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## **BARRIERS OF ESCO SERVICE BUSINESS IN FINLAND**

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## **ABSTRACT**

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The purpose of this study is to determine what are the key barriers hampering ESCO service business success in Finland. Research approach for this study is qualitative. Data was collected using Delphi method with two questionnaire rounds. Internet based tool was applied in carrying out questionnaires. Respondents of the questionnaires were ESCO service experts and researchers, and people working for ESCO service providers. Characteristics of ESCO service and ESCO project implementation are analyzed by using transaction costs theory of service business.

In terms of ESCO service in Finland, uncertainty and asset specificity are relevant dimensions of TCE. General uncertainty in world's economy hinders demand for ESCO service, and asset specificity of ESCO contracts induces slight problems for project financiers. Also bounded rationalism and opportunism are present in Finnish ESCO business. The most significant barriers of success of ESCO service in Finland are problems in legislative and political frameworks, and in customers' investment processes. ESCO service providers should move more strongly towards service dominant business logic and improve understanding of customer needs. Political barriers are unsuitable procurement processes, unclear and unpredictable laws, and lack of compelling factors in subsidy system. Investment process hurdles are caused by customers' lack of interest to change course of action. These are things in which ESCOs can have influence in.

## ACKNOWLEDGEMENTS

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First of all I would like to express my gratitude to Professor Satu Pätäri for her untiring support and dedication to this study. Initial idea for this extremely interesting topic was given by her so great many thanks for that. Secondly, huge acknowledgements belong to all of those enthusiastic ESCO service experts who sacrificed their precious time and answered the questionnaires. Without you this theses wouldn't have been possible or at least sensible. Hopefully this study has brought some new insight for all.

Lastly, I must thank my friends and family for having energy to support my studies even after I decided to broaden my studies from energy technology to business degree. I'll promise that this is enough, for now.

Lahti, 4.8.2013

Anssi Sinkkonen

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## 1 INTRODUCTION

Throughout the history, large scale phenomenon have influenced in behavior of people, legislators and governments. These large social, economic, political, and technological changes can be called megatrends (Kotler 1997). Generally acknowledged megatrends are, for example, globalization, population growth, and technological developments. One major area, in which huge changes have been occurred and will occur in the future, is everything related to energy. Scarcity of natural resources, concern about the environmental degradation, and observed climate change have forced governments and research activities, together and individually, seek for alternative sources of energy, ways to reduce greenhouse gases and other pollutions, and to improve efficient use of energy.

Environmental aspects are not the only reason for attempts to enhance energy efficiency and to seek alternative energy sources. There are economic incentives present as well. Sudden rises in fuel prices have already caused serious problems for world economy in the history. For instance, two oil crises in 1970's raised the attention to the fact that world's economic systems relies on fossil fuels and other finite natural resources. Consequently possibility of new energy related crises cannot be ruled out. Concern for environment combined with its economic aspect has encouraged companies and government institutions to develop new energy technologies. (Kotler & Keller 2012, 102; Kotler 1997, 157)

Improving energy efficiency and reducing carbon dioxide emissions are high priority goals for European Union (EU). Hence, EU has established legislation and regulation in order to achieve these goals. Most significant of those are Directive on Energy End-Use Efficiency and Energy Services (2006/32/EC), European Performance of Buildings Directive (2002/91/EC and recast 2010/31/EU), Cogeneration (CHP) Directive (2004/8/EC), and Eco-design Directive (2009/125/EC). In addition, many national level actions have been done in various countries (Marino et al. 2011).

EU's legislative framework and political decisions made by EU member states have opened new business opportunities for energy related business models.

One of these versatile business models is so called ESCO business model. ESCO refers to Energy Service Company, and idea of ESCO business model is to produce versatile services which aim, for instance, to improve client's energy efficiency in various ways and to achieve cost savings. ESCO business model differs from traditional service business models in its peculiar earning logic where remuneration is based on the savings achieved in ESCO project on a way or another. (Marino et al. 2010, 1–5; Marino et al. 2011, 6192–6193)

It has been recognized that ESCO business model can enhance energy efficiency, generate cost savings and save environment. Despite that, ESCO business model has not achieved expected level of diffusion. It has been noted that the energy service market in the European Union is far from utilizing its full potential (Marino et al. 2010, 5). How can it be that evidently good business model is not in use on a larger scale? This question and unexploited possibilities of ESCO business model makes ESCOs worth of study. (Sinkkonen & Pätäri 2012)

## **1.1 Background of the study**

This study is part of joint project of LUT School of Business and LUT Energy. Main project is called New Energy Services for Dynamic Markets (NESDyM), and its purpose is to work out how to develop new energy services, and how to successfully manage these novel business models. As said, the research is done in Lappeenranta University of Technology in interdisciplinary manner, i.e. the knowledge of business as well as technology is utilized in the research.

NESDyM-project consists in total of five work packages, in which topics of business model development, policy enablers, internationalization of services, business model acceptability, and life cycle cost calculation, to name a few, are studied. Common in all work package topics is that they all are related to energy business. So far, some research relating to this project has already been done. For instance, Tiia Tulokas (2012) studied in her master's thesis the success factors of Danish energy industry. In addition, Kirsi Sinkkonen and Satu Pätäri (2012) have studied previous literature in order to explain the barriers of the

development of energy service companies. The latter study is essential for this research because the results of Sinkkonen's and Pätäri's study are developed here further.

## **1.2 Objectives and positioning of the study**

There is a wide range of studies on ESCOs and on energy efficiency businesses as a whole. Many of those papers study the situation in Europe. There are also several studies which identify barriers of ESCOs' development at a general level. However, there are no comprehensive researches made on ESCO success barriers particularly in Finland, at least according to our present knowledge. Therefore, this study is limited to cover Finnish ESCOs only. More precisely, the focus is on ESCO firms which provide services for other companies (B2B-firms) and/or for the public sector. The scope of interest in this study is not only on the views of people working for ESCO service providers but on the views of ESCO service specialists even though they would not be working for any ESCO service provider. In other words, the views of ESCO service providers' customers are omitted from the study. The reason for this is that the customer group is quite scattered and it is extremely difficult to identify actual customer's ESCO project decision makers. In addition, entities included in this research must meet the general requirements for ESCOs. These requirements are defined, for instance, by NAESCO (NAESCO: National Association of Energy Service Companies 2011) which operates in the USA, and by the European Association of Energy Service Companies (eu.ESCO) which, in turn, operates in Europe.

The relevance of this study stems from the urgent need for boosting the development of energy efficiency in order to accomplish the ambitious environmental targets of the EU, but also in the desire of generating vital new business opportunities into Finland. By and large, there is a high level of engineering competence of energy issues in Finland. Hence, by attaining profound insight of energy business development, more successful energy efficiency businesses can be established. For these reasons, this study is reasonable.



The objective of this research is to gain new information on the ESCO success barriers in Finland. The purpose is to test if success barriers found in previous literature analysis made by Sinkkonen and Pätäri (2012) are actually those which hamper ESCO business development in Finland. Research questions are formed on the basis of Sinkkonen's and Pätäri's research. The main research question is formed as follows;

*What are the key barriers hampering success of ESCO service business in Finland?*

To attain sound answer for the main research question, three secondary research questions are formed as follows;

- 1. Does the legislative and political framework in Finland provide business environment which enables development and success of ESCO business model?*
- 2. Does the funding framework for ESCOs work properly in Finland? What kind of financing model suits best for ESCO business model?*
- 3. Is there any mistrust between ESCOs and their customers which could create barriers for successful ESCO activity? Is the awareness of ESCO-model at sufficient level among potential customers?*

The main goal of this study is to attain answers for determined research questions, and perhaps gain some new insight in factors effecting ESCO service business in Finland. Answers for research questions are formed via empirical study. Study is carried out as a Delphi questionnaire study from which new insight is composed.

### **1.3 Theoretical framework**

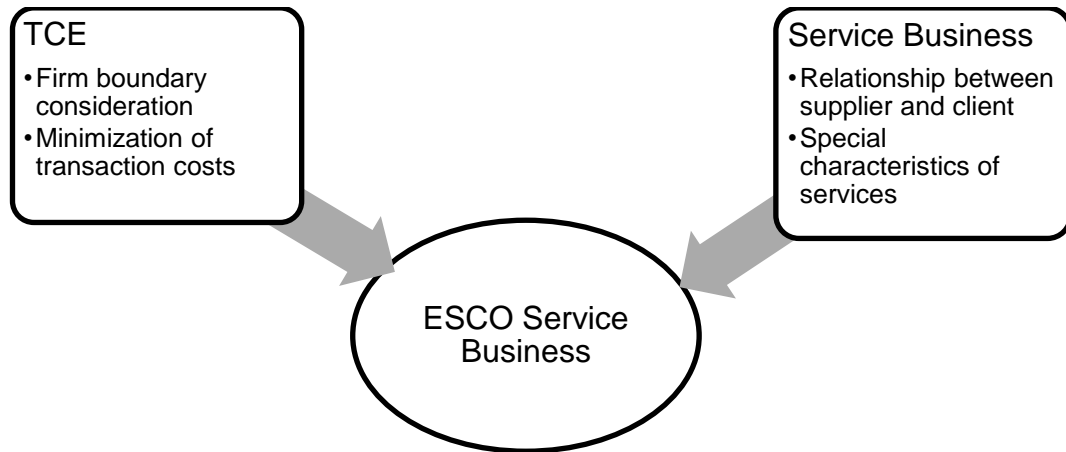
In ESCO-business, suppliers offer various energy related services to customers (Marino et al. 2011, 6191). Purpose of these services is, for instance, to carry

out tasks, processes, and projects which customers might otherwise implement by themselves. Decision-making associated with these kinds of problems determine the boundaries of the firm (Williamson 1981, 556).

Determination of firm boundaries which includes interaction between different entities, e.g. selling and buying goods and services, is theorized in business sciences, for instance, with transaction cost economics -theory (TCE). Transaction cost economics is one of the major theories found in social sciences and therefore credible and widely acknowledged in scientific community (Carroll & Teece cited in Carter & Hodgson 2006, 461). Hence, transaction cost approach suits well for the purpose of this research. Basis for transaction cost economics lays in the works of John R. Commons (1931) who published his thoughts in the article called Institutional Economics, and Ronald Coase (1937) whose article The Nature of the Firm introduced explanation why companies form partnerships and interact with each other instead of merely trading through markets. Third and perhaps the most important author in development of transaction cost economics to its contemporary form was Oliver E. Williamson. In his work, Williamson (1979; 1981; 1998; 2005) introduced a theory for evaluating different governance structures and principles on which basis appropriate governance structure should be selected in firms.

Different governance structures and transactions between different entities cause so called transaction costs (Levy 1985, 444). One form of economizing transaction costs are make-or-buy-decisions. The goal of make-or-buy-decisions is to determine the best and most profitable way to use available facilities and resources (Horngren & Harrison 1992, 1172). Therefore transaction cost economics, as well as make-or-buy decisions for that matter, are feasible theoretical frameworks for evaluating ESCO's transactions with its stakeholders.

In addition to transaction cost economics, characteristics of service business are relevant in terms of ESCO-business model, since the key idea of ESCO-model is, after all, to produce services for clients. Therefore, in the theoretical framework of this study, service business theory is also included. Theoretical framework of the thesis is summarized in Figure 1.



**Figure 1** Theoretical framework of the thesis

Another possible way to approach the problem of determining the boundaries of the firm could be the theory of resource-based view (RBV). In RBV firms are described by their resources, capabilities, and endowments, for instance. RBV, however, is mostly used for analyzing firm's competitive advantage instead of the organizational structures of the firm. Therefore resource-based view is excluded from the theoretical framework of this study. (Williamson 1998, 48; Wernerfelt 1984)

## 1.4 Research methodology

Research approach of this study is qualitative, so no large data sets are handled. Instead, information is obtained from a small and well selected group of experts. In this research, data is collected by using a Delphi questionnaire which was originally developed by the Rand Corporation in 1950s (Woudenberg 1991, 132). This research method, data is collected by using questionnaires. From the basis of answers given in questionnaires, solutions for the research questions are drawn.

In this study, Delphi-type questionnaire was conducted by using Internet-based survey tool. This kind of survey tool is well suited for the purpose of this study since utilizing web-browser for submitting the answers for the questions is very user-friendly way of carrying out the survey. At first, participants were approached via e-mail where their tentative willingness to participate in the survey

was inquired. Then an e-mail containing a link to the survey was sent to the attendees.

The study consists in total of two survey rounds. Twofold structure of the study was found appropriate since in this way the motivation of the participant was expected to remain high. The benefits from additional survey rounds were also considered to be small given available time and resources. Questions for the first survey round are conducted on the basis of the research questions in a way that all essential dimensions are covered. In the following round, the questions were adjusted according to the results attained from the first round.

## **1.5 Structure of the study**

There are two main parts in the study. In the first part theoretical background of the study is introduced. Purpose of the theoretical part is to examine the theoretical environment in which the problem under study belongs to. Both transaction costs economics and service business issues are discussed in first part. In addition, some applications of transaction cost economics in various research settings are introduced in order to understand possibilities of transaction cost economics.

Second main part of the study consists of the empirical research. At first, research design is presented. Then ESCO service model is discussed more thoroughly. The special characteristics as well as previously identified success and hampering factors of ESCO business are presented here. Secondly, results from both questionnaire rounds are presented in terms of different topic. Lastly, obtained results are analyzed, research questions are answered, and main findings of the study are summarized.

## **2 FIRM BOUNDARIES AND SERVICE BUSINESS**

Optimal boundaries of the firm can be determined via transaction cost economizing analysis. Economizing of firm's transaction costs are done by following the principles of transaction cost economics -theory. In the following chapters basic idea of transaction cost economics is presented. In addition to transaction cost economics, theory of service business is another key concept of this thesis. For this reason, main principles of service business from the business-to-business perspective are discussed. Lastly, some previous studies applying transaction cost economics are presented in order to enhance insight of in which kind of research settings transaction cost approach can be used for.

### **2.1 Transaction cost economics**

Transaction cost economics (TCE) originates from two separate fields of economic research, new institutional economics and new economics of organization (Williamson 1998, 23). The new institutional economics consists of two parts which deals with institutional environment and institutions of governance. In the scope of this research, nevertheless, these areas of economic research are not introduced in detail. However, it can be stated that all of these have played an important role in the history of transaction cost economics. In addition to studies of institutional economics and organizational issues, literature of economizing and contract law are essential parts of transaction cost theory (Williamson 1981, 550,573). In the case of transaction cost economics, contract law refers to issues related to firm's governance.

Originally, the primary purpose of transaction cost economics was to determine the boundaries of the firm, i.e. the scale and the scope of the firm. The boundaries are determined by economizing the transactions of the firm in a way that the total costs of transactions are minimized. Economizing the transactions is achieved by selecting proper governance mechanism for the particular transaction (Håkansson & Lind 2007, 888). What this mean is that the decisions concerning for instance the size of the firm and the activities done within the firm are made on the basis of TCE analysis. (Shelanski & Klein 1995, 335–336)

In the following parts the basic theory of the firm behind the TCE is presented. After this, the key dimensions of classifying transactions and factors of human behavior are discussed. Finally, principles of economizing transactions and basis for firm boundary decisions are presented in summarizing manner.

### **2.1.1 Theory of the firm – basis for transaction cost economics**

Theory of the firm examines how economic system should be structured and why firms are dominant way of organizing economic system. Foundation of the theory of the firm study stems from the work of Ronald Coase who gave new insight to the study of economic system and found that there are also other reasons for establishing firms than division of labor. As early as late 1930's Coase raised questions that "Why are there firms?" and "Why is not all activity organized in one large firm?" Coase's ideas launched the study of theory of the firm which eventually laid the foundation for later development that led to the emergence of the transaction cost economics. (Coase 1937; Williamson 1981, 550)

The unit of interest in theory of the firm is in individual firms rather than whole industries. However, firms do operate in collaborative exchange economy in which firms must make decisions on how they are allocating their scarce resources. According to Coase (1937, 393), resources are organized and therefore the economic system is coordinated on the basis of the price mechanism. Price mechanism refers to the way prices of goods and services are formed on free markets. On free markets, the buyer's demand and seller's supply are balanced via price mechanism which forms an equilibrium price for the commodity being traded. (Coase 1937, 386)

Traditional economists considered the economic system to be self-acting, which means that the demand and supply adapt to each other elastically. In history, economists also suggested that because the market is thought to be efficient, it is always cheaper to contract out, i.e. use price mechanism, than to hire people. The system where faceless buyers and sellers meet to exchange goods at equilibrium price is called a non-transaction specific governance structure (Williamson 1979, 247–248). There are many other possible governance struc-

tures for exchange of goods or services between technologically separate entities in addition to non-specific structure. Decision making related to these structures is discussed in chapter 2.1.4 of this study. (Coase 1937, 387, 393).

By definition, utilization of the price mechanism is not free of charge. Costs of the price mechanism consist of determining what the relevant prices for goods and services should be. Costs of obtaining a good or service are thus more than just the price of the commodity. Coase (1937) named these costs transaction costs which purpose is discussed in more detail later in this thesis. If a bundle of resources are combined, and an organization, such as a firm, is formed, the costs of using the price mechanism can be decreased due to the economies of scale. Economies of scale refer to situation where a supplier provides goods or services to many customers and so achieve lower unit costs (Dabhilkar 2011, 160). In addition, if a certain good or service is acquired frequently it may be desirable to make a long-term contract for the supply of good or service instead of applying the price mechanism for every transaction that has to be made. For this reason – the costs of the price mechanism – Coase stated that it is more profitable to establish a firm, i.e. combine smaller entities and actions to one bigger one, rather than to continue to operate individually. Coase also emphasized that transactions will be organized in a firm if the costs of doing so are lower than the costs of using the market, i.e. the price mechanism. Although governing economic activity through a firm can reduce the costs of using market mechanism, the costs cannot be completely eliminated. Hence, consideration of different transaction governance structures is essential in determining firm boundaries. (Coase 1937, 390–391; Williamson 1981, 550)

In addition to the question of why do firms exist, Coase raised the question of why all activity is not organized in one large firm (Williamson 1998, 32). This would obviously be profitable in terms of minimizing the costs of using the price mechanism. But as said, there are costs of using the price mechanism which cannot be eliminated. For this reason, determination of firm boundaries, i.e. determining the size of the firm, is an optimization problem where the costs of different governance structures must be evaluated. The simplest case of optimizing governance structure is a decision-making process between organizing ac-

tivities within the firm and purchasing activities from the market. A firm grows in size when additional transactions are organized by the entrepreneur, i.e. the firm, and a firm becomes smaller when the entrepreneur abandons the execution of some transaction previously done within the firm (Coase 1937, 393).

