact, it is absolutely necessary to have tools to deal with critical attitudes of the stakeholders. What I had responsibility for last year; I run this house more efficient this year. We have made the maintenance needed. Then you have built a garage, this is something that you have added. We assess this garage in the same orderly manner, but if you compare last year with just the house and the house plus the garage, it is obvious that there is a difference in the total cost. We got out some synergies in the transition but it is obvious that the cost is higher. It is absolutely crucial to be able to show this to the stakeholders to be remaining at your position over time.

Obviously, if there are critical attitudes from the stakeholders, the managers needs to have the tools to be able to show how the IT costs is developing over time and to clarify what the total IT cost is consisting of and driven by. Such tools are only given by an increase cost transparency and thus a more advanced IT cost model.

For intermediate IT cost models allocation of IT costs to business units is based on at least one simple allocation key. One firm uses a general cost allocation to business units is for shared IT services and full cost is allocated to the cost centre (business units) that is the key user of that system. Another firm makes a distinction between development and operating costs. For development, costs that is not activated in the general ledger, is allocated to the business units based on their percentage of the total turnover. This cost is allocated to each business unit based on their percentage of the total turnover. Gerlach et al. (2002) explains that to be able to cover the cost using chargeback methods or user fees can ultimately collect it. There are several allocation keys for apportion costs to business units. As pointed out by the respondents, the firms with an intermediate IT cost model uses at least one simple allocation key for this purpose. As one respondent putted it:

> Regarding operating costs I experience that our cost allocation of the operating IT costs is not fine-tuned. Furthermore, I believe that we could use a more sophisticated allocation instead, for example per utilization, to create certain incentives for the business units. The benefit of a 'percentage of total turnover' allocation is that it is easy. The drawback with such an allocation model is that it does not reflect the business units utilization of IT services. I also believe that the cost-benefit of a more sophisticated allocation must be taken into account.

Considering the respondent's answer it is clear that sophisticated allocation keys could be more appropriate for cost allocation to cost centres if the aim is to be able to reflect their utilization of the IT services. Regarding the business units' service utilization level, it is apparent that allocation keys may generate different incentives. Thus, it may affect their behaviour. The respondent also points out that the cost of such an allocation must not be higher than the value that it creates. Clearly, no firm wants to adopt new routines that in the end do not give them any value. To be able to assess the value of a more sophisticated model, the firm needs to consider not only the

monetary value but also to actually be able to monitor, track and forecast their IT cost on a more detailed and accurate level than before.

In sophisticated IT cost models the allocation of IT costs to cost centres is service or resource specific. Mainly, identified indirect and direct costs of a resource or service are allocated to cost centres as a flat rate (also called 'management fee') corresponding to what the actual service or resource cost is. During the interviews there have emerged different allocation keys. Examples of such keys are that cost is allocated based on the number of services or resources the cost centres utilizes and storage is allocated based on consumption. The respondents also stress the fact that the users possibility to influence its own cost base:

> The allocation keys needs to be based on drivers that can influence the behaviour and thus the cost. When one self can influence its own cost base, if cost allocation is not relevant then the users will receive a fixed cost each month without the ability to influence it. When one driver is found it should only be used to allocate relevant cost to the driver or the firm will not get much use if this allocation.

> What the business can influence, it must also understand. Must find things that the end users can influence, the firm cannot control what the business cannot influence. Business cannot influence software CPU time.

> Managing per transaction creates wrong management effect since the end users cannot control their IT costs by reducing their amount of transactions since this also means that they i.e. needs to reduce their number of customer handlings. The responsibility of IT costs is on the wrong person (end user) since he/she does not understand what it is, cannot do something about it. It creates a wrong management effect. But the IT costs needs to be allocated so that it lands on a system owner, or system area so that a manager gets an overview of the systems and its processes, to establish if the cost if low or too high and assess what the problem is; correct information to the right employee.

Once again the respondents in firms with sophisticated IT cost models have identified an important and complex issue. To deal with such issue one respondent stressed the need of a dialogue:

> It is necessary to have a dialogue, explain the cost model and discuss how the cost is allocated and why and what the cost centres pays for. Many managers seek the best allocation method, but without this dialogue about what it is, and that the right person understands what it is, and how it drives costs, it does not matter. Without the dialogue, the managers can claim that the allocation is right and some cost centres are satisfied and others not. This will not accomplish a change in the cost centres behaviour, which is the goal of cost allocation.