As mentioned, expanding firm size can reduce unit costs of single transaction. Coase (1937) stated, however, that marginal benefit of expanding the firm decreases while the firm grows. What this means is that benefits of integrating an activity or a transaction into the firm compared to the costs of using the price mechanism become smaller as firm grows. This is the factor which defines the size of the firm, i.e. the firm boundaries. Simplistically it can be said that a firm tends to expand as long as the costs of organizing the additional transaction, i.e. activity, within the firm are lower than the costs of exchanging on the open market. Expansion stops and firm has reached its optimal size when it becomes profitable to organize extra transactions with the market mechanism. (Coase 1937, 394–396)

Reasons, why firm expansion ceases to be beneficial, are many. If a firm grows too large organization might become too rigid and hence execution of internal transaction could become costly. Another reason for the expensiveness of large organization can be the difficulty of allocating production factors in the most efficient way. For instance, processes which are not firms core business. Smaller units are able to concentrate on the things they do best better than large ones because larger units have to deal with various activities in which they probably do not have the best available knowledge. Smaller firms might also have higher incentives to succeed in activities they are performing because the whole existence of the firm might depend on that. When there is no room for errors, motivation of the organization is high. Therefore smaller firms might be able to get more out of the same resources than larger firms can. (Coase 1937, 394; Williamson 1998, 44)

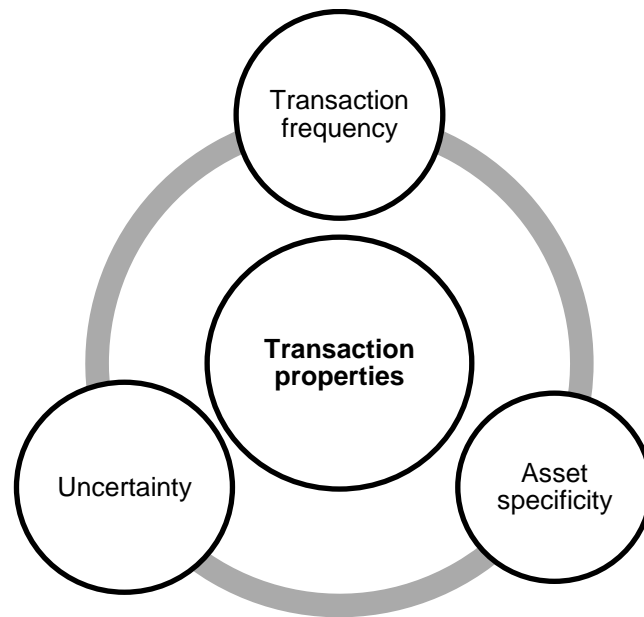
In theory of the firm, Ronald Coase presented two simplistic alternative forms of coordinating production; a firm and market. He also suggested that outside the firm a series of market exchange transactions determine the prices of goods



and services. In addition, within the firm production is coordinated by entrepreneur coordinator, and through careful analysis of internal costs of operation and external transaction costs, the boundaries of the firm should be determined, i.e. a firm must decide when to integrate and when to rely on the market. Albeit Coase's model is too simple and narrow to fully explain the situation in reality, it gave good grounds for later study on boundaries of the firm. (Coase 1937, 388, 550)

### **2.1.2 Key dimensions of transaction cost economics**

Williamson has identified, and other researchers have verified three dimensions which are essential in describing transactions (Håkansson & Lind 2007, 888; Dabhilkar 2011, 159). Dimensions presented by Williamson are uncertainty, frequency with which transactions recur, and asset specificity. In addition, a dimension of complexity of the trading arrangement appears in the literature of transaction cost economics (Shelanski & Klein 1995, 337). Complexity, however, largely corresponds to dimension of uncertainty (Slater & Spencer 2000, 74), and therefore complexity is seen parallel to uncertainty in this thesis. Even though complexity refers in this context complexity of the known matters at hand, when as uncertainty refers more to the unawareness of future events regardless of how complex they are. Frequency with which transactions recur describes how often the particular type of transaction happens between the same participants. As for asset specificity refers to the degree to which durable transaction-specific investments are incurred in the particular transaction relationship. Most of the empirical studies involving transaction cost economics have examined these dimensions in a way or another. According to transaction cost economics, economic transaction relationship is a function of these key dimensions. The dimensions of TCE forms the relevant characteristics of transaction cost analysis as illustrated in Figure 2. In order to organize efficient transaction relation all of these dimensions must be concerned. (Williamson 1998, 36; Williamson 1979, 239, 261; Williamson 1981, 555)



**Figure 2** Key dimensions of transactions in TCE-analysis (Williamson 1979, 239)

Due to the intertwined nature of the key dimensions of transaction cost economics, they cannot be treated separately. Therefore in the following sections the main issues of each dimension are highlighted in terms of others. Focus is, however, on the Williamson's dimensions themselves because it seems that they are the most important and most used way of classifying dimensions of transactions in business literature.

### *Uncertainty*

Uncertainty is considered to be highly relevant in the study of the firm (Williamson 1979, 239). Coase (1937, 392) stated that it is extremely improbable that a firm would even exist without the presence of uncertainty. Uncertainty that exists in environment in which businesses operate is interesting in terms of transactions and as well as in terms of firm's organizational structures. Reason for this is that without the existence of uncertainty it would not make a huge difference which governance structure is used. This is due to the fact that if the future holds no insecurity, all the right decisions can be made well beforehand. Despite the evident importance of uncertainty, there are still quite few studies

concentrating on uncertainty in transaction cost economics. (Williamson 1979, 253–254; Slater & Spencer 2000, 61)

In reality there is always at least some degree of uncertainty present. Hence, the important question is: what are the effects of increasing uncertainty on the governance of transactions? It is said that uncertainty to predict the future events is a key problem preventing the use of complete market contracting, especially in long time-scale and for long-term contracts (Slater & Spencer 2000, 63, 73; Williamson 1979, 237). In principle, when market conditions are constant, i.e. no uncertainty present, simple market contracting transaction model is sufficient. However, increase in uncertainty should shift emphasis of governance from market-contracting mode towards internally organized transactions. This happens particularly when transactions are recurrent and asset specificity is at least moderate. Another way to deal with uncertainty is to standardize the transactions and use market contracting mode. (Williamson 1979, 254, 259; Slater & Spencer 2000, 68)

Increase in uncertainty alone does not necessary induce substantial need for a change in governance structure for transactions, instead the state of other factors have effect on the situation as well. Asset specificity, for instance, can make uncertainty nearly insignificant or highly important in terms of governing structure. If asset specificity is low, increase in uncertainty does not cause any problems because rearrangement of transactions is relatively easy. Instead, if the asset specificity is high, risks will increase. For this reason, it becomes highly important for the parties of particular transaction to figure out in advance measures to be done if something unexpected happens. In the presence of opportunistic behavior of human agents – which is discussed in more detail in section 2.1.3 – the effect of uncertainty is relatively surprising. If everyone acts always in perfectly opportunistic way, there is no uncertainty about the future behavior of the actors. It can be simply thought that if it is possible for someone to gain some additional value for oneself by taking some particular action, that action will be taken. This arrangement would not be changed even if there are contracts or conventions present as a result of opportunistic behavior. In gen-

eral, uncertainty can be reduced by proper mix of market and internal governance. (Williamson 1979, 254; Slater & Spencer 2000, 61, 75)

### *Transaction frequency*

Frequency with which transactions recur indicates how often certain transaction takes place between certain parties (Williamson 1979, 239). Williamson (1979, 247) has identified three categories for transaction frequency; one time transactions, occasional transactions, and recurrent transactions. One time transactions do not happen again in the same way, occasional transactions do happen in similar way but not very often, and recurrent transactions occur often or even on daily basis. Generally speaking, transaction frequency refers to buyer activity in the market.

If transaction under consideration occurs only once in that particular form and between particular participants it is obviously reasonable to procure commodity or service needed from the market. It is so because there is no sense to establish organization within the firm to perform solely one activity once. Hence, the case of single transaction is not highly interest in terms of determining governance structure.

If particular transaction occurs several times in the same form it might be sensible to consider internal procurement. Internal procurement refers to organizing the actions needed for performing transactions within the firm. As mentioned before, economies of scale can be exploited by organizing activities in larger units – such as firms – and applying internal procurement. For this to be possible, frequency of transactions must be high enough – recurrent or even occasional depending on the situation. In other words, if particular transaction takes place often enough, it is more profitable to organize transaction within the firm than procure from the market. High level of transaction frequency can introduce benefits such as fast investment amortization for instance (Müller & Seuring 2007, 490). Consequently, frequency with which transactions recur is important in terms of make-or-buy decisions. (Fallan 2000, 60)

### *Asset specificity*

Asset specificity is the level at which durable transaction-specific investments occur in particular transaction relationship. High asset specificity means that resources which have been invested in particular transaction relationship cannot be easily or economically exploited in some other transaction relationship. Therefore high asset specificity effectively locks the parties of exchange relationship together, but if asset specificity is low it is easy for both buyer and seller to replace business partner and terminate transaction relationship. (Williamson 1981, 555). Williamson (1979, 247) has identified three characteristic categories of investments involved in transaction relationships; nonspecific investments, mixed investments, and idiosyncratic investments.

Nonspecific investments are those which can be exploited in other transaction relationships without any problems. Nonspecific investments occur for instance when dealing with standard materials and equipment. Contrast to nonspecific investment, idiosyncratic investments represents high asset specificity. Idiosyncratic transactions occur, for instance, when transaction relationship requires acquisition of components, equipment or a plant which cannot be used for other purposes than where it was originally designed for. Mixed investments have features from nonspecific as well as idiosyncratic investments, and therefore mixed investments land somewhere between the two extremes. Mixed investments might occur when transaction concerns customized equipment or material, for example. (Williamson 1979, 239, 242, 247)

If asset specificity is low, market transaction has benefits over production within the firm in terms of production costs and governance costs. In other words, there is larger number of transaction alternatives which can utilize the same asset. In this situation, economies of scale can be better exploited and risks of uncorrelated demand can be mitigated when supply side is pooled in larger units. Nevertheless, if asset specificity is high – that is when exchange involves transaction specific investments – market transacting becomes costly and firm preferably organizes transactions inwardly or makes other efforts to improve continuity properties of the exchange. Continuity of the transaction is important

because if the transaction relationship ends for one reason or another, firm possesses assets with no rational use. (Williamson 1981, 555, 558)

Williamson (1981, 555) states that asset specificity is affected by the location and the properties of the asset. Asset specificity related to the location is called site specificity. Site specificity refers to that how the asset cannot produce equal value if located somewhere else. For instance, in the case where a set of industrial plants form an ensemble where different plants are producing products or raw materials to each other, it is clear that high site specificity is present – plants are dependent on the proximity of other plant and production might not be possible or economical somewhere else. (Williamson 1981, 555; Shelanski & Klein 1995, 341)

Asset properties, i.e. what kind of asset is at stake, has also effect on asset specificity. Physical asset specificity arises from the special properties of machines, devices, equipment, etc. For instance, if there is a certain component needed for production of some product, and that particular component cannot be used for other products, the machinery which manufactures that component has high physical asset specificity. Assets are not necessarily tangible. (Williamson 1981, 555; Shelanski & Klein 1995, 341)

One form of asset specificity of intangible assets is human asset specificity. Human asset specificity refers to transaction specific knowledge of human capital. Human asset specificity emerges when some members of the organization possess knowledge which is relevant for some particular transaction. Increase of human asset specificity is due to learning-by-doing or specialized training. High level of knowledge is by definition a good thing but if knowledge is highly asset specific and transaction relationship, in which knowledge is exploited, comes to an end there is a risk of wasting human capital assets. (Williamson 1981, 555; Shelanski & Klein 1995, 341; Williamson 1979, 240)

In addition to asset specificity types mentioned above, there can be so called dedicated assets. Dedicated assets are formed when substantial general purpose investments are made to serve a particular transaction relationship. An

example of dedicated asset could be for example commitments of which are necessary to serve some large individual customer. Asset specificity can also be found in firm's trade-name or brand-capital. Those intangible assets have value only to that particular company apart from franchising chains where different entities use same brand equity. (Shelanski & Klein 1995, 341; Williamson 1998, 36)

### **2.1.3 Bounded rationality and opportunism**

Both bounded rationality and opportunism are central concepts in transaction costs economics because they bring the aspect of human behavior into the equation. They both are pervasive characteristics of human traits. Concepts of bounded rationality as well as opportunism were brought into the study of contractual relationships and firm boundaries by Benjamin Klein et. al. (1978) and Oliver Williamson (1979). In some contexts bounded rationality is seen equal to behavioral uncertainty as flaws of human judgment are closely related to uncertainty of the future. (Grossman & Hart 1986, 692; Slater & Spencer 2000, 68, 71, 73)

However, one of the major researchers behind the development of bounded rationality was Herbert Simon (1957). According to Simon, people are making decisions and acting in the limits of their rationality. Limits of rationality are defined by human's inability to solve complex problems. Even though people are mostly trying to act as rational as possible, because of limited computational capacity of human mind, their behavior is only limitedly rational. This built-in feature of humans is called bounded rationality. (Simon cited in Slater & Spencer 2000, 66; Williamson 1981, 553)

Another built-in characteristic of human nature is desire to act opportunistically. Opportunistic behavior means that people – some people, not necessarily all – are knowingly trying to mislead, distort, disguise, obfuscate, or in another way to confuse others in order to maximize their own benefits. Thus, opportunism is more than merely selfishness, and it encompasses systematic self-interest maximizing. (Williamson cited in Slater & Spencer 2000, 67; Williamson 1981, 554)

Both bounded rationality and opportunism have ramifications for economic organizations. Due to bounded rationality, all complex contracts made between business transaction participants are unavoidably incomplete at some extent. Especially long-term contracts are highly prone to the effects of bounded rationality (Williamson 1979, 241). It is, in the end, difficult for the human agent to take every possible future outcome into account, and virtually impossible to know which one of them finally comes true. And when contracts made are incomplete, a possibility of opportunism emerges. This is an important issue in the theory determining firm boundaries inasmuch as various types of contracts are used for determining the firm boundaries. (Slater & Spencer 2000, 70–71; Williamson 1998, 30–31; Grossman & Hart 1986, 692)

The significance of opportunisms is particularly important for economic activities which encompass high asset specificity investments of human and/or physical capital. If asset specificity is high, damages caused by opportunistic behavior can be substantial due to the possibility of relationship termination and sunk costs followed by that. Risk of opportunistic behavior increases especially when the transaction relation is expected to be short-term. If there are no plans to continue the relationship, involved parties might experience a greater urge to gain some extra benefits at the expense of another. In addition, if there is possibility to gain substantial benefits through opportunistic behavior, risk of opportunistic behavior is higher. (Williamson 1979, 234; Klein et al. 1978, 304–305)

According to Klein et al. (1978, 298) there are two possible ways to mitigate the hazards of opportunism. Firstly, by increasing vertical integration of transactions into the firm, possibility of other party to behave opportunistically can be reduced. In practice, it means that firm's governance structure is moved towards doing activities within the firm rather than utilizing the market mechanism and collaborating with other firms. Secondly, possibility of opportunistic behavior can be mitigated by proper contract practices. Contracts must be so well prepared that the chances of opportunism are minimized as well as possible. In addition, the longer the contract period is the lower are the incentives for opportunistic behavior. Therefore the continuity of the relationship must be beneficial for both of the parties in order to achieve transaction relationship with no intentions to



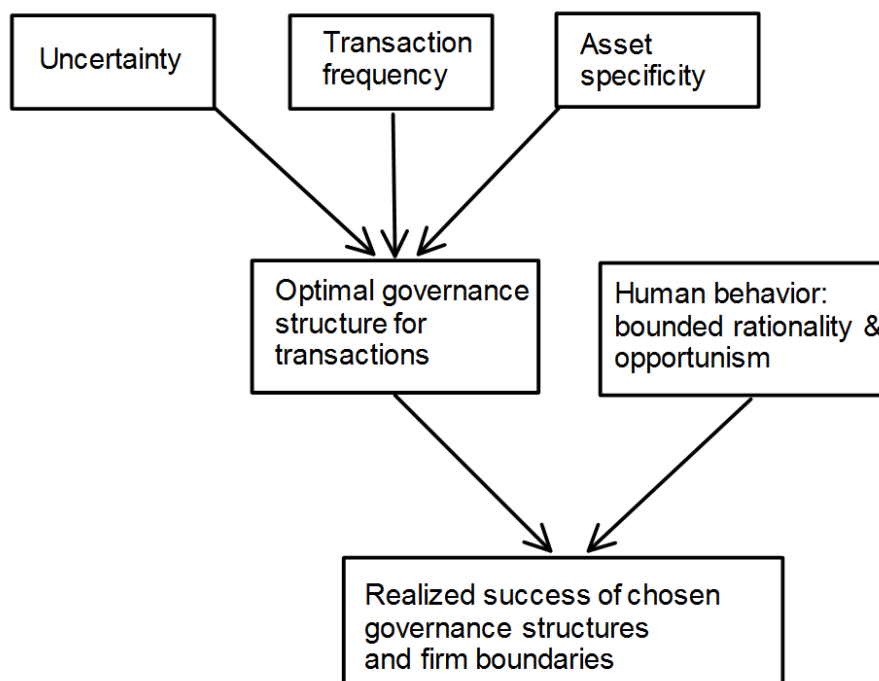
behave opportunistically. However, preparation of contracts leads back to the theme of bounded rationality, which in turn has its own effect on the perfection of the contracts made. For this reason, bounded rationality and opportunism will always be present at the transaction relationships between two entities. (Klein et al. 1978, 302)

#### **2.1.4 Economizing transactions: choosing optimal governance structure**

As said, determination of optimal firm boundaries is the main purpose of transaction cost analysis, and optimal firm boundaries are essential for firm success. In practice, determination of firm boundaries means selecting the suitable governance structures for firm's transactions. Governance structures must be matched with transactions in transaction-cost economizing way. In selection of suitable governance structures for each transaction the properties of transaction should be taken into account. These important properties are those which are referred as the key dimensions – uncertainty, transaction frequency and asset specificity – of TCE. Especially asset specificity is extremely important factor in governance structure evaluation. The basic idea is, therefore, to evaluate how each of the key dimensions are present in the transaction under study and select the proper governance structure according to that. (Williamson 1981, 553; Foss 2005, 9)

At the heart of transaction cost economics are transaction costs which are considered to be the costs of organizing the economic system or the costs of transacting with another business partner (Arrow cited in Levy 1985, 438). Transaction costs include, for instance, costs of writing contracts, costs of coordination, and costs of management control to name few (Anderson 2007, 490–491). Hence, different firm governing structures have different transaction costs, and this makes some governance structures more beneficial for particular situations than others. In simple form, this means making decisions between integrating production of a certain product or a service into firm or purchasing the same product or service from the market. In this decision making, external procurement includes transaction costs and market price, and internal procurement includes internal costs of production and administration. These options must be

compared with each other in terms of transaction cost economizing properties, and the one with lower total costs in relation to benefits should be selected. Also human capital aspect should be taken into account in decision making (Williamson 1981, 562). One useful rule of thumb is to select simple governance structures for simple contractual relations and complex governance structures for complex relations (Williamson 1979, 239). However, in reality it may be that distinction between transactions made within a firm and market place transactions is too simplistic way of thinking because there are many long-term contractual relationships – e.g. franchising contracts – which blur the line between the market and the firm. In Figure 3 the process of determining firm boundaries, i.e. economizing firm's transactions, is presented in simplistic form. (Klein et al. 1978, 326; Williamson 1979, 245)



**Figure 3** Process of governance structure and firm boundaries determination

Figure 3 depicts different aspects which have effect on the final realized firm's governance structure. It is worthwhile to notice that the key dimensions – uncertainty, transaction frequency and asset specificity – of transaction set the optimal and best working governance structure for transaction under consideration. These dimensions, however, are characteristics of that particular transaction and therefore do not take into account the human behavior. As have been said

before in this thesis, human behavior in the form of bounded rationality and opportunism has significant relevance in terms of contracting and other interaction between firms. Therefore the governance structures and firm boundaries in reality are always affected by the human behavior as well.

As Figure 3 suggests, the optimal governance structure is outcome of interaction between different factors, and therefore these relevant factors shouldn't be viewed independently. In Table 1 effects of increasing and decreasing influencing factor on optimal governance structure is presented. The table merely illustrates the effects in situations where only one factor is altered (*ceteris paribus*). In reality situation is not that black and white so the purpose of the table is merely to give overview of the issue.

**Table 1** Summary of effects of key dimensions on governance structure decision (*ceteris paribus*)

Influencing factor	Effect of factor on governance structure ( <i>ceteris paribus</i> )	
	<i>Increase in dimension</i>	<i>Decrease in dimension</i>
Uncertainty	towards internal procurement and vertical integration	towards market transaction
Transaction frequency	towards internal procurement	towards market transaction
Asset specificity	towards internal procurement and vertical integration	towards market transactions
Bounded rationality & opportunism	towards internal organization	towards market transaction

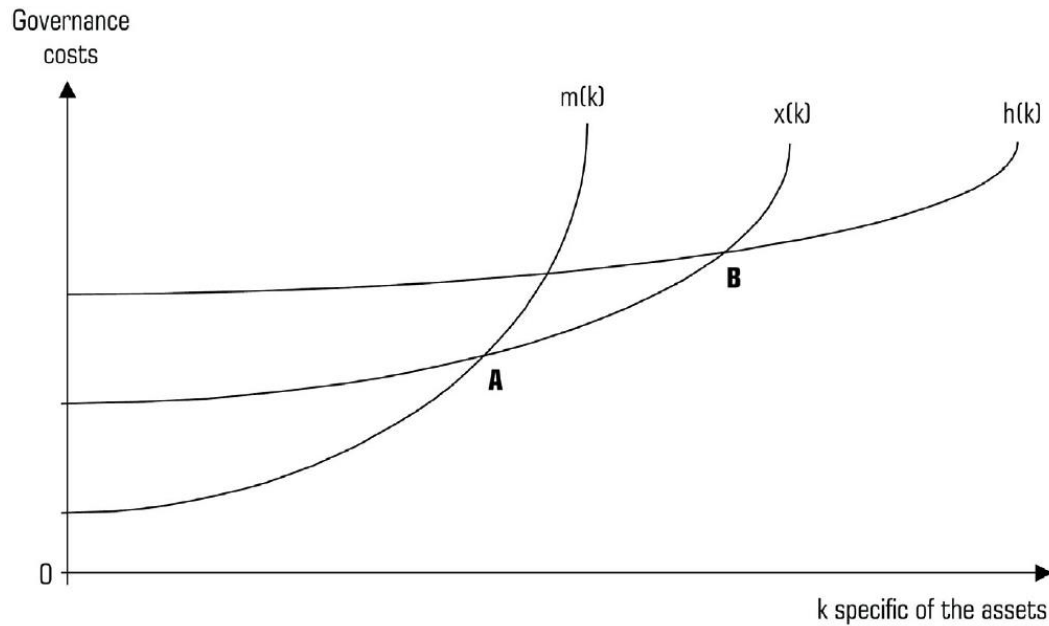
If uncertainty in business environment rises, incentive to shift transactions from market transacting to internal procurement increases because adjusting to changing situations create additional costs (Williamson 1981, 559). Integrating transactions within the firm can also be beneficial even at intermediate levels of uncertainty if transaction is recurrent and asset specificity is high (Carter & Hodgson 2006, 464). For transaction with high transaction frequency internal procurement seems beneficial, and for one-time transactions as well as occa-

sional transactions market transacting is sufficient governance structure (Williamson 1979, 248).

Decrease in asset specificity renders market transacting more beneficial (Williamson 1979, 245; Levy 1985, 439). When market transacting becomes feasible economies of scale provided by markets can be fully exploited and operational risks can be transferred to the market (Williamson 1981, 558). However, vertical integration, i.e. internal procurement, can be beneficial for transactions with intermediate asset specificity as long as transaction is recurrent and there is sufficient level of uncertainty present (Carter & Hodgson 2006, 464). In the case of increasing bounded rationality and opportunism internal organization of transactions become more rational form of organizing transactions, especially when the transaction is characterized by asset specificity (Slater & Spencer 2000, 68).

In practice, there is various governance structures used in addition to simplistic production within a firm and market procurement. According to Foss (2005, 9), Williamson has identified three main categories for governance structures; markets, hybrids, and hierarchies. The two extremes – markets and hierarchies – are already discussed in this study. As concluded before, market governance refers to classical market procurement. Contrary, hierarchies refer to coordination of transactions within the firm, in other words vertical integration. Hybrid model combines elements from both of the extremes. In hybrid model governance structure involves complex contracts and, for instance, partial ownership arrangements (Shelanski & Klein 1995, 337).

According to Foss (2005, 9) the decisions of contractual forms and governance structures will primary reflect asset specificity because both contractual forms and governance structures are means for handling the contractual hazards introduced by asset specificity. Therefore optimal governance structure can be assessed in terms of asset specificity. The costs of different governance structures are presented in illustrative way in Figure 4. (Silva & Saes 2007, 448; Shelanski & Klein 1995, 337)



Curves: governance via market ( $m(k)$ ), governance via contractual rules (hybrid) ( $x(k)$ ), governance via hierarchy ( $h(k)$ )

**Figure 4** Governance costs of different governance structure in terms of asset specificity (Williamson cited in Silva & Saes 2007, 449).

In transaction cost economics economizing of transaction is done by choosing the governance structure with lowest total governance costs. As can be seen from Figure 4, at low levels of asset specificity market governance mode gives lowest governance costs and therefore markets should be favored over internal integration in these cases. Markets are the best alternative until asset specificity increases above point A. When asset specificity rises above point A transactions require more specific investments from the firm and therefore it is not reasonable to rely solely on anonymous markets. Instead, it is more sensible to build long-term contracts and other agreements with reliable partners. Nonetheless, it is not profitable to adopt the transaction completely within the firm. Hence, the optimal governance structure for this case – between points A and B – is hybrid mode. In addition to asset specificity the costs of market contracting include also the costs of writing contracts which in turn are dependent on the extent to which events can be anticipated beforehand (Levy 1985, 439). If asset specificity increases above point B the lowest governance costs are achieved by selecting hierarchy, i.e. vertical integration, governance structure. (Shelanski & Klein 1995, 337; Silva & Saes 2007, 448–450)

In this section, the principles of choosing optimal governance structure by economizing transaction are presented. The discussed governance structures are, however, universal kind. In most real life cases business relationships are neither standard textbook examples of vertical integration or cases of easily explained market contracts. Therefore, in reality when every transaction case is unique, every case must be considered individually and the optimal governance structure can be somewhere between the ones discussed here. In addition, the can various different governance structures for different purposes in use within a single firm. Hence, the field of determining firm boundaries as a whole is highly complex. (Klein et al. 1978, 325; Shelanski & Klein 1995, 336)

## **2.2 Service business**

Services play a major role in modern business life since they account for a significant share of total purchase volume (Wynstra et al. 2006, 475). Some authors (Grönroos 2008, 2011; Bitner 1997; Berry & Parasuraman 1991 cited in Mathieu 2001) have even suggested that all firms are service firms at least at some extent because customers consume goods and services as services.

A service as a concept can be seen from three different point of view. In addition to traditional aspect of service being an activity to assist customers in their everyday practices, services can be seen from the perspective of customer value creation. Services can also be examined as firm's choice of business logic. (Grönroos 2008, 300)

In many cases, services are being used as tools for outsourcing various firm operations for external actors. Using services for carrying out various tasks in outsourcing schemes has several motives. By using external service providers the quality of activities can be higher due to more experienced actor with higher volumes. Experienced supplier can also be able to provide services much faster than the company could on its own. In addition, using external provider can, in many cases, contribute to rapid changes in technology used and generation of new innovations. These are some motives, which make services important in modern business life. (Dabhilkar 2011, 160)

In the following chapters, the basic characteristics of services and fundamentals of creating successful service business are discussed. Given the aim of this research, the scope of interest in this context is on business-to-business services, i.e. business services. Hence, features of consumer service business are left out of the discussion.

### **2.2.1 Characteristics of services**

There are various definitions for services. Stephen Vargo and Robert Lusch (2004, 2) stated that services are the applications of competence by one party for the benefit of another. Competences are, for instance, different knowledge and skills, and they are to be applied via deeds, processes, and performances. Philip Kotler (1997, 467) defined services as acts or performances offered by one party to another which are intangible and do not necessarily lead to ownership of anything. According to Christian Grönroos (2006, 323), services are *“processes that consist of a set of activities which take place in interaction between a customer and people, goods and other physical resources, systems and/or infrastructures representing the service provider and possibly involving other customers, which aim at solving customer’s problems”*. Hence, it is fair to say that interaction between the service provider and the customer is an essential part of service business.

Scholars have identified few features which describe the nature of services (Kotler & Armstrong 2010, 268–269; Grönroos 2000, 47; Brentani de 1991, 33, 36; Kotler 1997, 469–471). Services are considered to be intangible, inseparable, variable, and perishable. Intangibility of services means that services are processes consisting of activities rather than physical things, and the purpose of these processes are to assist customer’s practices (Grönroos 2006, 319). The process nature of services is considered to be the most distinguishing characteristic (Grönroos 2000, 48). Services cannot be seen, tasted, heard, smelled, or otherwise physically felt before consumption. However, services can be combined with physical, i.e. tangible, products. Because significance of service component in business is increasing, intangibles like skills, information, and knowledge are becoming increasingly important (Vargo & Lusch 2004, 15).

Services cannot be separated from their providers. What this means is that services are produced, delivered and consumed simultaneously. Due to this, both customers as well as service providers have effect on the service outcome. For this reason, service firms should be in close contact with its customers and constantly seek solutions for client problems. This service characteristic is called inseparability of production and consumption of services. (Kotler 1997, 469; Kotler & Armstrong 2010, 268–269; Brentani de 1991, 33, 37; Grönroos 2000, 47)

As stated, services are also variable. Variability – or in some contexts heterogeneity – of services basically means that the quality of particular service depends on who provides it, where and when it is provided, and how the service is provided. The way a customer experiences a service is not the same how the next customer experiences the same service even though service ought to be the same. In simple words, service outcome and customer experience varies at each purchase occasion. Customer experience can be either better or worse than on average. Negative effects of service variability can be mitigated, for instance, by monitoring customer satisfaction, standardizing the service performance process, and investing in good human resource selection and personnel training. (Kotler & Armstrong 2010, 268–269; Grönroos 2000, 49; Brentani de 1991, 37; Kotler 1997, 470)

Last of the four distinguish characteristics of services is service perishability. Because of their intangible and inseparable nature, services cannot be stored for later use after their production. Once service is produced and thus consumed the service is gone. Inability to store services has effect on business processes in a way that service companies cannot built any reserve against fluctuating demand. Instead, they might suffer from lack of resources during high demand seasons and struggle with low resource usage during low demand seasons. Both of these situations can cause additional costs for the company. (Kotler & Armstrong 2010, 269; Brentani de 1991, 38)

Common way to examine characteristics of services is to compare them with physical goods (Grönroos 2000, 47). In Table 2 previously presented service



characteristics are summarized and compared with characteristics of physical goods.

**Table 2** Services versus physical goods: comparison of characteristics (Grönroos 2000, 47)

<b>Characteristics of services</b>	<b>Characteristics of physical goods</b>
Intangible; cannot be physically felt	Tangible; can be hold or touched
Heterogeneous or variable	Homogeneous or invariable
Production, distribution and consumption simultaneous process	Production and distribution separated from consumption
An activity or process	A thing
Core value produced in buyer-seller interaction	Core value produced in factory
Customers participate in production	Customers do not (normally) participate in the production process
Cannot be kept in stock	Can be kept in stock
No transfer of ownership	Transfer of ownership

One important dimension, presented in the table, which haven't been discussed yet is creation of value. According to traditional view, core value of physical goods is produced in factory during the manufacturing process, and core value of services is produced in buyer-seller interaction instead. For this reason goods and services were seen different. However, during 1990's it was suggested that there are no substantial differences between goods and services in terms of consumption and value creation. The role of value creation in service and goods centered approaches is examined more thoroughly in following chapter. (Grönroos 2008, 301)

### **2.2.2 Value and value creation**

Value creation is an essential aspect in service concept (Vargo et al. 2008, 146). Customers purchase services because of the additional value services bring to them (Vargo & Lusch 2004, 2; Grönroos 2008, 306). Acquired services are consumed in a way or another in buyer's internal processes to create value. Therefore the key purpose of services is to create value for the customer. In addition to customer value creation, objective of services is to generate value for the service provider as well (Grönroos 2011, 243). Previously it was consid-

ered that value for customers is embedded in customer's products and other outputs, but according to later view, value for customers is created in separate value-generating process at customer's sphere through various supplier-customer interactions (Normann & Ramirez 1993; Ravald & Grönroos 1996; Vandermerwe 1996; Wikström 1996; Vargo & Lusch 2004; Grönroos 2006, 2011). Hence, production and value creation are different things even though they can overlap in certain circumstances (Grönroos 2011, 243).

In order to understand the nature of value and value creation, concept of value must be defined. Simply put, value of a certain service for a customer is a feeling that things are better off than before consuming the service. In some cases it, is possible to evaluate the level of value on monetary terms but value always has an attitudinal aspect. Value can occur through dimensions such as trust, commitment, attraction, affection, comfort, and easiness of use. It is also worthwhile to notice that value can also be a negative value, i.e. some kind of disadvantage. (Grönroos 2008, 303)

According to Stephen Vargo et al. (2008, 146) there are two different ways to approach value and value creation. Concept of value can be divided in value-in-exchange and value-in-use. Value-in-exchange occurs simultaneously with the exchange of the service, i.e. at the purchasing moment. Value-in-exchange is the value which the service provider experiences, for instance the price of the service. Value-in-use, instead, occurs when the customer has consumed the purchased service. In another words, value-in-use is the final value experienced by the customer. Therefore value-in-use is more important to both customer and service provider because value-in-exchange cannot exist without value-in-use at least in theory and in long-term. (Grönroos 2008, 304)

As stated, value-in-use is the most important part of the value which services provide, and thus value is created within customer's processes. Given this, the question rises that what is the role of suppliers in value generating process. Generally speaking, the part of service provider is to support and facilitate customer's value creation by providing necessary resources needed for value creation. Therefore, both customer and service provider participates in the value

creation process (Vargo et al. 2008, 145). Understanding of this profound role of business service provider is essential in creating successful service proposition. Implementing this kind of service oriented approach is referred in literature as service based business logic. Characteristics of this approach and its differences compared to traditional business view are discussed in next chapter. (Grönroos 2008, 305; Grönroos 2011, 242–243; Grönroos & Helle 2010, 570)

### **2.2.3 From goods dominant logic to service dominant logic**

Since services have become increasingly important in modern business (Wynstra et al. 2006; Grönroos 2008, 2011; Bitner 1997), new service oriented business logic has emerged. It seems that the traditional division between goods and services does not hold true anymore and new more service-oriented ways of doing business are utilized more often (Vargo & Lusch 2004, 2). In business literature, two different business logic approaches are identified; goods dominant logic and service dominant logic (Vargo et al. 2008; Grönroos 2008; Vargo & Lusch 2004).

Goods dominant logic refers to the traditional way of thinking which emphasizes manufacturing of goods efficiently, with high quality, and to fit customer's needs as well as possible. In goods dominant business logic value is produced through physical products and delivered by exchange of money. Therefore, according to goods dominant logic, the purpose of economic exchange in business is to make and distribute products which value is determined in markets in monetary terms. The main ways of achieving maximum efficiency and profit in goods dominant business logic are standardization of products and economies of scale in production. (Grönroos 2011, 241; Vargo et al. 2008, 146–147)

Another more modern approach for business is service dominant logic. In service dominant logic the customer is a co-creator of value together with the supplier, and the fundamental basis of exchange is service. The quality of interaction between supplier and customer is important for value co-creation (Grönroos 2011, 245). There can also be physical goods involved with services. If so, goods are tools which support delivery of the total service package. In other

words services are value supporting processes and goods are value supporting resources. If a firm implements service dominant logic it (1) focuses on understanding of customer practices and (2) assisting customer's in their everyday practices, (3) develops its goods and services to match customer's practices, (4) interacts closely with the customer, and (5) engages itself in customer's value creation as well as value fulfillment. The key resources for competitive advantages in service dominant logic are knowledge and skills. As can be noticed, there are significant differences between goods dominant logic and service dominant logic, the main differences are presented in Table 3. (Vargo et al. 2008, 146–1478; Vargo & Lusch 2008, 6; Grönroos 2008, 300, 306; Grönroos & Helle 2010, 568)

**Table 3** Differences between goods dominant logic and service dominant logic (adapted from Vargo et al. 2008, 148)

	<b>Goods dominant logic</b>	<b>Service dominant logic</b>
Value driver	Value-in-exchange	Value-in-use
Creator of value	Firms, often with input from firms in a supply chain	Firms, network partners, and customers
Process of value creation	Firms embed value in goods or services, value is added by enhancing on increasing attributes	Firms propose value through market offering, customers continue value creation process through use
Purpose of value	Increase wealth for the firm	Increase adaptability, survivability, and system wellbeing through service
Measurement of value	The amount of nominal value, price received in exchange	The adaptability and survivability of the beneficiary system
Resources used	Primary operand resources	Primary operand resources, sometimes transferred by embedding them in operand-resources-goods
Role of the supplier firm	Produce and distribute value	Co-create value and provide service
Role of goods	Units of output, embedded with value	Value supporting resources, enables access to benefits of firm competences
Role of customer	Use value created by supplier	Co-create value with supplier

Summarizing the differences between goods dominant business logic and service dominant business logic, it can be stated that a firm which implements ser-

vice dominant business logic reaches much further into customer's sphere in order to involve deeply in customer's everyday practices and to provide tailored goods and services for the customer's benefit. By implementing service dominant logic instead of goods dominant logic firms can achieve various advantages. For instance, firms are able to better serve their customers and thus achieve better success in business. Implementing service logic has positive implications on multiple parts of firm's business. Service oriented approach has effect on how customer's value is created and what are supplier's and customer's roles in it, as well as how marketing is approached. Service dominant logic enables companies to create new market strategies and business models and by doing so help firms to be more successful. Therefore service dominant business logic is preferable and modern way of viewing business for all types of businesses not just plain service firms. (Grönroos 2011, 240–241, 243, 246; Grönroos 2008, 307)

#### **2.2.4 Types of business services**

Service companies provide different types of services for their customers. Aim of service providers is to correspond to customer's needs as well as possible. In many cases buyers of services are seeking for longer-term relationship with the supplier than buyers of simple goods (Barry & Terry 2008, 228; Holmlund & Kock 1995, 118–121). This is one feature which effects on the nature of business services. Business services can be roughly classified in two groups, maintenance and repair services, and business advisory services. Maintenance and repair services refer to different mechanical tasks which concentrate on physical equipment and machinery. Business advisory services, instead, are various consulting services and more of intangible nature. (Mathieu 2001, 452)