In line with the respondent's opinion, chargeback approaches and processes are designed to directly or indirectly affect organizational objectives and decision-making (Hufnagel & Birnberg, 1989; Brandl, 2008). Furthermore, Blosch (2003b, in Brandl, 2008) argues that chargeback is an influential tool of infrastructure controlling. It can influence anticipated behaviour but also lead to investment setbacks, political tensions and biased use of IT services. Other author addresses the need of dialogue as the respondent points out to be an important success factor of cost allocation. Ross et al. (1999) argues that the untapped potential of IT chargeback is an intensive use of chargeback of administrative processes to inspire communication between IT and

business. This is done through regular negotiations about rates, services, communication of total costs and charges. This process supports a mutual understanding of requirements and costs that result in an improved business-IT partnership. In accordance with the authors' conclusions both the awareness of the potential of affection of organizational behaviour and communication of the allocation method are important factors to regard when choosing the allocation keys and designing the IT cost model.

The firms with an innovative IT cost model in this research used several different keys for allocating IT costs to the cost centres. One firm uses, among others, negotiations by a project committee for management objects. They can negotiate the IT costs down to the different IT cost classifications such as operating, development etc. The receivers of the chargeback are identified by the utilization of the system and consumption depending on the application type. The firm has no intention to allocate end user costs based on transactions. Another firm uses so called apportion keys and depending on the service and tries to find a sensible way to divide the consumption that occurs. It can be per user that is the base, per number of employees per sales or per transaction. These keys are communicated and agreed with the customers. Brandl (2008) concludes that it is complex to allocate costs for the provision of central business application systems due to that each application systems has its own infrastructure, application and support requirements, and one instance of the application system can be used simultaneously by several customers. The author also points out that infrastructure costs are related with a specific capacity level and resource consumption of applications is the main cost driver. Due to this complex nature the firm uses different methodologies regarding the allocation to the business units. One firm relies on negotiated terms regarding the management objects. This can be seen as a way of avoiding the complexity by adding subjective basis of the allocation. Another firm, that strives for sensible ways of allocating the IT service consumption to cost centres, uses several different allocation keys that are communicated and agreed with the receivers. Once again, using several keys instead of just one assesses the complexity.

Brandl (2008) stresses that the drawback with a resource profile model is that there are several processes that cannot be controlled that increases the resource consumption without the customer uses the service. This uncontrolled consumption is the resource consumption of the background activities. This grey zone is not something that has been addressed by the different respondents. This can be seen as either ignorance or lack of knowledge. The literature do not address to which extent the background activities consumes the services. For what is known, this consumption then may be negligible. Another drawback that has not been stressed by all the respondents is the lack of customer orientation, which means that it does not take into account metrics such as quality of service or required capacity. To overcome this problem, manager must be able to estimate the required capacity and resource costs for several alternatives (Brandl, 2008). One firm argued that they used real time monitoring for assessing the required capacity and computation of the resource costs. Obviously, if the chargeback is computed on the basis of only one scenario and no real time monitoring is made. There is an imminent risk of high variation of the resource consumption that may affect the IT department's profit and loss negatively.

The industrial firm Gartner implies that the allocation bases and method must be customer oriented and founded on simplicity, fairness, predictability and controllability (Blosch et al., 2003b; Gomolski, 2005, in Brandl, 2008). Some of these guidelines were being considered when creating an innovative IT cost model and the respondent emphasized that:

> The guideline of the linkage keys is fairness. What is the fairest formula to allocate costs to a service? The firm assessed the keys and were selected based on the ownership of these keys. This creates some implications due to the variations that are affecting the IT department's profit and loss.

In line with the Gartner guidelines the firm is said to use fair allocation keys based on the ownership of those keys. According to earlier discussion, the cost centres need to be able to influence and control their cost for the allocation keys to be successful, thus, ownership may be a good factor to consider. Furthermore, the respondent emphasizes the role of objective measures:

> Our allocation is fact based and if you introduce too much subjectivity, there are no buyers, everyone wants this for free and no one want to pays for it voluntarily. A CEO can possibly require that business units take on costs, but beyond this scenario, there is always a desire to avoid costs.