According to Finn Wynstra and others (2006), a proper way of classifying business services is to group them on the basis of how the buying company applies the provided service with respect to its own business process, i.e. how they are used. Manner in which business services are consumed is important because the business service customers are other companies which have clients of their own. Hence, the services purchased by a company can be used by the compa-

ny itself or by the clients of that buyer company (Wynstra et al. 2006, 478). Authors found four distinguish types of services; component services, semi-manufactured services, instrumental services, and consumption services. All of the service types have different objectives, and therefore they require different capabilities from both customers and suppliers. In Table 4 descriptions and most important capabilities of service provider are summarized according to each business service type. Then the service type characteristics are discussed in more detail. (Wynstra et al. 2006, 479, 491)

**Table 4** Summarized characteristics of different business service types

<b>Business service type</b>	<b>Description</b>	<b>Critical capabilities of the provider</b>
Component services	Transferred to buyer's customers. No transformation by the buying company	Knowledge of the client's final product.
Semi-manufactured services	Consumed by buyer's customers. Service transformed by the buyer at some degree.	Good ability to understand changes in final customer's demand.
Instrumental services	Consumed by the buyer itself. Corresponds to buyer's primary processes.	Good understanding of buyer's primary processes at present and in the future.
Consumption services	Consumed by the buyer itself. Do not affect with buyer's primary processes.	Cost efficiency

Component services are services which are delivered and consumed without any transformation of the service by the buying firm. What this means is that the buyer of the service delivers that service to its own customers without any modifications. This kind of service could be, for instance, baggage handling service at an airport. Customers of an airline company receive a baggage handling service which the airline company has purchased from a cargo management company without any additional modifications. Critical capabilities of a component service provider include knowledge of the client's final product as well as understanding of its own offering. (Wynstra et al. 2006, 479–480)

Semi-manufactured services resemble component services with the difference that the purchased services are transformed before consumed by the customers of the firm which purchased the service from a service provider. In other words, the buying company uses the service as an input for its offering for final customers. From a service provider point of view, providing semi-manufactured services demands good ability to interpret, translate, and communicate changes in final customer demand. (Wynstra et al. 2006, 479, 481)

Instrumental services are services which have direct influence to buying company's primary processes but are not delivered to buying company's end-customers. That is to say the buying company consumes services purchased by its own. Therefore the timing and frequency of service is not directly dependent on the demand of the buying firm's customers. An example of instrumental services could be different information technology services for financial management. In order to provide successful instrumental service, service provider must have good understanding of buying firms primary business processes. Service provider must also be able to sustain, develop and support the service for extended period of time in a way that the changing needs of the client are taken into account. (Wynstra et al. 2006, 479–481)

Like instrumental services, consumption services are also consumed by the buying organization itself. The difference between instrumental services and consumption services is that consumption services are not associated with the organization's primary processes. Consumption services are meant for aiding and enabling organization's support actions. The purpose of consumption services is typically to facilitate organization to focus on its core activity and improve cost-efficiency. One typical example of consumption service is cleaning services. Critical capability of consumption service provider is to provide appropriate service with affordable price. (Wynstra et al. 2006, 479–481)

### **2.2.5 Developing successful and high quality business services**

Traditionally business services have been including after-sale services, guarantees, and maintenance services, for instance. However, it seems that these tra-

ditional ways of serving customers are not enough anymore (Mathieu 2001, 458–460). Instead, services related to information technology and consulting are becoming increasingly important. In addition, the core service or product is today less often the reason for customer dissatisfaction than the additional elements surrounding the core product or service (Grönroos 2000, 8).

In order to provide successful services, firms must identify and respond to market needs as well as possible (Brentani de 1991, 54), and shift their focus from firm's own practices towards its customer's processes (Reinartz & Ulaga 2008, 96). Understanding customer needs is important not only in terms of providing successful service but in terms of customer relationship quality as well (Kim & Cha 2002, 334–337). Since there is a strong element of human resource involved in services, the quality of business services is in many cases affected by the human resources in the production, delivery, and consumption of the service in both sides of the business relationship (Wynstra et al. 2006, 477). For this reason, characteristics of the service itself do not necessarily ensure the success of service, and the relationships between people involved in service production, delivery and consumption are also important.

The quality of services can be perceived through various aspects and is built on different quality components. Quality may be perceived through tangible elements of services, through attitudes and behavior of personnel contact with services, or derived from the service encounter or from the actual process of buying services (Szmigin 1993, 8). Rough classification of service quality is to divide quality in two parts; technical service quality and functional service quality. Technical service quality refers to all formal and technical operations which do not require much human participation or interaction between customer and provider, such as money transfer in banking. For this reason technical service quality is sometimes identified as a hard dimension of service quality – what is being performed during the service process. Functional service quality, instead, represents component which is strongly affected by human interaction in form of attitudes, appearance of the service, and service mindedness of the provider, for instance. Hence, functional service quality is also called as soft dimension of service quality – how the service is performed during the service process. Hard



and soft service quality components have effect on one another. For instance, if the soft aspect of provider's service provision is in good shape, some errors in the hard quality side could be forgiven and vice versa – different clients have different requirements in the hard and soft dimension balance. (Szmigin 1993, 8–10; Gounaris & Venetis 2002, 640)

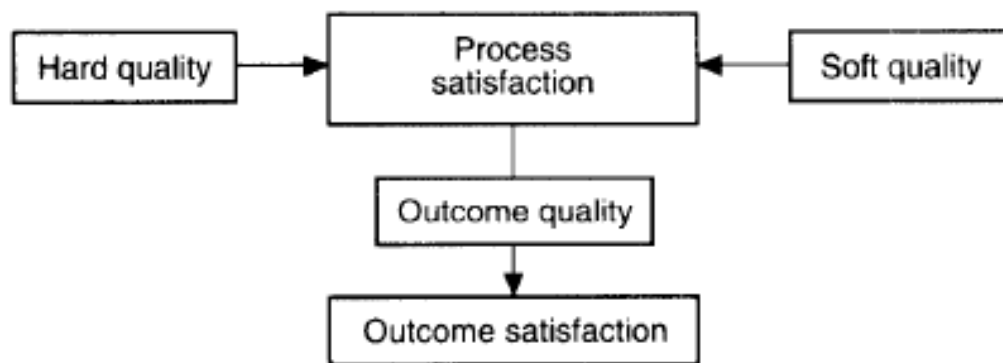
In addition to hard and soft service quality components which describe the service process itself, third dimension of business service quality has been identified; outcome quality. Outcome quality of business service refers to the quality which customers experience after consuming the service, i.e. how the provider has succeeded in providing the service as a whole. Outcome service quality cannot be always controlled by participating companies because it is prone to external factors such as outside pressure and environmental conditions for instance. (Gounaris & Venetis 2002, 640–641; Szmigin 1993, 9)

Outcome quality dimension can be divided in two sub dimensions; immediate outcome quality and final outcome quality. Immediate outcome quality describes how well the service provider has managed to provide a solution for the client's problem. Final outcome quality, instead, describes how desirable effect the service provider's solution has created for the client after the solution has been employed. In Figure 5, presented factors of overall service quality in business-to-business services are summarized. As can be seen from the figure, there is still one dimension yet to be discussed. Potential quality is, according to Spiros Gounaris and Karin Venetis (2002, 649), the quality of the communication with the supplier communicates with the client. (Gounaris & Venetis 2002, 641)



**Figure 5** Service quality dimensions for business-to-business relationships (Gounaris & Venetis 2002, 641)

Quality of service perceived has fundamental role in the level of satisfaction experienced by the customer. Customer's overall satisfaction of a service received and consumed arises from the perceived outcome quality which reflects the service process satisfaction. This, in turn, mainly consists of hard and soft quality dimensions of the service. The process of customer outcome satisfaction formation is depicted in Figure 6.



**Figure 6** Formation of customer satisfaction in business relationship (adapted from Szmigin 1993, 10)

As presented in Figure 6, customer's satisfaction ultimately depends on the outcome quality of the service (Szmigin 1993, 10). Therefore substantial attention should be given to outcome quality of the service provided. Service providers, especially in business-to-business services, should concentrate on managing the quality of service delivery process and the service itself. This can be done,

for instance, by commencing personnel training in order to improve soft process quality and skills; develop flexible service scheme to give guidelines for service generating and delivery – hard process quality –; and by ensuring that given promises to clients are kept and unrealistic expectations are not raised – immediate outcome quality (Gounaris & Venetis 2002, 650). Generally speaking, understanding of customer's everyday practices and value creating processes, and knowledge of how goods and services are consumed by customer is extremely important in terms of providing satisfactory service (Grönroos 2008, 306). In addition, services with high synergy benefits are more likely to succeed (Brentani de 1991, 52). If services fit well with customer's existing services and operations, they are more likely to have high value for the customer. Therefore success of service business is largely dependent on successful formation and continued management of a customer-supplier relationship (Szmigin 1993, 5).

### **2.3 Applications of TCE**

Transaction cost economics have been used for many different research purposes. In following table some examples of applications of transaction cost economics are presented. As presented in Table 5, transaction cost theory has been theoretical approach, for instance, studies examining energy industry as well as different service industries.

**Table 5** Studies utilizing transaction cost economics

<b>Author(s) &amp; Year</b>	<b>Research object</b>	<b>Methods</b>	<b>Findings</b>
Sorrell, Steve (2007)	Asses the feasibility of energy service contracting (ESC) in different circumstances	Developing a theoretical model by using existing data	ESC is unsuitable for small sites and process-specific energy uses at large sites. ESC may have role in achieving low carbon economy
Spanjer, Aldo R. (2009)	Investigate regulation in European gas markets	Examining of a theoretical framework	TCE gives better perspective for gas markets than neo-classical model. Politicians should: allow alternative coordination measures, recognize that less than perfect competition may be optimal, and be more reticent in prescribing interventionism measures
Ofei-Mensah, Albert & Bennett, Jeff (2013)	Assess transaction costs in Australian energy sector – especially costs associated with greenhouse policies.	Surveys, records, estimates from similar policies, structured interviews	Transaction costs need to be considered alongside other costs and benefits in the assessment policies. Transaction costs associated with greenhouse policies are substantial different.
Heine, Klaus (2011)	Achieve more insight into the interplay between the external market regulation and internal regulations of energy firms; governing of energy firms.	Theoretical review	Relation between external and internal regulations is not problematic as long there is no market failures. Firms that are not able to adapt to external regulations will face bankruptcy.
Midttun, Atle; Dirdal, Tore; Gautesen, Kristian; Omland, Terje & Wenstøp, Søren (2007)	Integrate corporate social responsibility with other strategic foci into the supply / contractor chain.	Case study, review of CEO's and the Chairman's statement letter to the shareholders.	The suppliers / contractors emphasize the technology dimension more strongly than the petroleum companies. Health, environmental and safe corporate social responsibilities are strategically under-communicated within the suppliers.
Ennew, Christine; Wong, Pauline & Wright, Mike (1992)	Examine financial services in order to explain how firm acquisitions are implemented in UK	Literature review	Asset specificity is likely to be high due to the distinctive characteristics of financial services. Levels of divestment and buy-outs in financial services are lower compared to other industrial sectors.
Tseng, Cher-Hung & Chen, Liang-Tu (2013)	Investigate the influence of transaction cost factors in outsourcing of multinational corporations subsidiary (manufacturing in Taiwan)	Quantitative study, regression model	Transaction cost factors are negatively related with degree of domestic outsourcing. International experience can reduce the transaction costs-
Greenberg, Penelope Sue; Greenberg, Ralph H. & Antonucci, Yvonne Lederer (2008)	Integrate the information systems and the interfirm governance literatures to develop a framework	Literature review	Three elements that influence the design and function of interfirm relationships: transaction, transaction environment, parties. Three types of trust: trusted system, institutions, and partners
Espino-Rodríguez, Thomás F.; Lai, Pei-Chun & Baum, Tom (2008)	To analyze make-or-buy decisions in Scottish hotel industry	Survey	Relationship between asset specificity and operation performance is weaker when the operations are executed in-house.

In terms of this thesis, the most relevant paper of ones presented in Table 5 is Steve Sorrell's (2007) paper about energy service contracting (ESC). In his study Sorrell (2007) studied feasibility of energy service contracting in various circumstances by employing TCE and existing data in developing a new theoretical framework. Sorrell (2007) found out that ESC does not suit well for small sites or process specific energy consumption objects.

Other energy industry related papers are Aldo Spanjer's (2009) paper about European natural gas markets, Albert Ofei-Mensah's and Jeff Bennett's (2013)

study of greenhouse policies in Australia, Klaus Heine's (2011) research on energy firm's governance and regulation, and Atle Midttun's (et al. 2007) study on petroleum industry of the North Sea. All of these studies have used TCE in a way or another as a theoretical framework.

Spanjer (2009) found out that TCE is better approach for European natural gas markets than traditionally used neo-classical model. He also gave few suggestions for policy maker's decision making in order to improve gas market performance. Ofei-Mensah and Bennett (2013) assessed the role of transaction costs in Australian greenhouse gas policies. They concluded that there are various transaction costs associated with greenhouse policies and energy sector, and these costs must be considered alongside with other benefits and costs when assessing political decisions. As a conclusion of Klaus Heine's (2011) theoretical review of energy firm's governance, Heine suggested that relation between external and internal regulations is not problematic for energy firms as long as there are no market failures. He also concluded that firms which are not able to adapt regulations will face serious difficulties. In Atle Midttun's (et al. 2007) case study about the Norwegian petroleum industry's social responsibility, statements from CEOs and Board Chairmen to stakeholders were examined. Authors found out that technology dimensions are more strongly emphasized by suppliers than the petroleum companies. Authors also stated that suppliers under-communicate health, environmental, and safe corporate social responsibilities in their strategies.

In addition to studies concerning energy industry, there are studies applying TCE from the areas of financial services, business governance and outsourcing operations as well as make-or-buy decisions, for instance. Christine Ennew (et al. 1992) conducted a literature review in order to determine how firm acquisitions are done in financial service industry in UK. In this study, asset specificity became important TCE dimension since asset specificity was noticed to be high due to the distinctive characteristics of financial services. Ennew (et al. 1992) also suggested that level of buy-outs is lower in financial services compared to other industries. Cher-Hung Tseng and Liang-Tu Chen (2013) investigated in their quantitative research the influence of transaction cost factors in outsourc-

ing decisions in Taiwanese manufacturing companies. They concluded that transaction cost factors are negatively related with degree of domestic outsourcing, i.e. increase in transaction costs reduce the degree of outsourcing.

Penelope Greenberg (et al. 2008) also studied outsourcing. Their scope of research was, however, role of trust in governance of business process outsourcing. Greenberg et al. found that influence interfirm relationships; transaction, transaction environment, and parties of transaction. Authors also suggested that there can be identified three types of trust; trusted systems, trusted institutions, and trusted partners. Third research paper presented in Table 5 concerning outsourcing or business governance is Thomás Espino-Rodríguez's (et al. 2008) survey study on make-or-buy decisions in Scottish hotel industry. In this study Espino-Rodríguez et al. examined asset specificity and concluded that if operations are executed within the firm relationship between asset specificity and operations performance is weaker.

It is fair to say, referring to previously discussed examples, that transaction cost economics can be used in wide range of applications. Examples of TCE studies presented in Table 5 are just a small sample of studies applying TCE, and there are numerous other suitable objects of study for TCE. Many of them, though, deal with determining organizational boundaries in a way or another. Hence, TCE gives a proper approach for this thesis as well.

### **3 EMPIRICAL ANALYSIS ON ESCO SUCCESS BARRIERS IN FINLAND**

The main purpose of this thesis was to carry out a research in which the most significant barriers of ESCO service business in Finland were identified. In next two chapters the research design implemented in this research and brief introduction of ESCO service model are presented. After these results obtained from the Delphi questionnaire are given.

#### **3.1 Research design**

In this thesis, Delphi research method is applied. Delphi is a model which aims to structure a group communication process in a way that new insight for complex problems can be formed (Kuusi 1999, 70–71). In a Delphi questionnaire, a set of experts answer predetermined statements. Participants have also a chance to comment on the statements made. Delphi study can be characterized by participant and response anonymity, iteration, controlled feedback, and group statistical response. Delphi survey is anonymous because identity of participants is known only to the researcher and not to other respondents. Iteration in a Delphi study means that there is number of questionnaire rounds. Statements and questions of subsequent rounds are supplemented accordance with results of previous rounds. Controlled feedback means that the main results and opinions of a questionnaire round are presented to all participants. Statistical response, in turn, refers to the way answers are given – questionnaires include questions from which statistical data can be obtained. (Pätäri 2010, 97–98; Woudenberg 1991, 133; Landeta 2006)

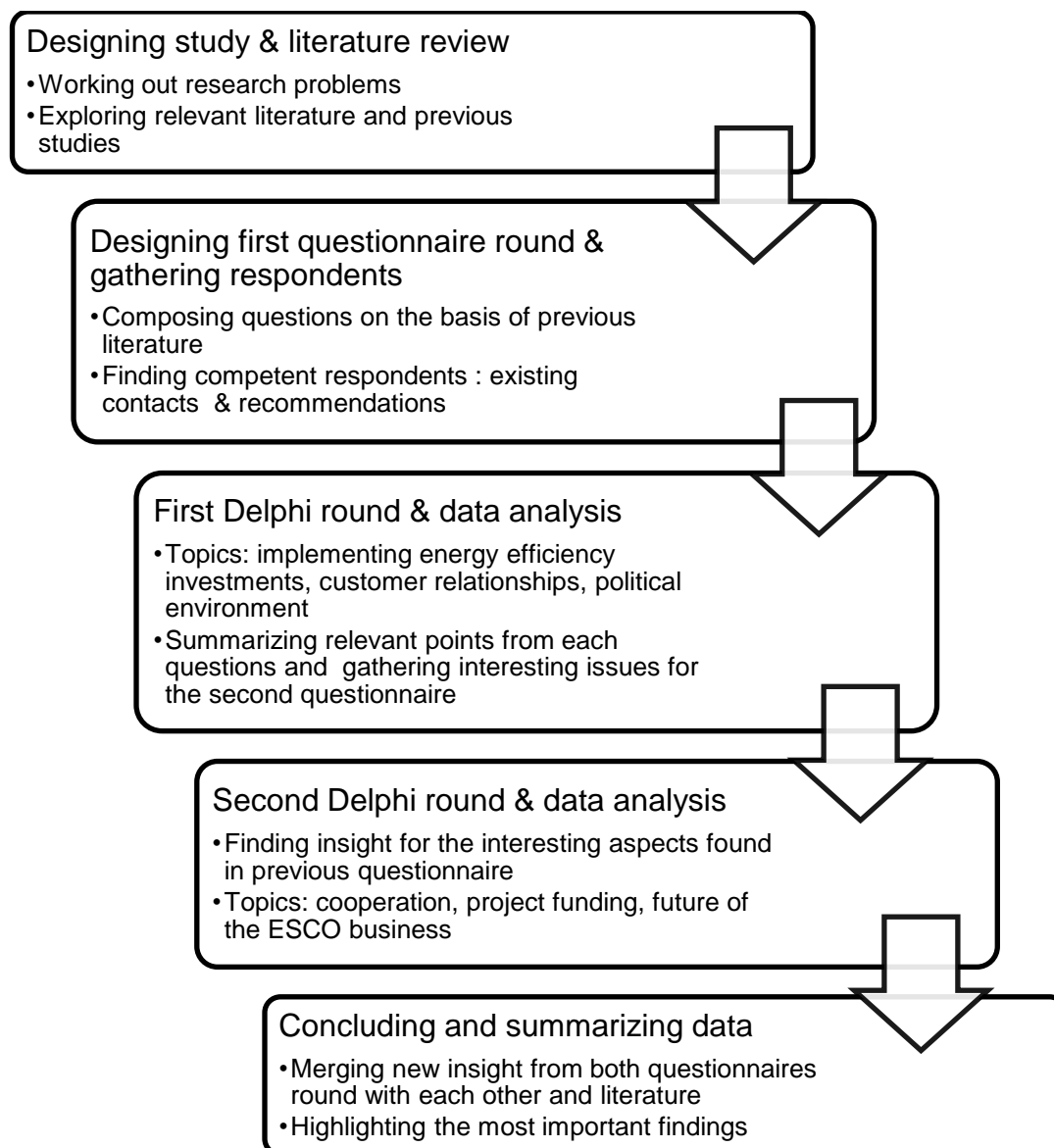
There were two Delphi questionnaire rounds in this study. Study was carried out during fall 2012 and spring 2013. Before questionnaire rounds were executed an extensive literature review was done. Purpose of this review was to gather information about previous researches of ESCO service model. This knowledge was used to form research problems as well as questions for the first questionnaire round, and strengthen question setting for the second questionnaire

round. In both questionnaires questions were formed in a way that first panelists were asked to answer multiple-choice question, and then to freely comment on the issue. In addition, in second questionnaire future scenario questions were applied.

There were different themes selected for both questionnaire rounds. Firstly, general information about participants was asked at beginning of the first questionnaire in order to find out more about participants' backgrounds and knowledge. However, the main topics of first questionnaire were willingness and ease of implementing energy efficiency investments, customer relationships in ESCO business, and political environment of energy efficiency. There were in total of 11 statement questions in first questionnaire in addition to general background questions.

After analyzing responses of the first questionnaire and identifying the most relevant observations, questions for the second round were composed. Second questionnaire included six statement questions and three different scenario questions. Statement questions dealt with cooperation and mutual arrangements between different parties in ESCO business and ESCO project funding. Three scenarios in second questionnaire assessed future of ESCO service business. Desirability and likelihood of each scenario were asked by using multiple-choice questions as well as giving respondents opportunity to freely comment on scenario. Responses from both questionnaire rounds were used in composing solutions for the research questions. Relevant information was sought especially from free comments. Obtained insight was also review from the theoretical point of view, and examined through TCE and service business frameworks. General structure of the research design is presented in Figure 7.





**Figure 7** Research design

Participants for the study were selected among Finnish ESCO actors. Aim was to obtain people with strong experience in ESCO business model and energy efficiency projects in Finland. Relevant respondents were found via existing contacts and recommendations. Participants of the questionnaires represented ESCO suppliers and ESCO specialist. 56% of the respondents had more than 5 years of experience in ESCO business, and 31% of the respondents had experience longer than 10 years. In total of 35 potential participants were approached with contact letter and given opportunity to take part in the study and receive analyzed results of the study. In the first questionnaire round 16 of

these persons answered the questions. Response rate stayed relatively high in the final questionnaire round for which 13 persons participated.

### **3.2 ESCO business model**

ESCO (Energy Service Company) is an organization which provides energy services and/or other measures for improving energy efficiency in its client's processes or premises. ESCO is typically engaged in developing, installing, and financing energy efficiency projects which duration is typically less than ten years. ESCOs provide comprehensive service package for implementing energy saving investments including technical as well financial services. In principle, ESCO service companies can provide various services for their customers. Services can encompass, for instance, energy analysis and audits, energy management, project design and implementation, maintenance and operation, savings monitoring and evaluating, property management, and energy equipment supply. (Bertoldi et al. 2007, 6; Vine 2005, 691; Motiva Oy 2000, 6; Marino et al. 2011, 6191)

The ESCO business model has been established in turn of 70's and 80's even though its origins date back to 19<sup>th</sup> century France. ESCO service model has been utilized on large scale since late 1980's – early 1990's. Despite ESCO model's long history, it hasn't quite thrived as expected even though ESCO projects have been found to have various benefits. Direct benefits of ESCO projects are, for instance, reduced energy and maintenance costs. Indirect benefits are improved productivity and environmental improvements among others. (Motiva Oy 2000, 8; Bertoldi et al. 2007, 5–7; Marino et al. 2010, 5)

What makes investments done with ESCO service model different than traditional investments is ESCO service's peculiar way of paying back investment. In ESCO service initial investment costs are paid back using cash flow from saved energy costs which occur during the contract period. In other words, client does not purchase needed equipment itself but buys investment service from ESCO service provider and uses future energy cost savings to pay back the investment and gain ownership of the investment. Hence, ESCO service helps to

overcome financial constraints of energy efficiency investments. (Marino et al. 2010, 5)

ESCO service providers help carrying risks of the energy efficiency projects. ESCO service provider takes responsibility of implementation and energy cost savings generation, and ensuring the overall success of the implemented project. In addition ESCO accepts some degree of financial risk. ESCO service is not fully risk free for the client either. In ESCO projects clients generally takes risk which is related to market conditions of client's industry. Market conditions may effect on project profitability via changes in customer's operation volume or total closure of the operations. If client's utilized capacity reduces, savings from improved energy efficiency may not realize as calculated and investment's lucrativeness suffers while remuneration to ESCO service provider does not necessarily reduce. (Motiva Oy 2007, 16; Bertoldi et al. 2007, 6)

ESCO service model is often used in different energy related modernization and refurbishment projects such as heating, ventilation, air conditioning projects, automation control system installations, and boiler renewal projects, for instance. Often ESCO service client represents public sector but ESCO service is known to private sector as well. ESCO service suits best for buyers which lack sufficient knowledge and/or finance to carry out energy efficiency projects. ESCOs provide for example engineering skills, manpower to manage projects, capital funding, risk management skills, and technological information. At the end ESCO's service proposition depends on ESCO's background and area of expertise. Some providers are merely brokers who organize engineering work and equipment externally, and some ESCOs operate as consultants and have most of the needed engineering skills in-house. Then there are also ESCOs which have all the needed skills and resources such as engineering, contracting, and equipment delivery in-house. There are even existing ESCOs which take responsibility of customer's whole energy procurement process. (Motiva Oy 2007, 4; Marino et al. 2011, 6192; Bertoldi, et al. 2007, 80; Motiva Oy 2000, 7–8)

ESCO service providers are not necessarily individual firms. In many cases ESCO service is one business unit or a subsidiary of a larger company. Usually energy services are somehow related to core business of these companies. ESCO service is often provided for instance by energy supply companies, engineering companies, manufacturers of building automation and control systems, and facility management companies. In Finland ESCO service has been offered by building automation and control system manufacturers, facility management and operation and control firms, and consulting and engineering companies. (Marino et al. 2011, 6191; Marino et al. 2010, 20)

### **3.2.1 Variations of ESCO service models**

There are various forms of energy service contract as well as ESCO service models developed by different actors in the industry. In this context, focus is on so called energy performance contracting (EPC) in which contract models presented here are included. In general, in EPC some of the investment project's risk is transferred to external organization, i.e. ESCO service provider, and the payments of the project is based on the performance of the project (Bertoldi et al. 2006, 1821; Marino et al. 2011, 6191; Bertoldi et al. 2007, 6). Two main models discussed here are shared savings contracting model and guaranteed savings contracting model. Both of these are used in Finland, and therefore they are selected in further discussion in this thesis (Bertoldi et al. 2007, 37). In addition, Motiva Oy's further developments of these models are discussed as well.

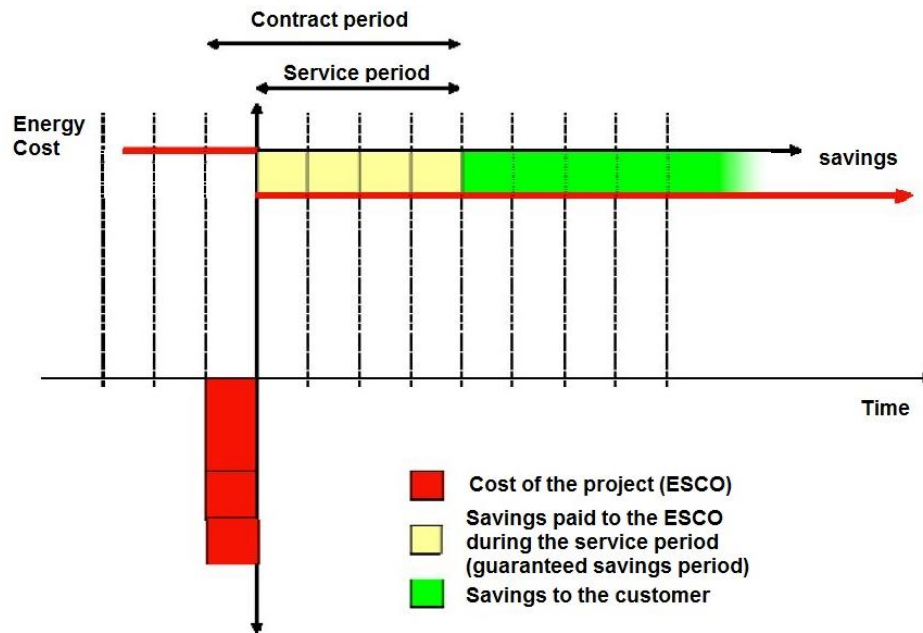
In shared savings contracting model ESCO service provider provides financing for the project and the customer pays to the ESCO pre-determined share of the realized savings during the contracting period. The share which customer pays is determined by assessing the cost of the project, the length of the contract period, and the amount of risk which ESCO and customer are facing. Advantage of shared savings model is that customer is able to benefit from the reduced energy costs immediately (Motiva Oy 2000, 11). Principles of shared savings contracting model is presented in Figure 8. (Bertoldi et al. 2006, 1822)



**Figure 8** Shared savings contracting model (Dreessen cited in Bertoldi et al. 2006, 1822)

In shared savings model business risk stays with the customer but the ESCO bears performance risk and credit risk. ESCO can use subcontractors for different project services and acquire some savings guarantees from them. Financing of the projects is often provided by financial institutions or other investors, and acquired by ESCO service provider. Utilizing financial institutions in ESCO project funding is commonly referred as third party financing (TPF) (Bertoldi et al. 2007, 6). It is also possible that financing is provided directly by ESCO service provider and without any external financial institution. (Bertoldi et al. 2006, 1822)

Moriva Oy (2007, 6) has developed an ESCO service model close to shared savings contracting model (see Figure 9). This model was developed for municipalities and other public actors but there were no remarks that it wouldn't suit for private entities as well.



**Figure 9** Motiva Oy's ESCO model, ESCO financing (adapted from Motiva Oy 2007, 6)

In this model ESCO service provider acquires the investment at the beginning of the contract period. When investments are ready to put into service, actual service period begins. As can be seen from Figure 9 customer pays back the investment using realized savings at constant pace. In addition to investment repayments service fee for the ESCO service provider must be considered also. It is worthwhile to notice that, in principle, customer's energy costs do not change during the contract period compared to costs before ESCO contract – if everything goes as planned. In this respect Motiva Oy's model differs from traditional shared savings model where customer gained some benefits from the beginning. However, if additional savings are generated, they can be shared between customer and ESCO, and if savings targets are not achieved payments to ESCO can be reduced. There is also a possibility to alter the length of contract period according to realized savings. After the investment has been paid back completely customer is entitled to the savings generated by the investment, i.e. customer's energy costs reduces hopefully permanently. (Motiva Oy 2007, 6)

Guaranteed savings model is a contracting model where ESCO service provider gives guarantees for the client that expected level of savings will be achieved during the contract period, and if they're not achieved ESCO will compensate

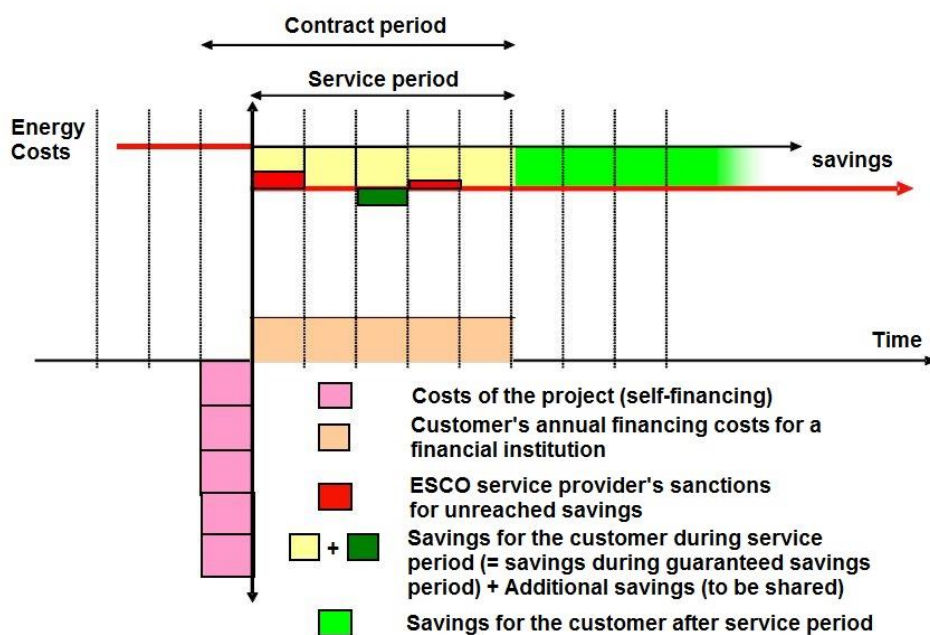
losses. By doing this ESCO takes over the performance risk of the investment. Since client is entitled to pre-determine compensation despite the level of realized savings, guaranteed savings contract does not cause performance risk for the client – only general business risk remains. Therefore savings guarantees have been found important risk mitigating factor in customer's decision making process (Motiva Oy 2007, 4). General principles of guaranteed savings contracting model is presented in Figure 10. (Bertoldi et al. 2006, 1821)



**Figure 10** Guaranteed savings contracting model (Dreessen cited in Bertoldi et al. 2006, 1822)

Commonly used financing model in guaranteed savings contracts is customer's self-financing. In other words customer acquires funding for the project the way they want. It is noteworthy that customer not necessarily use external funding but covers the expenses in cash. If external loan is acquired customer naturally takes care of all financing costs. The project in guaranteed savings contracting is designed in a way that yearly loan payments correspond to the savings guarantees given by the ESCO service provider. This way possible lenders or investors bear the credit risk. (Bertoldi et al. 2006, 1822)

Motiva Oy's equivalent to traditional guaranteed savings model is presented in Figure 11. Like Motiva Oy's previously discussed model, this model has developed public ESCO projects in mind, but model's principles should fit for other clients as well.



**Figure 11** Motiva Oy's ESCO model, customer's self-financing (adapted from Motiva Oy 2007, 7)

Motiva Oy's model presented in Figure 11 resembles Motiva Oy's previously discussed model in way that customer's energy costs stays equal compared to costs before the project. Models are different in terms of client's financing costs, sanction of unachieved savings for ESCO, and sharing of additional savings. (Motiva Oy 2007, 7)

In addition to these Motiva Oy's basic models, Motiva Oy has prepared an ESCO service model which combines ESCO's financing and customer's self-financing. Purpose of this model is to joint energy efficiency project with other refurbishment projects or other equipment renewal. In many cases improving energy efficiency is only a part of the project, and future savings are not sufficient to cover whole investment. If so, additional funding is needed to complete the project, i.e. both ESCO's funding and customer's self-funding is utilized. (Motiva Oy 2007, 8)

As mentioned, there are different ways to handle project financing in ESCO projects. Financing models where financing is provided by ESCO service provider or client themselves or via financial institution – third party financing – have already been briefly discussed. In Finland it is also possible to receive subsidies



for implementing energy efficiency projects (Motiva Oy 2007, 16). This is also an important aspect to be taken under consideration when planning ESCO service projects.

All payments discussed above are related somehow to the project investment. However, ESCO service providers are for-profit entities and therefore need some incentives themselves. These fees are often called as ESCO-fees or ESCO extras. Purpose of these charges is to give ESCO service provider fair compensation for the services ESCO has provided. ESCO-fee is additional fee to normal consulting and project management costs. These fees enable whole ESCO business. ESCO-fee can be a fixed fee, pre-determined fraction of total investment, or dependent on the success of the project – in other words on realized savings. (Motiva Oy 2000, 10; Bertoldi et al. 2007, 6)

### **3.2.2 Implementing ESCO projects**

As previously mentioned, ESCO companies can provide various types of services. Hence, ESCO projects may involve several parties from different area of expertise. Despite this in ESCO projects ESCO service provider acts always as a responsible supplier which has contractual relationship with the client and has overall responsibility for the project. (Motiva Oy 2000, 7)

ESCO projects can roughly be divided in 4 phases even though they are at least partly intertwined. Firstly existing energy efficiency possibilities must be identified and improvement measures designed. Secondly, project financing must be acquired. Third phase is implementing designed and financed energy efficiency investments. Finally, achieved savings effects must be verified during the service period. (Motiva Oy 2000, 7)

Identification of energy efficiency measures begins with conducting an energy audit of potential client's processes or premises. In this phase, current situation of energy consumption and energy efficiency is reviewed, and possible improvement objects are assessed. If sufficiently large savings prospects are found project preparation may continue. In principle, energy auditing can be

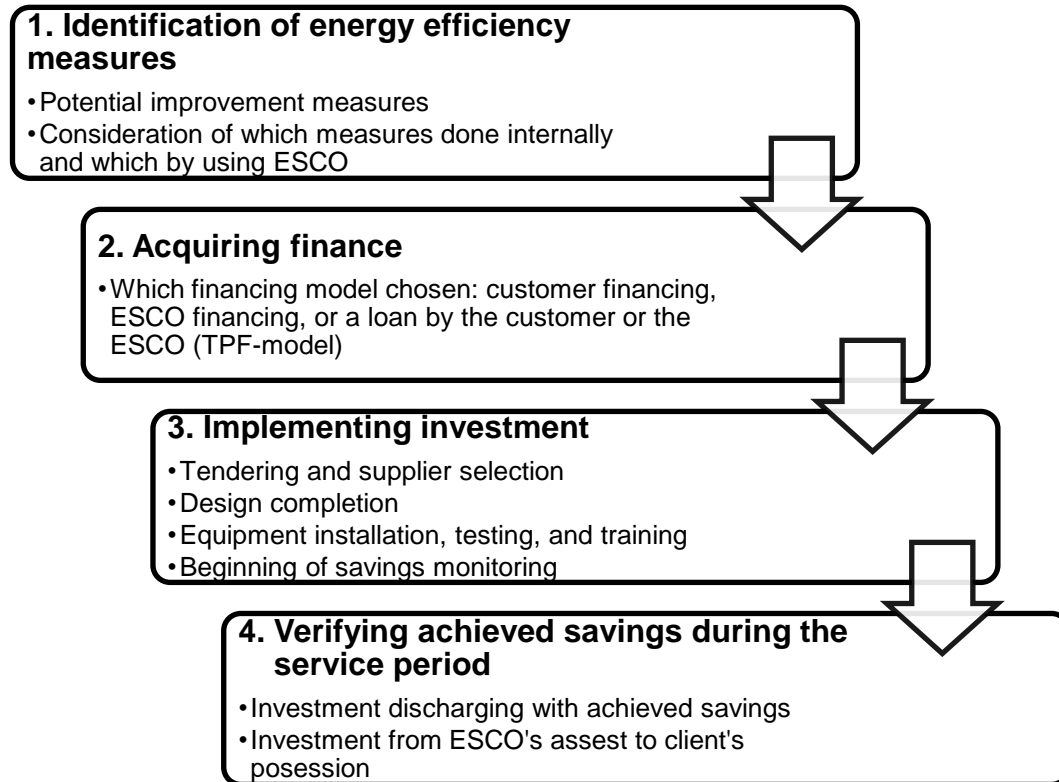
done by ESCO service provider or some other expert – an external consulting firm, for instance. However, in ESCO model developed by Motiva Oy auditing is done by other than ESCO company whereas in USA common practice is that ESCO service provider carries out the auditing. If ESCO company does the auditing it is mostly considered as marketing costs. It is not uncommon to find energy efficiency measures which are so lucrative and straight forward that it is reasonable for the client to carry out investments by themselves and without ESCO service. Investments, which are excluded from customer's own investment portfolio but are feasible to do, can be carried out by using ESCOs. (Motiva Oy 2000, 9–10, 17)

Second step in ESCO projects is to acquire financing for the project if suitable saving objects for ESCO service model are found. Financing of ESCO projects are done according to principles discussed in chapter 3.2.1 of this thesis, and the main decisions are related to how financing is acquired; customer's financing, ESCO's financing, or a loan by the customer or the ESCO.