The same respondent also points out the need of predictability and stable fees:

> … another purpose is to charge for the IT services you produce. Here, you want to be predictable and stable. You want to show the development over time. The IT department uses quarterly internal invoices and within this quarter they do a 'show back'. To be predictable and stable the IT department, on a yearly basis, sets costs responsibilities and standard costs.

By using stable fees, managers at different cost centres are able to comprehend their IT cost and be able to do more probable budgets. Using an innovative IT cost model implies advanced IT cost measurements. The Gartner simplicity guideline is dealt with by using sensibility, simple allocation keys and communication:

> We uses so called apportion keys depending on the service and tries to find a sensible way to divide the consumption that occurs. It can be per user that is the base, per number of employees per sales or per transaction. These keys are communicated and agreed with the customers.

Even though technical metrics, that can be hard to comprehend, is used to measure resource consumption, the chargeback is based on several simple allocation keys that are easier for the end user to understand and relate to. As have been discussed earlier, these simple allocation keys should be chosen so that the cost centres can influence their own IT cost base, thus communication and the agreement with the customers should be an vital part of the allocation key success.

In general, traditional IT cost models has the benefits of being easy, simple to administer and 'gets the job done'. The IT department are characterized by experiencing a low stakeholder pressure for cost transparency and are considered to be effective. The drawbacks with such models are that it is evident that these firms do not consider the total IT cost, are not able to monitor the IT services or resources and

are not able to take appropriate decisions based on IT cost. As one respondent putted it:

> The budget is a guessing game because we do not know, but we always meet the budget close. This is more due to coincidence than anything else.

Furthermore, traditional IT cost models only uses one simple cost allocation key which causes perceived incorrect internal pricing. Such perceived incorrect prices has, in some cases, lead to an outsourced IT department. It is apparent that if the managers are not able to assess critical attitudes of the stakeholders correctly and show how the IT costs are developing and why, they may not be able to hold their position. One way to show such factors is to, as we have seen in sophisticated and innovative IT cost models, to adopt a more transparent IT and advanced IT cost model.

6.6 Dealing with the legacy

During the interviews several respondents have pointed out how the increased transparency may help deal with the running costs of the IT legacy. One respondent argued that:

> It is easy to adopt new IT without reduce the legacy. What is the cost of the complex of having several different IT solutions or having different IT solutions? This is something that the firm wants to add into the decision discussion. Earlier, the business side have been enthusiastic about a system but the IT department have not been able to assess the total cost of that system, they want to be able to give such accurate information to the business side decision maker fully is aware of what it actual costs and can make a decision on that basis.

It is apparent that an increase in cost transparency may lead to more accurate business cases and cost estimations since the IT department now are more aware of how much certain resources and IT services actual costs. This information may then be used in the business case to assess the future cost of the new investment. Another respondent added to the discussion:

> It would be interesting to measure how much the operational costs are versus how much it would cost to replace it. But how fast does the underlying IT structures change? How fast does the hardware platforms change in contrast to the software that runs on them, and then also the application life cycle. Looking back five years, how much has not the telephone area developed, with iPhones, androids and windows.

The respondent stresses the benefit of being able to assess the operational costs of an resource. This would mean that after investing in resources and communicating the actual cost of these, the IT department will be able to assess the running costs and do a follow-up to determine the variation of the estimation and the actual cost. The respondent emphasizes that the estimation of the lifecycle of a resource complicate the measurements:

> Some resources have long life cycles and some has very long life cycles, so what do you want to measure and what kind of decision-making base are you aiming for? It can vary very much, depending on the usage area. You have to put it in the right context and assess how long I the life cycle in this context, and then, describe what do we need to measure during this horizon, and how much does it

cost, and what benefits does it generate in the long run. The question is, how constant is the life cycle in the IT area?

Obviously, the lifecycle is an important factor to consider regarding IT cost measures of a specific resource. Even though it is hard to exactly comprehend the lifecycle of a resource, high cost transparency may enable detailed cost monitoring that, in the operational perspective, may give an indication of when the resource costs are dramatically changing, which will give an indication of the maturity level of the resource. The respondent also stresses the conversion pressure of the business process and the capitalization rate:

> IT is an automated part of the value creation process, it creates possibilities, and the question is what the value is of these possibilities and how fast you can capitalize on them.

The respondent's reflection of the conversion pressure of the business process can be interpreted as a direct link to the firm's propensity to change. Such willingness may be seen as a determining factor for the likeliness of the firm to adopt a high cost transparency model. High conversion pressure of the business process, in relation to the IT legacy and increased operational costs, may influence the firm to reduce and rationalize the IT legacy in order to respond to the pressure by investing in new IT solutions. But should be of the most importance that the firm do not rationalize resources that may harm neither the competitive advantage nor their future development. Another respondent emphasized the importance of high IT cost transparency in relation to new investments and the base line:

> It is crucial to be able to demonstrate changes in the base line. This was my start position; this is my end position, cleared of everything else. I can also demonstrate, this have we invested in. In the coming decenniums, IT is becoming more core business for everybody, and there is a underlying growth in IT and there is at the same time an underlying expectation to always reduce the IT cost, and I must be able to respond to this expectations. I can do more with less with the same base line, and then we add things and I must be able to demonstrate these two things. You must protect your base line or you will never be successful.

Apparently, the pressure of reducing the total cost of IT may lead to several undesirable outcomes. First, in firms with low cost transparency, reduced total IT cost may include the reduction of new investments or vital resources. Such decisions may affect the firm's competitive position negatively. Instead, if the firm is able to assess which resources that are less vital for the business processes, they may be able to reduce the total IT cost by rationalizing such resources without undermining the total investment budget and thus remain or even increasing their competitive edge. Second, if the IT department is not able to present the difference between running and investment cost, and are not able to demonstrate the starting position in relation to today's position, it will not be able to assess the efficiency of the IT department. Instead, by demonstrating the actions taken, the impact of the total IT cost and the development of the IT costs during the period, the efficiency of the IT department is comprehendible. Based on the discussion, a best practice model was created to assist firms in their work with their IT cost model (see Appendix B).

7. Conclusions

7.1 Contribution to research
Several gaps between the literature and practice have been identified and it can be concluded that the workload analysis is not made in practice. Instead, the firms focus their attention to the activities or cost units that drives the costs. Furthermore, the duration between the occasions when the firm observes the cost centre's expenditures is not consistent with the literature. Apparently, in practice the benefits suggested by the literature of performing monthly measurements have not been attained.
It can also be concluded that firms typically allocate resource costs to services through the utilization of seconds and bytes. They normally do not consider blocks to be a primary basis for allocation. The literature has recognized such storage to be a typical bottleneck. Finally, the literature has identified background activities that consume services. In practice, this consumption is either ignored or not detected.

7.2 Contribution to practice
In practice when firms' only assess the resource cost by initial product costing it creates a biased estimation. The literature emphasizes that such cost should instead be measured by a consumption-based method. Furthermore, the firms have not emphasized the need to compare actual and forecasted costs; they have rather stressed the usage of appropriate allocation keys. It can be concluded that if the chargeback is computed on the basis of only one scenario and no real time monitoring is made. There is an imminent risk of high variation of the resource consumption that may affect the IT department's bottom line negatively.

7.3 Conclusions
In total it can be concluded that IT costs can be classified in several different ways. Between the firms there is a clear spread from no classifications of IT costs to several different categories corresponding to strategy and responsibility. It can also be concluded that there exist differences regarding the identification of direct IT costs throughout the firms, but the primary method of identification is made through invoices received. Furthermore, in traditional IT cost models indirect costs are often overlooked due to unawareness or as an agenda to get senior management support while more advanced IT cost models identifies a higher share of the IT costs in contrast to the traditional IT cost models. The total IT cost identification gives implications of several management processes such as benchmarking or IT cost management.

It is evident that the firms with an innovative IT cost model use several steps and methods for identifying IT costs to specific resources whereas traditional models only identifies such costs when there is an associated invoice. In conclusion traditional IT cost models do not allocate cost to specific IT services or resources, only to key areas, whereas the firms with an innovative IT cost model are aware of the complicated nature of IT costs and are using several methods deal with such complexity.