When proper investment targets are found and project financing is in order, investment implementation can begin. Crucial parts of the implementation process and in some extend the financing process are tendering process of the investment, and preparing project contracting agreements. If ESCO project reaches this stage and ESCO service provider has done the energy auditing process, it is common practice that auditing costs are included in the project investment and paid back during the contract period. In general, implementation phase encompasses detailed design, equipment installations and test period, staff training, and savings monitoring commencement. (Motiva Oy 2000, 18)

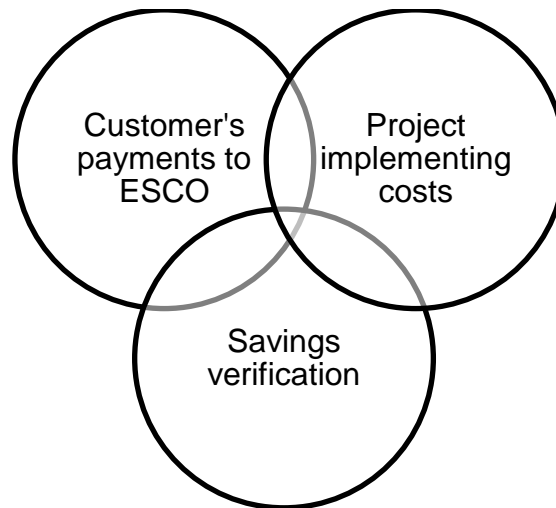
The final phase of ESCO project is verifying achieved savings. This is done during the service period. This is the time period where savings for paying back the investment are generated and investment is shifted from ESCO's possession to client's ownership. Paramount part of the service period is that achieved savings are monitored correctly because ESCO's remunerations and investment payback are dependent on it. Monitoring must be done with care. However,

costs of the monitoring must not exceed the benefits of it. Main stages of ESCO projects are summarized in Figure 12. (Motiva Oy 2000, 18; Motiva Oy 2007, 5)



**Figure 12** Phases of ESCO project

Phases presented in Figure 12 depicts by large engineering and contracting processes of the project. However, as mentioned acquiring financing has a role in ESCO projects as well. In matter of fact, there can be identified an economical process which in the end gives grounding for the whole project. Factors related to economical side of the ESCO projects are given in Figure 13.



**Figure 13** Economic factors of ESCO project

Customer's payment to ESCO represents the level of cash flow that ESCO receives during the contract period. Fees can be either fixed or variable depending on the agreement (Motiva Oy 2000, 10). Project implementing costs refer to the total amount of capital what is needed for designing, purchasing, and building everything investment requires. Lastly verifications of savings provide final result on how big the realized savings are after all. All these factors together determine overall profitability of the ESCO project.

### **3.2.3 Barriers of ESCO business identified in previous literature**

Barriers of ESCO business have been studied already in the past. In this section some of the most significant reasons for poor ESCO success found in various international ESCO business studies are examined. Key barriers of ESCO business model success are presented in Table 6.

**Table 6** Previously identified ESCO business barriers (Marino et al. 2011, 6193–6195; Marino et al. 2010, 21, 86–89; Sinkkonen & Pätäri 2012, 20; Bertoldi et al. 2007, 85–87)

<b>Barrier Group</b>	<b>Problem Issues</b>
Unclear legislative framework	<ul style="list-style-type: none"> <li>• Difficult procurement laws for municipalities</li> <li>• Mismatch of IFRS-rules</li> </ul>
Non-supportive procurement practices	<ul style="list-style-type: none"> <li>• Unsuitable procedures in companies' procurement procedures</li> <li>• Lack of ESCO supply and competition</li> <li>• Effects of ESCO projects to firms' balance sheet</li> <li>• Problems of budgeting rules in public sector</li> </ul>
Problems in political framework	<ul style="list-style-type: none"> <li>• Unpredictable political attitudes</li> </ul>
Financial difficulties	<ul style="list-style-type: none"> <li>• Financial crisis and economic downturn <ul style="list-style-type: none"> <li>▪ Stricter financial requirements and postponement of investments by clients</li> </ul> </li> <li>• Difficulties in raising funding</li> </ul>
Business and technical risks	<ul style="list-style-type: none"> <li>• Low and fluctuating energy prices</li> <li>• Small project size</li> <li>• Difficulties in measuring energy consumption</li> <li>• Low priority of energy efficiency investments</li> <li>• Unwillingness to outsource energy management; concern that energy efficiency is favored at the expense of core processes</li> </ul>
Mistrust and burdens between stakeholders	<ul style="list-style-type: none"> <li>• Lack of standardization</li> <li>• Belief that there is something unfavorable hidden in the contract</li> <li>• Mistrust that savings do not realize or given guarantees would not function as agreed</li> <li>• Collaboration between client and provider is time-consuming</li> <li>• Cultural issues; energy efficiency is moral issue and earning from other's savings is not desirable</li> <li>• Administrative hurdles and high transaction costs</li> </ul>
Insufficient knowledge	<ul style="list-style-type: none"> <li>• Clients and financial institutions are not familiar with ESCO concept</li> <li>• Willingness to learn about the concept is low because energy efficiency is not core business</li> <li>• Limited understanding of savings measurements and verification protocols</li> </ul>

Legislative framework has been reported to be problematic in terms of unsuitable procurement laws of public actors. Requirements make procuring ESCO services time consuming and high in terms of transaction costs. In addition, contractual agreements related to ESCO service are not well recognized in public procurement processes, and are incompatible with regulated contractual agreements for project development in public sector. Also IAS- and IFRS-reporting rules are not suitable for ESCO service contracting model. Problems

are related to how investments are recorded in balance sheet and in income statement. In IFRS-system clients who apply IFRS-accounting protocol must show ESCO investment in their own balance sheet instead of recording investment as services in income statement. (Marino et al. 2011, 6193–6194; Bertoldi et al. 2007, 38)

Unsuitable procurement practices are problematic in private sector as well as in public sector. However, problems occur in different way. When in public sector main hurdles are created by government legislative, in private sector problem are within firms. Procurement processes in firms are not familiar well enough with ESCO service model (Bertoldi et al. 2007, 38).

Unpredictability of political atmosphere around energy efficiency contributes to barriers of ESCO success. Governments do not have sufficient will to enact laws which would efficiently improve energy efficiency. Lack of energy codes and standard, unfavorable taxation, as well as voluntariness of energy audits depict this problem. Sometimes improvement of energy efficiency can be in conflict with other government policies. (Vine 2005, 696)

Energy efficiency investments compete with more traditional investments in terms of available funding. In many cases amount of funding in firms' disposal is not sufficient enough to cover all viable investment targets. Especially due to the recent economic downturn and financial crisis, available funding is even more scarce resource. Unfortunately, many times energy efficiency investments are not seen as crucial as some other investments. Also access to external funding has become more difficult during the recession because loan requirements have been tightened. For instance, financial institutions have remained more skeptical toward cash flow -based lending instead of asset-based lending, in other words financial institutions are assessing creditworthiness of the customer instead of the project itself. Also, financial institutions are not very familiar with financing energy efficiency projects or even are not interested in them, and therefore proper financing models are not available. (Vine 2005, 693–694; Marino et al. 2011, 6194; Bertoldi et al. 2007, 86–87)

Like all business endeavors and investments, there are business and technical risks involved in ESCO projects. One of the major business risks of ESCO service contracting is low and fluctuating energy prices. If there is no certainty of the value of future savings profitability of energy efficiency projects is extremely difficult to determine. This hinders ESCO service demand. Small project size and difficulties in measuring energy consumption and thus savings represent technical risks perceived by ESCO customers. Customers can also fear that interventions in energy systems might pose risks to the core business processes and therefore are not keen to implement ESCO projects and consider energy efficiency secondary issue. (Marino et al. 2011, 6194)

Mistrust between stakeholders has been identified as one of the biggest barriers of the ESCO business (Sinkkonen & Pätäri 2012, 20–21). Mistrust is caused largely by lack of standardization and inexperience of actors in ESCO business (Marino et al. 2011, 6194). Shortcomings in standardization are related to complex contracting, unclear definitions, and problems in savings measurements and verification. Also low level of competition in ESCO industry causes mistrust between ESCOs, clients, and financial institutions. Due to the mistrust clients might fear that there is something hidden within the contract, anticipated savings do not realize as they should, or agreed guarantees will not be provided as promised (Bertoldi et al. 2007, 85). Sometimes difficulties in relationships may be caused by cultural issues and decision maker's attitudes towards improving energy efficiency. All the same, different administrative hurdles increase transaction costs of ESCO projects and hamper willingness to implement ESCO projects. (Marino et al. 2010, 89)

Even though ESCO model has been around for a quite some time ESCO concept is not as well-known as it could be. Hence, insufficient knowledge in different forms is one identified barrier for ESCO business success. Lack of knowledge and expertise is found in clients as well as in financial institutions side. Potential clients are not aware of possibilities of ESCO concept and financial institutions do not feel comfortable getting involved with business model they do not fully understand. And if firms do not consider matters of energy efficiency as part of their core business willingness to learn more about the issue

can be relatively low. In addition, limited understanding of savings measurements and savings verification protocols hinders demand for ESCO service. (Marino et al. 2010, 21; Bertoldi et al. 2007, 85; Vine 2005, 693)

### **3.2.4 Factors of ESCO success from previous literature**

In addition to ESCO business hampering factors some factors for enhancing ESCO business success have been identified in previous literature. In this section most significant of these are discussed. Many of the identified success factors are in a way or another related to the barriers of ESCOs. For instance, increase in energy prices, and stricter environmental regulations due to the climate change concern have been reported to have positive effect on development of ESCO service business. Rise of energy prices is based on both increase in global market prices and increase in energy related taxation. Increase in energy prices have been found one of the main factors influencing the demand of different energy efficiency investments (Marino et al. 2011, 6193). Climate change concern in turn has led to various emissions reduction measures such as Kyoto protocol and EU's emission reduction targets which in turn contribute to demand of energy efficiency measures. (Bertoldi et al. 2007, 87, 89)

Development in European energy policies has also suggested having impact on ESCO service business. The liberalization of the gas and electricity market and government's support actions has enhanced the development of ESCO business in Europe. Government's and EU's hand print in ESCO business development can be seen in formation of ESCO supportive legislation and guidelines, subsidy systems, and other support measures such as organizations established by public authorities to promote energy efficiency. Also voluntary energy efficiency agreements as well as obligatory requirements for energy audits have been suggested to develop ESCO industry. And sometimes improving factors can quite simple. For instance, bundling of smaller projects together in order to make project more interesting can take ESCO project implementing forward. (Marino et al. 2010, 8, 94; Bertoldi et al. 2007, 87–89)



### **3.3 Results**

In following pages the most important and most strongly emphasized notions and opinions about the topics discussed in questionnaires are presented. Aspects highlighted here are solely opinions of the respondents; authors own reasoning is not included. Results are not presented in the order in which the questions were asked. Instead, results are organized by themes. At first, responses to questions concerning energy efficiency investments are presented. Then, relationships and co-operation in ESCO business as well as questions about energy policy are discussed. Lastly, views about the future of ESCO service is assessed via future scenarios. Statistics of responses for each theme are presented in subject to each question. Most interesting findings form both statistics and free comments are discussed more thoroughly. Additional insight from the responses is composed from respondents' free comments and presented in form of direct quotes.

It was noticed that respondents could be divided in three different categories. Approximately 19% of the original respondents represented ESCO service providers which had strong experience in carrying out ESCO projects in industrial environment. 31% of the respondents were working mostly on ESCO projects for buildings. Third identified group consisted of other ESCO business specialists, researchers and facilitators, and it corresponded 50% of the original respondent group. In addition to respondent grouping, one interesting aspect could be identified from the responses. It seems that there is substantial relevance whichever, public or private, business environment ESCO service provider operates in. In general, opinions on questions asked varied quite a lot in terms of from which standing point –private or public – was the respondent viewing the question. Also this observation is emphasized in following pages where results are presented in more detail.

#### **3.3.1 Energy efficiency investments**

A large number of questions presented in questionnaires dealt with energy efficiency investments. Questions concerning energy efficiency investments are

divided in two main categories. Firstly, the current state of energy efficiency investments is discussed (see questions in Table 7). Secondly, questions concerning, for instance, pooling of projects and knowledge, and ESCO project financing are presented in Table 8 and discussed later.

### *Current state of energy efficiency investments*

In total of four questions dealt with current state of energy efficiency. Purpose of these questions was to identify characteristics of energy efficiency investments in Finland. Results of these questions are given in Table 7.

**Table 7** Views on current state of energy efficiency investments

<b>Question (1–4)</b>	<b>Disagree</b>	<b>Partially disagree</b>	<b>Partially Agree</b>	<b>Agree</b>
1. Majority of ESCO projects carried out in Finland are small in size.	0%	47%	53%	0%
2. For significant part of implemented ESCO projects, it can be said that actual savings have been achieved for sure.	0%	7%	36%	57%
3. In addition to direct financial benefits of reduced energy costs, ESCO projects create other benefits for customers as well.	0%	7%	50%	43%
4. Companies are not willing enough to make energy efficiency investments.	0%	44%	38%	19%

Question – number 1 in Table 7 – of ESCO-project size divided opinions of the participants. Representatives of industrial ESCOs as well as representatives of ESCOs focusing on buildings mostly stated that Finnish ESCO-projects are not small in size. ESCO specialists and facilitators, instead, largely were of the opinion that ESCO projects in Finland are somewhat small in size. Industrial ESCO projects were reported to be 1 million euros in size on average, and varying from €200 000 up to 7 million euros. Thus, the size of ESCO projects is substantial if not huge. The project size has been growing since 2000. At the beginning normal project size could be about €50 000. Nowadays ESCOs are not interested in such small projects.

Project size, however, is not seen as a hindrance in establishing ESCO projects and the problems of ESCOs are found elsewhere. This was summarized well in following comment.

*“Project size is not a problem per se. Size should, however, be such that contracting, project management, and other costs does not consume disproportionate amount of time [or other resources].”<sup>1</sup>*

As noticed, ESCO projects must be large enough to cover different transaction costs related to project implementing. If this is realized the project is large enough to be carried out. Nonetheless, one problem related to project size was highlighted. Sometimes interests of client and ESCO service provider does not meet in terms of desired project size. ESCO service provider would like to do project as large as possible but the client would like to pilot the ESCO service with a smaller test project.

#### *Realized financial and other benefits of ESCO projects*

For energy efficiency projects in which ESCO model had been implemented, actual savings were achieved according to most responses of question 2 in Table 7. No one disagreed and only 7% of respondents partially disagreed with the statement made. Especially strong opinion that real savings have truly been achieved was among representatives of industrial ESCOs. ESCO projects were also mentioned to be mainly more lucrative than firm’s normal business in terms of return on net assets and internal rate of return. In general, if ESCO service provider had given guarantees for future savings, these savings have been usually reached. One explanation for this was given in following comment.

*Projects are often so simple that realization of savings is pretty obvious. Although total energy consumption could increase, for example due to change of building usage, ESCO project can still be considered achieving savings.*

Keeping projects simple – intentionally or not – leads sometimes to partial optimization, i.e. energy efficiency potential is not fully utilized or emissions are not actually reduced but moved elsewhere, for instance. This, however, does not mean that savings would not be achieved, but that more could have been achieved if wanted.

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<sup>1</sup> Because original answers were given in Finnish the author has freely translated them into English. This applies for all quotes of respondents made in this thesis.

Participants mostly agreed that ESCO projects can produce other benefits for clients in addition to direct financial benefits from decreased energy consumption (see question 3 in Table 7). All respondents representing industrial ESCOs and ESCOs for buildings at least partially agreed that other benefits are gained as well. Only minority of ESCO specialist and facilitators partially disagreed on the statement. Identified benefits were related to improvements in processes and property, increase of value, and image improvement. ESCO projects naturally lead to renewal of various equipment and devices. Applying latest technology does not only improve energy efficiency but the quality and efficiency of the process for which the equipment are used for. This may lead to reduction in material consumption in processes and improvements in indoor air quality in buildings, for instance. ESCO projects also increase the value of firms and properties because they make them more efficient and modern, and reduce future maintenance costs. In addition to these quite obvious benefits, ESCO projects were reported contribute to organization's green image even though there were some disagreements on importance of this. Another benefit which could really interest firms is possibility to examine their own core processes and increase knowledge of their processes and their efficiency. Also ESCO project may enable to extend investments as was stated in following comment.

*“As someone from the municipal side stated: We have one million euros of our own money, and if portion of investments made with ESCO service is one million euros, we're able to carry out investments of one million euros in two different places.”*

Even though respondents mostly agreed that ESCO projects provided savings and other benefits, few negative implications of ESCO projects were highlighted. ESCO project could cause so severe problems that the actual industrial production process could stop for a while or at least cause minor problems in the future. Because utilization rate and high quality are seen paramount in industry, managers don't want to take any risks of hampering production processes. For this reason outsiders are not allowed to intervene in production and ESCO projects are sometimes dismissed. In addition, a risk of flawed calculations was identified as a disadvantage of ESCO projects.

### *Actors' willingness to carry out energy efficiency investments*

According to responses of question 4 in Table 7, willingness to invest in energy efficiency is not particularly high among firms. Or if there is willingness to invest, payback time requirements are extremely high. The strictest payback time demands were reported to be for industrial energy efficiency projects – as short as 1–2 years. Reason for this was considered to be short-sighted view of business caused by general uncertainty in economy as one respondent put it:

*“Uncertain future, if there is a doubt that [firm is] alive after a couple of years, no one does investments with 4–5 years payback time in that situation.”*

This was reported to be one of the major reasons for weak demand of ESCO services. In addition, when payback time plays a large role in investment decision making, it leads to the selection of ESCO service proposition which has the shortest payback time. This choice, however, does not necessarily be the best one in terms of energy efficiency, i.e. in terms of reaching energy efficiency and emission reduction targets.