It can also be concluded that the allocation to cost centres involves several different important aspects. First, the administrative abilities need to be considered when developing and choosing an IT cost model. A too detailed model and inability to maintain it properly may result in unwanted discussions and problems. Second, fair allocation keys based on the ownership of those keys should be regarded since the

cost centres need to be able to influence and control their cost for the allocation keys to be successful. Third, stability and predictability is important factors to consider in the IT cost model since cost centres need to comprehend their IT cost. Fourth, transforming advanced IT cost measurements into simple communicated and agreed allocation keys is important for the IT cost model to ensure it at different organizational levels. Fifth, the IT cost model should consider the potential effect of organizational behaviour.

Another important conclusions is that managers needs to have the tools to be able to show how the IT costs is developing over time, to assess critical attitudes of the stakeholders correctly and to clarify what the total IT cost is consisting of and driven by. Such tools are only given by an increase cost transparency and thus a more advanced IT cost model. It can be concluded that the firms have several incentives for increasing the IT cost transparency. Some of these incentives are to be able to monitor IT costs of a particular resource over time, to see how effective the IT department is, to get a better picture of whether there are costs that should be highlighted in order to reduce them and be able to set them against the benefits, be able to relate IT costs to the business processes they support and thereby to assess the usefulness of these systems provide in relation to cost. It can also be concluded that in the process of increasing the transparency the firm needs to assess the right level of detail so that the investment or on-going cost of maintaining transparency is not higher than the value of the more advanced IT model.

7.4 Future research

One limitation with the conducted research is that is does not include the wider extent of the process of identifying and allocating IT cost. Future research may focus their attention on the issues this process. Inspiration can be found in Segatto et al. (2013), which explains the wider context of business process management. The research should focus on how executive leadership, process design specialists, partners and interested third parties, clients, project managers, facilitators and owners of the process affect how firms work with identification and allocation of IT cost.

The proposed framework for categorizing firms regarding the maturity level of their IT cost model may provide an avenue for future research using different methodologies to explain differences in IT cost controlling performance. Inspiration can be found in Carr (2003) who argues that firms overestimate the strategic value of IT and Xue et al. (2012) which explains the ambiguous correlation between IT spending and output increase. The project should focus on if increased investments in IT cost models and IT controlling can create better conditions for IT's strategic value and a clearer correlation between IT spending and output increase.

Bibliography

Ax, C., Johansson, C., & Kullvén, H. (2009). *Den nya ekonomistyrningen.* Malmö: Liber AB.

Bahnub, B. J. (2010). *Activity-Based Management for Financial Institutions.* Hoboken: Wiley.

Baker, J., Song, J., & Jones, D. (2008). Refining the IT business value model: evidence from a longitudinal investigation of healthcare firms. *Proceedings of the International Conference on Information Systems.* Paris: Association for Information Systems.

Banker, R. D., & Bardhan, I. R. (2008). The role of manufacturing practices in mediating the impact of activity-based costing on plant performance. *Accounting, organizations and society* , 1-19.

Barton, N. (2006). Benchmarking, Outsourcing, And Evaluation In the IT Industry. *The 13th European Conference on Information Technology Evaluation* (pp. 1-14). Genoa: ECITE 2006.

Barua, A., Kriebel, C. H., & Mukhopadhyay, T. (1995). Information Technologies and Business Value: An Analytic and Empirical Investigation. *Information Systems Research* , 3-23.

Blosch, M., Woolfe, R., & Grigg, J. (2003). *Chargeback: How Far Should You Go?* Stamford: Gartner.

Brandl, R. (2008). *Cost Accounting for Shared IT Infrastructures.* Wiesbaden: Betriebswirtschaftlicher Verlag Dr. Th. Gabler .

Brynjolfsson, E., & Hitt , L. H. (2000). Beyond Computation: Information Technology, Organizational Transformation and Business Performance . *The Journal of Economic Perspectives* , 23-48.

Carr, N. G. (2003). IT Doesn't Matter. *Harvard Business Review* , 41-49.

Cho, W., & Shaw, M. (2009). Does IT synergy matter in IT portfolio selection? *International Conference on Information Systems.* Phoenix.

Cooper, R., & Robert, K. S. (1991). Profit Priorities from Activity-Based Costing. *Harvard Business Review* , 130-135.

Dalrymple, J., & Kelly, T. F. (2003). TCO Analysis. *World Trade* , 48-51.

David, J. S., Schuff, D., & St. Louis, R. (2002). Managing your IT Total Cost of Ownership. *Communications of the ACM* , 101-106.

Detlor, B. (2010). Information management. *International Journal of Information Management* , 103-108.

Dyche, J. (2012, 09 13). *Shadow IT Is Out of the Closet.* Retrieved 04 22, 2014 from Harvard Business Review Blog Network: http://blogs.hbr.org/2012/09/shadow-it-is-out-of-the-closet/

Emigh, J. (1999). Total Cost of Ownership. *Computerworld* , 52.

European Commission. (2003). Commission Recommendation. *Official Journal of the European Union* , 1-6.

Fürer, P. J. (1994). *Prozesse und EDV-Kostenverrechnung. Die prozeßbasierte Verrechnungskonzeption für Bankrechenzentren.* Bern: Paul Haubt.

Fink, L. (2011). How do IT capabilities create strategic value? Toward greater integration of insights from reductionistic and holistic approaches. *European Journal of Information Systems* , 16-33.

Gartner. (2014, 04 08). *IT Glossary.* Retrieved 04 08, 2014 from Gartner: http://www.gartner.com/it-glossary/total-cost-of-ownership-tco

Gerlach, J., Neumann, B., Moldauer, E., Argo, M., & Frisby, D. (2002). Determining the Cost of IT Services. *Communications of the ACM* , 61-67.

Gomolski, B. (2005). *electing a Chargeback Method Depends on the Business Unit and IT Service.* Stamford: Gartner.

Grover, V., & Kohli, R. (2012). Cocreating it value: new capabilities and metrics for multifirm environments. *MIS Quarterly* , 225-232.

Horngren, C. T., Datar, S. M., & Rajan, M. (2012). *Cost Accounting - A Managerial Emphasis* (Vol. 14). New Jersey: Prentice Hall.

Horváth, P., & Reinhold, M. (1989). Prozesskostenrechnung. Der neue Weg zu mehr Kostentransparenz und wirkungsvolleren Unternehmensstrategien. . *Controlling* , 214-219.

Hufnagel, E. M., & Birnberg, J. G. (1989). Perceived Chargeback System Fairness in Decentralized Organizations: An Examination of the Issues . *MIS Quarterly* , 415-430.

Hutchinson, R. (2013). Cost accounting and simulation: toward a post-structuralist understanding. In J. Y. Lee, & M. Epstein, *Advances in Management Accounting* (pp. 159-184). Bingley: Emerald Group Publishing Limited.

Irani, Z., Ezingeard, J. N., & Grieve, R. J. (1997). Integrating the costs of a manufacturing IT/IS infrastructure into the investment decision-making process. *Technovation* , 695-706.

IT Governance Institute. (ed. 2005). *COBIT 4.0 . Information Systems Audit and Control Association.* Illinois: Rolling Meadows.

ITIL. (2011, 01 01). *Translated Glossaries - ITIL Glossaries*. Retrieved 04 10, 2014 from ITIL: http://www.itil-officialsite.com/nmsruntime/saveasdialog.aspx?lID=1180&sID=242

Johnson, H. T., & Kaplan, R. S. (1987). *Relevance Lost: The Rise and Fall of Management Accounting.* Boston: Harvard Business School Press.

Kaplan, R. S., & Anderson, S. R. (2004). Time-driven activity-based costing. *Harvard business review* , 131.

Kaplan, R. S., & Atkinson, A. A. (1998). *Advanced management accounting* . New Jersey: Prentice Hall .

Krcmar, H. (2004). *Informationsmanagement.* Berlin: Springer.

Krumwiede, K. R., & Roth, H. P. (1997). Implementing information technology innovations: The activity-based costing example. *SAM Advanced Management Journal* , 4-13.

Kvale, S. (1997). *Den kvalitativa forskningsintervjun.* Lund: Studentlittertur.

Lee, J. Y., & Mark, E. (2013). *Advances in Management Accounting.* Bingley: Emerald Group Publishing Limited.