In addition to challenging phase in world's economy, problems of implementing energy efficiency investments were reported to be related to the investment process itself. Respondents were of the opinion that investment money is tight. In general, firms have more possible investment objects than they have money to spend. And because in most cases in industry, investment propositions and decisions are made by people responsible for the actual production process and not necessarily for energy costs, investments directly in the production process get greater weight in investment portfolios while investments in energy efficiency are often dropped off. Firms consider other investments such as process efficiency – not energy efficiency – or process functionality more important things than saving energy.

According to respondents, lack of knowledge and commitment from the clients' side also hinders the willingness to carry out energy efficiency investments. Employees are today often overloaded with work and therefore unable or unwill-

ing to familiarize themselves with possibilities of energy efficiency. Also ease of sticking with old habits and not bothering to develop practices hinder willingness to invest in energy efficiency. Lack of knowledge sometimes occurs in form of distrust that energy efficiency investment is too good to be true, or in form of misconception that improving energy efficiency would lead to new problems like mold problems in buildings.

Since business is conducted by humans, it was not surprising that there are some human factors influencing decision making of energy efficiency investments as was put in one comment:

*“Also envy may control [decision making]: Why should someone else benefit from our energy efficiency?”*

What this means is that in some cases firms – or firm managers – do not want anyone else to benefit from the efficiency improvements even though without that arrangement whole investment may not be realized and no benefits would be gained by the firm itself either.

One major problem for diffusion of ESCO service is procurement practices of firms and municipalities. Even though ESCO model itself was reported to be especially suitable for municipal sector, problems of procurement processes were seen particularly substantial in that sector. Procurement process problems of industrial ESCO clients are mostly related to small amount of suitable ESCO service providers. Procurement of comprehensive ESCO project is difficult to justify by firm’s decision makers if there is not enough rival offers from different ESCO service providers, i.e. bidding process does not work properly. This situation leads to rejection ESCO service proposal and division of energy efficiency project to smaller parts which can be handled by the firm itself. Firms arrange tendering of different parts such as construction work, electricity and automation work separately. By doing this, buyer is able to involve a large amount of different subcontractors to tendering process and make sure it attains best possible offer for each part of the project. In this model even project management can be tendered if desired.

In addition to above-mentioned problems, municipal sector suffers from problems of procurement legislation. Procurement law in Finland sets strict rules for public procurements; these rules have not been seen very suitable for ESCO service model. There have been cases even in market court of law related to differences of municipal ESCO projects. This in part hinders companies' willingness to procure or even provide ESCO services.

### *ESCO project bundling*

In previous literature of ESCO service, a bundling of smaller projects together in order to form larger and more profitable project packages was mentioned as one mean of improving ESCO markets. According to participants of this survey the case is not that simple after all (see question 5 in Table 8). All respondents which represented industrial ESCOs and ESCOs for buildings agreed or partially agreed that pooling projects could provide competitive solutions. ESCO specialist and facilitators were more skeptical about the issue. Vast majority of them partially disagreed with the question.

**Table 8** Views on combining energy efficiency investments and knowledge, financing of ESCO projects, and importance of the starting phase

Question (5–9)	Disagree	Partially disagree	Partially agree	Agree
5. There is large number of small and medium-sized enterprises (SME) and there is large energy saving potential in SME sector. By bundling smaller energy saving objects to larger projects ESCO's are able to provide SME sector more competitive solutions.	0%	36%	45%	18%
6. There is sufficient technical and commercial know-how in Finland to market, design, and implement successful ESCO projects.	6%	31%	38%	25%
7. Most successful ESCO projects have been carried out by combining skills of different actors from different fields of expertise.	0%	33%	27%	40%
8. Financing of ESCO projects is straightforward.	9%	45%	36%	9%
9. ESCO project's starting phase success is particularly important for the success of the whole ESCO project.	0%	0%	30%	70%

Bundling of energy saving projects is not a new thing in Finland and these kinds of arrangements have been done many times before. Smaller projects are naturally more interesting together than separately because transaction costs per projects can be reduced and investment becomes more attracting.

While pooling of projects is in theory a good thing, there are some practical difficulties in implementing pooled projects. Contracting technicalities might become problematic, especially if there are several different clients involved in the contract. Problems may be related to scheduling, co-ordination, and sharing of costs and benefits of the project. A good point of view about the issue was given in following comment.

*“Bundling of client’s small individual projects into same contract is possible and it has been done. In this case transaction costs per project will be smaller (expert visits, contracting, project management, same contractors working with number of objects, etc.). On the other hand, profitability examinations needs to be done project basis and the final results should be viewed separately.”*

In addition to this, any grant applications must be sent by each participating company separately. Bundling of projects can also lead to that similar solutions are applied for all sub projects even though they are different in various way. This may not provide the best outcome in terms of energy efficiency. And after all, some projects are just too small to be carried out even together with larger projects.

#### *Required skills for successful energy efficiency investments*

Question (number 6 in Table 8) about current know-how among ESCO service providers somewhat divided the views of respondents. Most respondents, however, agreed or partially agreed that there is sufficient technical and commercial knowledge within Finnish ESCO service providers. The most positive views were held by ESCO specialist and facilitators. Even though no substantial stumbling blocks of know-how were reported, few areas of development were identified. For instance, ESCO service providers were stated to act strongly from engineering basis and therefore some commercial know-how, business thinking, insurance knowledge, and risk management skills were called for. ESCOs must possess sufficient multi-talents for efficient management of subcontractors and projects. Skilled subcontractors and their successful management are not enough. ESCOs must have skills of their own on planning, energy audits, industrial processes, contracting, procurement, contract making, financing,



risk management, and so on. It seems that the existence of these skills is not the problem. They just have to be utilized by ESCOs in a way or another. This is much easier for larger companies which many times possess – by themselves or by subcontractors – much of the needed skills already in their non ESCO related businesses.

In addition to individual skills, there was identified one important area in business in which ESCOs should focus on; overall assessment of client's needs. ESCOs should improve their user and customer knowledge because at the moment ESCOs conduct limited feasibility studies and provide solutions which do not fully take into account clients' needs or opportunities to integrate other benefits in ESCO projects. ESCOs should also focus on developing new service models and improve marketing. Today ESCOs rely too much on foreign ESCO business models which have been working there but do not necessarily work that well in Finland. Furthermore, ESCOs have too limited knowledge on ESCO markets and potential clients in Finland in order to implement efficient marketing of their services.

Another question related to skills in ESCO business was a question of the importance of combining skills in ESCO projects (see question 7 in Table 8). Most of the respondents agreed or at least partially agreed that joining knowledge of different actors could provide good results. For instance, all representatives of industrial ESCOs were of the opinion that statement can be partially agreed. Yet, there were some objections on that, especially among representatives of buildings ESCOs. The main point against co-operation between different actors was that ESCO projects are, after all, easiest to carry through when there is only few parties involved and the project is kept quite simple. One example of this is addition of heat recovery unit in ventilation system; project is easy to carry out and implementation will easily correspond what was originally required.

#### *ESCO project financing*

Opinions on ease of financing ESCO projects were controversial – see question 8 in Table 8. It was identified that foundations of project financing differs accord-

ing to the type of customer in question, i.e. requirements of public sector and private sector such as industry are different. Even within the municipal sector clients were reported to have different views on financing ESCO projects; some clients want to finance themselves and some expect financing from ESCOs. Generally speaking many clients prefer not to increase loans in their balance sheet due to ESCO project. Previously this was possible for larger industrial clients as well, but now when IFRS reporting model has become more common, companies are forced to record equipment of ESCO investments into balance sheet whereas previously ESCO service provider handled the financing and investment was left out from the client's balance sheet. This in part hinders willingness of industrial companies to carry out ESCO projects.

There are two main models for financing industrial ESCO projects; (1) ESCO service provider acquire financing for itself and provides the ESCO service to its clients in a way that the client pays the financing costs as part of the service charge, and (2) client acquires financing itself in a way or another and pays the ESCO service provider only for equipment and services ESCO service provider supplies. Problem in model 1 is that the substantial customer's credit risk stays within the service provider. Credit risk can be mitigated or even eliminated if ESCO is able to negotiate financing agreement with a financial institution, i.e. applying so called factoring financing model where financial institutions grant a loan against ESCO's receivables which the client pays in the future. This, however, increases costs for ESCO and therefore whole project costs. Another problem in ESCO's self-financing is that the financing costs are obviously added to the total costs of the project. This makes ESCO service proposition in many cases appear to be more costly than similar project implemented within the client firm because firms often do not take financing cost into account at all when planning projects such as improving energy efficiency.

Model 2 where financing is acquired by the client itself was considered to be more suitable for financing of industrial ESCO projects. In this model clients are able to practice their own financing and decision making procedures, and utilize financing sources which they see most beneficial. In addition, model 2 is more straightforward in terms of delivery contract.

In addition to experiences from different financing models, some general problems of financing ESCO projects were emphasized in the given comments. It was stated that collateral value in ESCO projects is unclear. Financial institutions are not clear with what is the actual value of the investment for which they are loan granting for. This makes risk assessment difficult for financiers. And since there are no after markets for ESCO contracts it is difficult to withdraw from a contract once made. These and perhaps some other issues create an atmosphere of mistrust which impede financing of ESCO projects.

#### *Relevance of early project stages*

Respondents were surprisingly unanimous in the question on the importance of starting phase in ESCO project (see question 9 in Table 8). The starting phase of ESCO project is particularly important for the success of the ESCO project as one respondent put it:

*“Yes, in the early stage the field on which the game is played is created. When trust between client and customer is formed, fixing minor concerns and problems is easier.”*

Furthermore, creation of trust was seen an extremely important factor enabling ESCO service provider to carry out other energy efficiency projects with the certain client in the future as well.

What makes the starting phase so important is determination of energy savings potential. Before investments are made present situation of the energy consumption must be measured. If this is done carelessly, realized savings after the investment is ready cannot be determined, and investment payback charges and other payments are former incorrectly. Also, if mistakes are made in the preliminary study, mistakes cannot be corrected after the investment is done because old equipment and processes have already been changed. Successful starting phase of ESCO project encompasses also proper technical designing and contract negotiations. Responsibility of the successful beginning of ESCO project does not lie solely within the ESCO service provider but with the client as well. Sometimes ESCOs offer solutions which do not give the best possible energy savings but easily implemented solutions utilizing ESCO's special area

of expertise in order to win the tendering process. Therefore it is client's responsibility to emphasize their own desires and to carry out a comprehensive requirement assessment of their own in order to ensure successful beginning of the ESCO project.

Received comments encompassed also suggestions on the structure of ESCO project. One noteworthy model consisted of four main phases; (1) preliminary study, (2) project design, (3) tendering, (4) project implementing. Preliminary study could be done according to Motiva Oy's energy auditing model and should be done by third party engineering office. Project design should also be done by a third party engineering office according to the results of the energy auditing. Tendering process should be done on the basis of the plans designed by the engineering office. Lastly, the implementing phase and the actual ESCO contracting period should follow. It is worthwhile to notice that the ESCO service provider came to picture not until the very last phase of the project. According to one respondent from the buildings' ESCOs side, the current tendering model does not lead to the best possible result because ESCOs have to do energy audits and project design themselves.

### **3.3.2 Public relations, customer relationship, and co-operation in ESCO business**

Another important set of problems dealt within the questionnaires was related to relationships between ESCOs and clients. Results of questions related to these issues are presented in Table 9.

**Table 9** Views on PR, customer relations, and co-operation in ESCO business

Question	Disagree	Partially disagree	Partially agree	Agree
1. Customers are skeptical about the ESCO company's calculations and estimates of the achievable energy savings.	13%	33%	53%	0%
2. Importance of improving energy efficiency is sufficiently emphasized in Finnish media and public debate.	13%	44%	38%	6%
3. Firms which are not investing in energy efficiency cannot be worthy actors in the eyes of stakeholders in the future.	9%	18%	45%	27%
4. Mutual agreement on clear and industry wide rules in terms of ESCO project identification, designing, and tendering is extremely important for ESCO model's future success.	0%	45%	27%	27%
5. Success of ESCO projects and development of ESCO business in general can be enhanced by creating joint discussion forum for ESCO companies, subcontractors, and customers to actively discuss and exchange information concerning their projects.	9%	27%	36%	27%

It seems that respondents have had different experiences in customer skepticism (see question 1 in Table 9). Some respondents have witnessed client's mistrust towards presented energy savings potential, and some have not. None of the respondents, however, were totally of the opinion that customers are skeptical about the ESCO's estimates.

Some degree of skepticism was seen a positive thing as one respondent put it:

*"I think that it shows common sense to question savings potentials presented by a consultant, and therefore it is worthwhile to demand more detailed calculations to support proposals. In a well-drawn ESCO contract savings monitoring and measuring are presented in a way that the game is transparent for both parties. This is often one of the most challenging things in ESCO contracts."*

In other words calculations must be clear and understandable for the client in order to raise trust. Naturally calculations must be also correct. According to respondents representing industrial ESCOs, calculations and realization of energy savings have been very successful so far. A good way to mitigate existing mistrust is to provide guarantees for future savings. Usually if ESCO gives savings guarantees clients tend to believe calculations because it is against ESCO's own interest to provide false or incorrect calculations. Even without guaranteed savings clients often regard ESCOs calculations trustworthy because it

is ESCOs own benefit to provide credible and even conservative savings estimates so that no setbacks will occur during the contract period.

Another discussed matter in questionnaires concerning PR and other relationships was the role of media and how energy efficiency is emphasized in media (see question 2 in Table 9). It seems that opinions were dissenting in this matter – there were about same number of respondents agreed and disagreed on the statement. However, there were some differences between different response groups. All of the representatives of industrial ESCOs were of the opinion that energy efficiency is not sufficiently emphasized in Finnish media, and most of the responses representing ESCOs for buildings more on the opinion that energy efficiency is discussed somewhat enough in media.

Even though facilitators of ESCO concept have made huge efforts promoting ESCO service in past over ten years, general knowledge of energy efficiency among society was not seen sufficient – taking energy efficiency forward requires continuous communication and marketing. Perhaps the problem is not so much in sending the message but receiving it. It is also a little bit unclear whose responsibility it is to market energy efficiency. From the establishment of ESCO model, marketing was seen a job for organizations like Motiva Oy. Yet at some point ESCO service providers should start taking responsibility for promoting ESCO model and their own offering.

Energy efficiency is not exiting subject enough to catch media attention. Media prefers to communicate matters relating to energy but not energy efficiency like one respondent put it:

*“Energy efficiency is talked very little in media. It’s not a media sexy subject. Overall, news coverage circles largely around energy production. Megawatts are discussed but “negawatts” aren’t.”*

Nonetheless, industrial actors were reported to be quite familiar with ESCO service and the barriers of ESCO success in this client group were reported to be other issues such as matters of procurement process.

Respondents gave some suggestions on how communication of energy efficiency could be improved. Successful energy efficiency projects should be emphasized more and potential customers should be more informed in financial benefits of energy efficiency and ESCO service. ESCO service should also be presented by different impartial technical publications because dissemination of ESCO information lies at the moment too much on salesmen's shoulders. ESCO service providers should take a larger role in all of this.

Respondents saw investing in energy efficiency quite important aspect of business for firms in the future (see question 3 in Table 9). A little bit confusing was the way investing in energy efficiency should be defined and measured, i.e. what is investing energy efficiency and what isn't. It was said that in the future worthy companies are those which invest in energy efficiency. That, how close future this will be in reality is another thing. A role of energy efficiency was well summarized in following comment:

*“Firm's good performance is wholeness and energy efficiency is not absolute value in itself. But investing in energy efficiency is an indication that the company is on the cutting edge and views things on perseverance way.”*

Many companies are not interested in energy efficiency at the moment. All the same, worthiness of companies not investing in energy efficiency was justified with the notions that energy efficiency does not show outside the company and energy efficiency is mainly about money, i.e. production efficiency, which is firm's internal matter. Therefore, at least in part, company which does not invest in energy efficiency could be seen as a worthy company in eyes of external stakeholders. Level of energy efficiency in a firm can differ a lot from what the firm shows or communicates outside. In some cases “greenwashing” in PR can create too good picture of the situation, and in some cases a good level of energy efficiency is not communicated outside.

Significant proportion of participants were of the opinion that establishing industry wide rules on project identification, designing, and tendering is not crucial for the success of ESCO service business even though discovery of mutual intent

was considered to be beneficial (see question 4 in Table 9). It was also pointed out that ESCO service model has been around for such long time that specific agreement on practices is no longer possible. Especially for industrial ESCOs establishing cohesive practices could be challenging. And there is also risk that strict rules and predetermined practices will suppress development of new service innovations and business models, and cause too much work as well. Instead, effort should be focused on helping and guiding customers, and raising awareness.

One area in ESCO business which calls for unified practices and code of conduct is municipal ESCO services. Procurement routines should be clearly defined so that everybody knows what should and is allowed to do. This is not just ESCO service providers' responsibility but clients should also participate. Fortunately Motiva Oy has recently released a comprehensive guide for implementing municipal ESCO projects.

A close subject to unifying practices and establishing rules for the ESCO business is cooperation between different parties in ESCO business. Some degree of cooperation has already been done for instance between ESCOs and financial institutions as well as subcontractors as one participant put it:

*“We combined expertise of different areas largely by using subcontractors. In financial side, long-term cooperation with financial institutions enabled development of new contract models. ESCO company must possess sufficient multi-talent so that subcontracting is efficient and handling of project implementation stays well in own hands.”*

Hence, various ways of cooperation is already been utilized in ESCO business. However, there is yet possible to deepen relationships between parties of ESCO business, and also this question was addressed in questionnaires (see question 5 in Table 9).

Suggestion of establishing a joint discussion forum for all parties involved in ESCO business raised conflicting opinions. Especially interesting was how ESCO specialist's and facilitator's opinions differed from ESCO service providers'



opinions. Surprisingly, only 40% of specialists and facilitators saw joint discussion forums good or somewhat good idea, whereas ESCO service providers had more positive attitude toward joint discussion forums. All of the representatives of buildings ESCOs agreed or partially agreed that discussion forums would be a good idea.

If some joint discussion forum is to be formed it could be used for information dissemination. Information could encompass different pre-tested and proven solutions as well as various flexible approaches for different projects, and perhaps price and cost information of past projects. This kind of information would be useful for much needed new actors entering ESCO business as well as for existing ESCO service providers who are extending their service offering. In general, exchange of mutual knowledge and experience could promote competition in ESCO business. But above all, establishing joint discussion forum would provide current and possible customers a change to participate in service development. Customer involvement was seen especially important because ESCO business is after all a service business where real demand is formed via customer's needs and requirements. Early stage customer involvement was also seen an effective way to alleviate reluctance to carry out energy efficiency projects and allow external service provider to take charge of the project implementation. However, it is another thing if customers are willing to take part in these forums.

Even though joint discussion forums were considered good idea in principle, and similar organizations have been established elsewhere, there were some practical problems highlighted. As one respondent put it:

*“According to my experiences discussion forums are more functional in theory than in practice. I believe that lack of this is not a bottle neck factor, and I doubt stakeholder’s interest to participate actively.”*

So it seems that although existence of joint discussion forum would contribute to the whole ESCO industry, from the individual ESCO service provider's point of view forum might not, after all, be an attractive option. Because competition between ESCO service providers is brutal, companies are afraid of leaking

business secrets to their competitors. Dissemination of so called business secrets would benefit the whole industry but at the same time would impede the company providing the information. For this reason it was seen very unlikely that it is possible to gather a comprehensive group of ESCO service providers at same table to settle a code of conduct for the industry.