Love, P. E., Ghoneim, A., & Irani, Z. (2004). Information technology evaluation: classifying indirect costs using the structured case method. *The Journal of Enterprise Information Management* , 312-325.

McGowan, A. S., & Klammer, T. P. (1997). Satisfaction with Activity-Based Cost Management Implementation. *Journal of Management Accounting Research* , 217.

Miller, J. G., & Vollmann, T. E. (1985). The hidden factory. *Harvard Business Review* , 142-150.

Mohamed, S., & Irani, Z. (2002). *Developing taxonomies of information system indirect human costs* . Salford: University of Salford .

Mukhopadhyay, T., Kekre, S., & Kalathur, S. (1995). Business Value of Information Technology: A Study of Electronic Data Interchange. *MIS Quarterly* , 137-156.

Office of Government Commerce. (ed. 2001). *Service Delivery.* London: Stationery Office Books.

Owen, G., & Law, J. (2005). *A Dictionary of Accounting* . New York: Oxford University Press .

Pavlou, P. A., Housel, T. J., Rogers, W., & Jansen, E. (2005). Measuring the Return on Information Technology: A Knowledge-Based Approach for Revenue Allocation at the Process and Firm Level   . *Journal of the Association for Information Systems* , 199-226.

Perkins, B. (2008). Chargeback with less drama. *Computerworld* , 34.

Ross, J. W., Vitale, M. R., & Beath, C. M. (1999). The untapped potential of IT chargeback. *MIS Quarterly* , 215-237.

Segatto, M., Inês Dallavalle de Pádua, S., & Pinheiro Martinelli, D. (2013). Business process management: a systemic approach? *Business Process Management Journal* , 698-714.

Silverman, D. (2011). *Interpreting qualitative data.* London: SAGE.

Turney, P. B. (1977). Transfer Pricing Management Information Systems . *MIS Quarterly* , 27-35.

van den Hoven , J. (2006). Data Architecture Standards for the Effective Enterprise. *Information Systems Management* , 61-64.

Venkatesh, V. (2010, 01 01). *Rankings Based on AIS Senior Scholar's Basket of Journals*. Retrieved 04 28, 2014 from Vvenkatesh: http://www.vvenkatesh.com/isranking/

Xue, L., Ray, G., & Sambamurthy, V. (2012). Efficiency or innovation: How do industry environments moderate the effects of firms' IT asset portfolios? *MIS Quarterly* , 509-528.

Zimmerman, J. J. (2011). *Accounting for decision making and control* (Vol. 7 ed.). New York: MacGraw Hill.

Appendix A

Interview questionnaire

QID	Question/Information
A	Respondent's opinions are depersonalized and treated confidentially.
B	Background description and purpose of the study.
C	Description of terms used in the interview.
Q1	Formal role and duties - 1.1 Can you tell us briefly about yourself and your history at the firm? - 1.2 What is your current role and what responsibilities do you have? - 1.3 What activities do you perform in your work?
Q2	IT costs - 2.1 How does the firm make classifications of IT costs? - 2.2 How does the firm work on compiling cost of a specific IT service?
Q3	Identification of IT costs - 3.1 How does the firm identify direct IT costs? - 3.2 How does the firm identify indirect IT costs? - 3.3 How does the firm identify costs (direct and indirect) for a specific resource?
Q4	Allocation of IT costs - 4.1 How does the firm allocate IT costs to specific resources? - 4.2 How does the firm allocate IT costs to specific IT services? - 4.3 How does the firm allocate IT costs to cost centres?
Q5	Open questions - 5.1 Was there a question you expected that never showed up? - 5.2 Do you have any questions for me so far in the study?

Appendix B

Best-practice model

A best-practice model has been recognized regarding identification and allocation of IT cost.
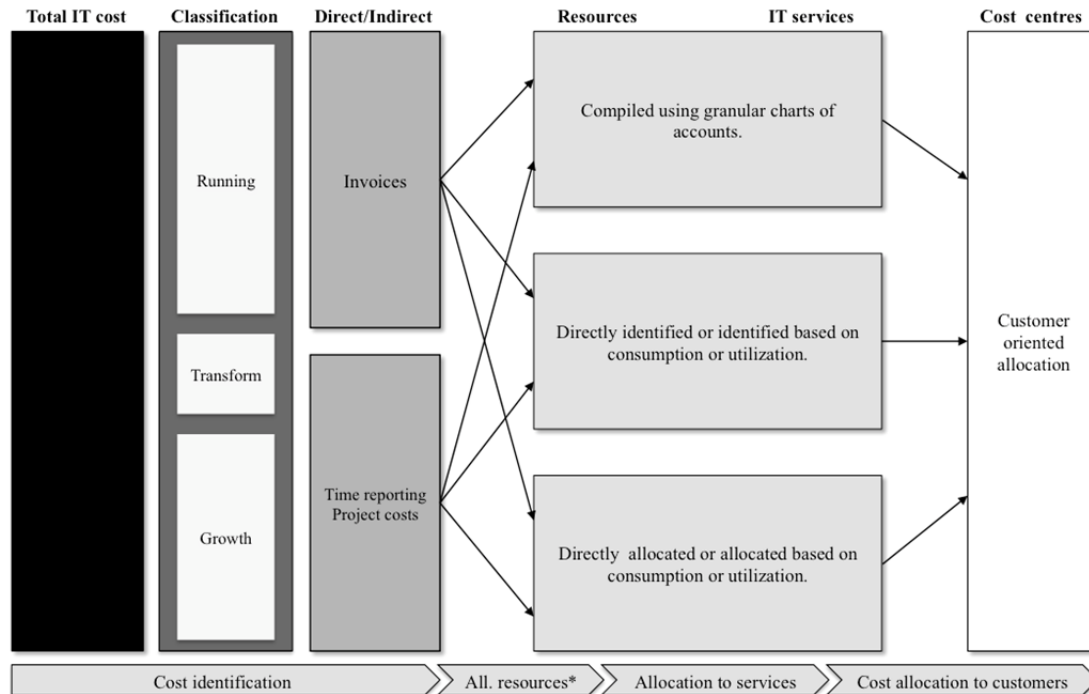
Figure 11: Best-practice model of the operationalization of identification and allocation of IT costs.

Identification and allocation of IT cost
The classification of IT costs should create better conditions for business improvements and new IT investments. Thus, the running, transforming and growing IT cost should be considered. This classification should promote running cost rationalisation and growth projects. Furthermore, responsibility should be given in line with the classification. Invoices and time should be used to be able to identify both direct and indirect IT cost through the general ledger. Project costs should be included if the firm does not use internal chargeback for projects. The cost related to specific resources should be allocated through consumption or utilization. The costs are then compiled using granular charts of accounts. Costs related to specific IT services should be identified and allocated based on consumption or utilization of resources. The costs are then compiled using granular charts of accounts.

Allocation to cost centres should be based on a customer oriented approach. A customer oriented IT cost model has four dimensions: fairness, simplicity, predictability and controllability. *Fairness* – consumption based, communicated allocation keys. *Simplicity* – allocation keys that are easy for the end-user to understand but do not restrict the usage of proper allocation keys. *Predictability* – yearly flat rates allocated using simple and fair keys, measured yearly or quarterly. *Controllability* – the allocation keys should be based on factors that the cost centres

are able to control, for example number of PCs or the utilization rate of a certain system and so on.

Further considerations
There must be a close link between the IT department and the business side. Certain employees must have the knowledge of both sides to be able to minimize the 'we against them' issue. It does not matter if they are stationed at the IT department or at the business units. These 'cross functional' employees are then able to help the business side to assess the IT cost in contrast to the IT benefit. The IT department must be aware of their administrational limit. Using too granular charts of accounts creates unwanted administration and discussions about to which account the cost should be allocated. The allocation must not put the IT cost responsibility on the end users. The end users do not have the proper insight and knowledge to be able to take decisions regarding IT investments. They should be included in the process but not have the final responsible for the IT cost; it should be put on the firm's IT managers. The IT cost model should be able to demonstrate changes in the base line. By increased IT cost transparency the managers can determine previous year's base line compared to current year included new investments and rationalizations. Finally, the model should support the rationalization process of the running IT cost. With an increased cost transparency, firms can assess and rationalize lifecycle resources or IT services in relation to the necessity to the firm's operations.