### 3.3.3 Energy policy

Third main topic of the questionnaires dealt with subsidies, systems improving energy efficiency, and other government's guidelines for energy policy. Questions and answers of these topics are presented in Table 10.

**Table 10** Views on energy policy in Finland

Question	Disagree	Partially disagree	Partially agree	Agree
1. ESCO projects receive sufficient amount of investment subsidies.	7%	7%	27%	60%
2. Finnish state laws and policies, such as energy taxation, support the development of the ESCO business.	13%	13%	60%	13%
3. In order to respond EU's energy efficiency targets, Finland has introduced national energy efficiency agreement program ( <a href="http://www.energiatehokkuussopimukset.fi">www.energiatehokkuussopimukset.fi</a> ) which covers the period 2008-2016. Introduction of energy efficiency agreements has promoted ESCO business.	13%	31%	38%	19%

According to vast majority of respondents, ESCO projects are currently receiving enough investment subsidies (see question 1 in Table 10). Especially ESCO specialist and facilitators were of the opinion that public authorities are providing sufficient financial aid for implementing ESCO service projects. Every participant of this group agreed or at least partially agreed with the statement. It was almost unanimously noted that reasons for poor ESCO service demand and unwillingness to start ESCO projects are something else than too low amount of government subsidies. It was also stated that the current amount of subsidies are just as much it is possible to provide – there is simply no extra more money available to spend on energy efficiency subsidies. In addition to subsidies, stricter government requirement for firm's energy efficiency were called for. Compulsoriness of energy efficiency improvements should be increased.

An important view about the role of investment subsidies was raised in following comment:

*“In order to be on a healthy ground, ESCO service should also be able to work on free markets as well – at least future development of ESCO service should strive to this. Potential challenges or problem areas of the service should not be tried to solve by increasing subsidies.”*

In other words, in the long run subsidies should be abandoned entirely. However, it was agreed that when new business model for enhancing energy efficiency, such as ESCO service model, is introduced subsidies are needed for covering initialization costs of the model. An interesting and quite general opinion among participants was a notion that in the end ESCO model is just one tool for enhancing energy efficiency and it should not be considered something which must be kept alive at all cost. The future of ESCO service is discussed in more details when future scenarios are discussed.

The question about functionality of Finnish government’s energy policy resulted somewhat disagreement in opinions (see question 2 in Table 10). All participants representing ESCOs for buildings agreed or partially agreed that Finnish state laws and policies support the development of the ESCO business whereas all respondents of industrial ESCOs disagreed or partially disagreed with the statement. All the same, political guidelines were not seen particularly clear at the moment.

Main problems in Finnish energy policy were comprehensively summarized by one respondent:

*“State policies cover almost only energy production, increase of greenhouse gas –free production, and keeping energy + emission prices low. There’s actually said nothing about improving industry energy efficiency in official programs.”*

So in other words the level of political will to improve energy efficiency is not, at least according to received responses, at sufficient level in order to achieve set emission reduction and energy efficiency targets. What EU and Finnish state should do if they wish to improve energy efficiency is to introduce more sanc-

tions and fines for entities which neglect energy efficiency. This, however, was seen a problematic because governments are afraid of companies to move their production into less regulated and cheaper countries. Protection of existing industrial production was seen especially important in times of economic downturns like one Europe is struggling with at the moment.

Yet, political control was seen necessary in the future as well. For instance, one suggestion for policy makers from the respondents was to establish a system in which current emission trading is combined with taxation for carbon dioxide, and import duties based on production's carbon dioxide emissions. This kind of system could effectively reduce greenhouse gas emissions and ensure competitiveness of local production.

One attempt to enhance energy efficiency by policy makers is introduction of national energy efficiency agreement program. Views on effectiveness of the program, however, varied quite much among the respondents (see question 3 in Table 10). Majority of representatives of industrial ESCOs disagreed or partially disagreed that energy efficiency agreements would have promoted ESCO business. On the contrary, representative of ESCOs for buildings were slightly of the opinion that the program has promoted ESCO business, not much but still a little.

Effectiveness of the energy efficiency agreement program in industrial environment was bluntly put as follows:

*“The agreement system does not work. At least industry has not done investments on large scale.”*

In general it was said that if agreements have had some positive effect on ESCO business in industrial environment it has been only marginal. For instance, joining energy efficiency agreement program could increase knowledge and interest of the subject in organizations. In addition it was emphasized that energy efficiency agreements are not limited to ESCO projects, and they cover various types of energy efficiency projects. Therefore true importance of energy efficiency agreements cannot be evaluated on the basis of ESCO projects.

One major problem of the agreement program was highlighted. Energy efficiency agreement program is after all a voluntary program. It is not compulsory for anyone to join the program, or even carry out any investments if joined – if plans are done that's enough according to respondents. It was suggested that energy efficiency agreements should be formed to more compulsory way in order to they have any real effect.

As said energy efficiency agreements were not seen suitable for industrial environment. Instead, for municipal ESCO projects energy efficiency agreements were seen somewhat or even highly useful. One respondent even stated that energy efficiency agreements and possibility to higher ESCO investment aid which the agreement makes possible are the greatest incentive for implementing municipal ESCO projects.

### 3.3.4 Future scenarios

In addition to plain statement concerning energy efficiency and ESCO service model, three different future scenarios were examined in second questionnaire set. Scenarios were drawn from the responses given in first questionnaire round. In some responses, participants evaluated the future of the ESCO service and gave opinions on how ESCO model will survive. In terms of these notions, three scenarios were conducted. Idea was to evaluate three different future outcomes. First scenario described case where ESCO service activity has declined compared to current situation. Second scenario depicted unchanged situation, and in third scenario volume of ESCO business has increased compared to current state. The scope of interest in all scenarios was in scenario likelihood and desirability as well as raised thoughts about the issue. In Table 11 first scenario under examination and its response distribution is presented.

**Table 11** Response distribution for scenario: In year 2025, energy efficiency projects are not carried out by using ESCO model

LIKELIHOOD		DESIRABILITY	
Unlikely	20%	Very undesirable	18%
Not very likely	60%	Undesirable	73%
Likely	20%	Desirable	9%
Very likely	0%	Very desirable	0%

Majority of the respondents think that ESCO service model is still being used in year 2025. Respondents were also largely of the opinion that it is quite desirable that ESCO service is still alive in year 2025. It was stated that in the future demand for different tools for improving energy efficiency is increasing, and that ESCO service is a good model among others in the future as well. In other words, if demand for energy efficiency projects increase it is fair to assume that demand for ESCO service increases too. Development of ESCO service business and competition in ESCO markets were seen to be in good progress, and there were seen no reason why this progress wouldn't continue. Still, current quarrelsome situation in ESCO markets and weakness of financial models pose threads to development of the model.

One notable view presented was a notion that ESCO service model is better suitable for some clients than others. Public sector and municipal energy efficiency projects were seen promising customer group for ESCO service providers as long as problems such as dysfunctional procurement processes are solved. Instead, prospects of ESCO service in industrial environment were seen quite grim unless some significant service development occurs in near future. Question of developing practices leads to the second scenario examined in the questionnaire. Results of this scenario are presented in Table 12.

**Table 12** Response distribution for scenario: In year 2025, ESCO projects' size, number, and methods are similar to those today

LIKELIHOOD		DESIRABILITY	
Unlikely	18%	Very undesirable	10%
Not very likely	55%	Undesirable	70%
Likely	27%	Desirable	20%
Very likely	0%	Very desirable	0%

From the likelihood column in Table 12 it can be seen that project size, number, and methods are expected to change in the future. It can also be seen from Table 12 that changes in used methods are very welcome. ESCO specialists and facilitators had especially positive attitude towards changes ESCO business. It was even argued that current ESCO service model will break down into many different types of energy efficiency service concepts – the way energy efficiency investments are done doesn't matter as long as they are done. All the same, it

was seen of paramount importance that the current ESCO service model will evolve into service model which better corresponds to existing demand and utilizes existing competences more efficiently.

Third and last scenario examined in questionnaire was a scenario where volume of energy efficiency projects as well as ESCO business has increased significantly. Results of this question are presented in Table 13.

**Table 13** Response distribution for scenario: In year 2025, investments in energy efficiency have high priority in the firm's investment portfolio. The total volume of ESCO business has increased significantly, and the ESCO service does not need government subsidies to succeed.

LIKELIHOOD		DESIRABILITY	
Unlikely	0%	Very undesirable	0%
Not very likely	45%	Undesirable	20%
Likely	55%	Desirable	60%
Very likely	0%	Very desirable	20%

Likelihood of this scenario gave no clear result. Yet slight majority of respondents were of the opinion that importance of energy efficiency and volume of ESCO business will grow, and ESCO's do not need government subsidies anymore. This scenario was also seen quite desirable future outcome – see desirability column in Table 13).

General reasoning for skeptical attitude toward scenario was that time horizon from present to 2025 is too short for any significant changes occur in firms' energy efficiency attitudes or ESCO service's ability to operate without any government subsidies. Firms' attitudes towards energy efficiency were seen as questions of people's attitudes which usually change slowly. However, it was forecasted that energy price will rise, more regulation will be introduced, and available technology will develop. All of these will help the examined scenario to come true. Alone these might not be enough. In addition, EU's and governments' strong political control and increase in prices of CO<sub>2</sub>-emissions are needed. Nevertheless, general significance of energy efficiency and success of ESCO service does not necessarily walk hand in hand as one respondent put it:

*“Investments in energy efficiency are surely to be ranked high, but I believe that investments are mainly implemented by using traditional model and own funding.”*



## 4 DISCUSSION AND CONCLUSIONS

In following pages obtained results are analyzed and discussed in more detail. First results are viewed through theoretical frameworks used in this study. Then solutions to secondary and main research problems are composed. It seems that some of the ESCO success barriers identified in this study are ones which have been found in previous foreign studies as well. Nevertheless, some of the identified hindrances have not played a significant role in previous studies. At the same, ESCO service's problems highlighted here characterizes situation in Finland. Lastly, contribution of this study in ESCO service development, ESCO related decision making, as well as in future ESCO research settings, is discussed.

### 4.1 Key findings

Transaction costs economics and theory of service business was used as a theoretical framework of this study. In transaction costs economics uncertainty of business environment was found to be an important factor in firm boundary decision making. This finding was noted to hold true in case of ESCO service business as well. Now, when general uncertainty in world's economy has increased and firms are struggling with economic downturn, willingness to invest in energy efficiency and purchase services from ESCO service providers has declined. If some investments in energy efficiency are done, they are preferably done within the firm as TCE predicts.

Another dimension of TCE which has identified in this study was asset specificity. It was reported that equipment investments in ESCO projects are somewhat asset specific investments because when devices and equipment are once installed it is extremely difficult to find feasible replacement use for them if project is terminated for one reason or another. This, however, was not seen significant ESCO project barrier. Perhaps bigger hindrances are caused by asset specificity in ESCO project finance. It was said that at the moment there are no aftermarkets for ESCO service contracts. Thus, it is nearly impossible for financier of the project to withdraw from the project and to sell the contract forward. Even

though lack of ESCO contact aftermarkets was not directly reported to be a barrier of ESCO business, it would be foolish to expect it wouldn't have any effect at all.

In addition to previously discussed TCE dimensions, aspects of bounded rationality and opportunism were also identified to exist in ESCO service business. Bounded rationality of customers' decision makers which occurs, for instance, through unawareness of ESCO project's benefits and inability to assess investment possibilities objectively, decreases demand for ESCO service. Features of opportunism in ESCO business are found for instance in customer sphere. Customers might fear that ESCO service provider is trying to benefit excessively from the contract or that ESCO service provider is giving exaggerated estimates about achievable savings and so trick customer to award the contract to ESCO. Opportunism was identified among ESCO service providers as well. It was noted that even though joint discussion forums for different actors sounds a good idea on paper, it is very unlikely that discussion forums will become popular among ESCO business actors. Major reason for this is fear of leaking business secrets and giving advantage to the competitors. Benefits of new insight were seen smaller than risks of losing advantage over competitors. However, it is notable that negative effects of opportunism and bounded rationality can be mitigated via savings guarantees and communication respectively. Table 14 summarizes identified TCE dimensions in ESCO service business and the effects those dimensions have in ESCO business.

**Table 14** Dimensions of TCE in ESCO service business in Finland

<b>TCE dimension</b>	<b>Dimension in ESCO business</b>	<b>Effects of TCE dimension on ESCO business</b>
Uncertainty	General uncertainty in worlds economy	Willingness to invest in energy efficiency has declined
Asset specificity	Equipment investments in ESCO service somewhat hard to utilize in alternative places. No aftermarkets for ESCO contracts	Equipment specificity has no significant effects  Lack of contract aftermarkets makes it difficult for the financiers to withdraw from the contract.
Bounded rationality	Inability to see benefits of ESCO projects	Investments decisions are not done objectively and feasible ESCO projects are dismissed.
Opportunism	Customers fear that ESCOs exploit customer's situation.  ESCO's fear that other ESCO's use shared information against them.	Customers might be suspicious about ESCO projects  ESCO's are not willing to participate in joint discussion forums and share information in order to develop the business model.

Utilizing economies of scale is one way to reduce transaction costs. This method is also used in ESCO service business. Project bundling in order to gain larger project size was identified in previous ESCO literature and it was used in Finland as well. It can be said that up to a certain point combining similar projects to a larger ESCO project can be beneficial. Nevertheless, issue is not that straightforward what TCE predicts. Deterioration of innovativeness and contractual problems reduce viability of project bundling and so increase transaction costs. Contracts become more complicated when there are several participants taking parts in same contract.

Signs of service dominant logic utilization can be found in ESCO service business. Service dominant logic represents modern approach to service business where cooperation between service provider and customer is seen paramount. In ESCO service, which falls into category of consumption services, ESCO service firms provide services for clients' support functions and help clients to focus on their core processes. Since ESCO projects are quite long-term investments, maintaining good customer relations is vital for the success of ESCO business, just as service dominant logic predicts. Yet, better understanding of true cus-

tomers needs was reported to be an important part of ESCO business model development. Hence, firms in ESCO business should be moving towards service dominant logic even more.

## 4.2 Solutions for research questions

There were in total of three secondary research problems in addition to the main research problem in this study. First secondary problem of this study was related to legislative issues in Finland and was put as follows:

*Does the legislative and political framework in Finland provide business environment which enables development and success of ESCO business model?*

It can be concluded based on obtained results that legislative and political framework in Finland, and for that matter in Europe, does not support ESCO business development as well as it could. For instance, public procurement rules in municipal ESCO projects create a major barrier for successful ESCO projects. These rules and legislation are of course well justified and needed but they don't suit for ESCO business. Generally speaking, political guidelines are somewhat unclear and hard to predict. This makes it difficult to make investment decisions for the future, and reduces overall willingness to get involved with energy efficiency investments. In addition, political discussion concentrates too much on energy production, and in many ways ignores possibilities of energy efficiency. Perhaps energy production is more interesting subject on people's opinion, and thus induces more political debate.

One aspect in government policy which does support ESCO business is energy subsidies. Government subsidies are at sufficient level and work as a good incentive to start planning energy efficiency investments. Therefore the level of energy efficiency subsidies is not a reason for poor ESCO business success. On contrary, generous investment aids may, in fact, enable poor business models to stay alive even though they should vanish. Subsidies, as useful as may be, are not enough for ensuring increase in energy efficiency, more is needed. Government should also introduce more obligatory aspects to its energy policy.

If there is no clear requirement for level on energy efficiency, and improving energy efficiency is solely energy user's responsibility, it is possible that energy efficiency measures are overlooked even though significant economic benefits could be achieved.

Statement can be reasoned with ease of sticking with old habits and focusing only on core processes. A good example of this is government's energy efficiency agreements program which largely is based on actors' voluntariness of improving energy efficiency, and holds – according to responses – no real demands for efficiency improvements. And for this reason, current model has had no notable positive effects on improving energy efficiency in industrial environment. However, it was extremely interesting finding that in municipal sector energy efficiency agreements were seen a major incentive to carry out ESCO projects. Therefore it can be concluded that there are somewhat different drivers for improving energy efficiency between private and public sector, and current energy efficiency agreements system should be developed to match needs of both customer sectors equally.

Second sub research problem dealt with ESCO project finance as follows:

*Does the funding framework for ESCOs work properly in Finland? What kind of financing model suits best for ESCO business model?*

It was noted that there are different ways of financing ESCO project depending on customer's standing point – public or private –, and customer's own interest. Generally speaking industrial customers prefer to use their own funding, and public customers expect ESCO to participate in financing acquisition more. Hence, it can be stated that most suitable financing model for ESCO service is the one which suits best for the ESCOs' clients. And with high degree of certainty it can be concluded that this is realized quite well in ESCO business in Finland at the moment.

Problems in ESCO project finance are mostly related to investment appraisal procedures. It is not always clear for the client nor for the ESCO how investment cost should be calculated. Especially problematic is the way how financing

provided by ESCO should be compared to customer's own project funding. If customers have not taken their own financial costs into consideration ESCO contract may appear to be too expensive compared to alternative where project is done in-house. This may lead to rejection of ESCO contract. In addition, it may be difficult for financial institutions to evaluate the true value of ESCO contract they are about to finance. This combined to the fact that there are no aftermarkets for ESCO contract may lead to low willingness of financing ESCO projects. However, there is no doubt that lucrative ESCO projects wouldn't get financing relatively easily. For this reason, it is fair to suggest that acquiring project financing is not significant barrier of ESCO business success, and funding framework works properly in Finland. This statement is supported by previously concluded notion that there are sufficient amount of government subsidies available for energy efficiency projects.

Third secondary research problem in this study examined relationships and level of awareness in ESCO business, and was formulated as follows:

*Is there any mistrust between ESCOs and their customers which could create barriers for successful ESCO activity? Is the awareness of ESCO-model at sufficient level among potential customers?*

Some problems related to trust between ESCO service provider and customer can be found in planning stage and investment decision making phase prior to the actual ESCO contract. Because investment money is a scarce resource, people are overloaded with work, and investment decisions are sometimes done by people who are responsible of production process but not energy costs, some mistrust towards feasibility of ESCO projects may incur. This, however, is mostly due to lack of knowledge about the ESCO project benefits. Therefore it is fair to suggest that customers have good confidence in ESCO projects and achievable savings from the projects. Especially in cases where ESCO service provider has given savings guarantees there is no reason for the client to doubt project's future cash flow. As said, mistrust is not included in major barriers of ESCO business in Finland. Yet, some difficulties are caused by awareness of ESCO model among potential customers. Lack of knowledge can sometimes manifest in form of mistrust.

There are two major reasons for low level of awareness; deficiencies in ESCO service communication and reluctance to learn about the model in buyer's side. Even though a lot of work promoting ESCO model has been done, for instance, by Motiva Oy for a long time, the level of awareness is not yet at sufficient level. Therefore ESCO service providers should become more active and sharpen their own communication and take larger role in promoting ESCO model and energy efficiency in general. ESCOs should try to make potential customers see benefits of ESCO projects and assess ESCO projects objectively. This is one of the major challenges in ESCO's communication.

Main research problem of this study was:

*What are the key barriers hampering success of ESCO service business in Finland?*

On the basis of secondary research problems and additional insight obtained from the research, solution for the main research problem could be summarized. As mentioned, project financing and mistrust between buyers and ESCOs were found not to be significant barriers of ESCO business. Instead, problems in political environment and in investment processes were discovered to be major reasons for poor success of ESCO service in Finland.

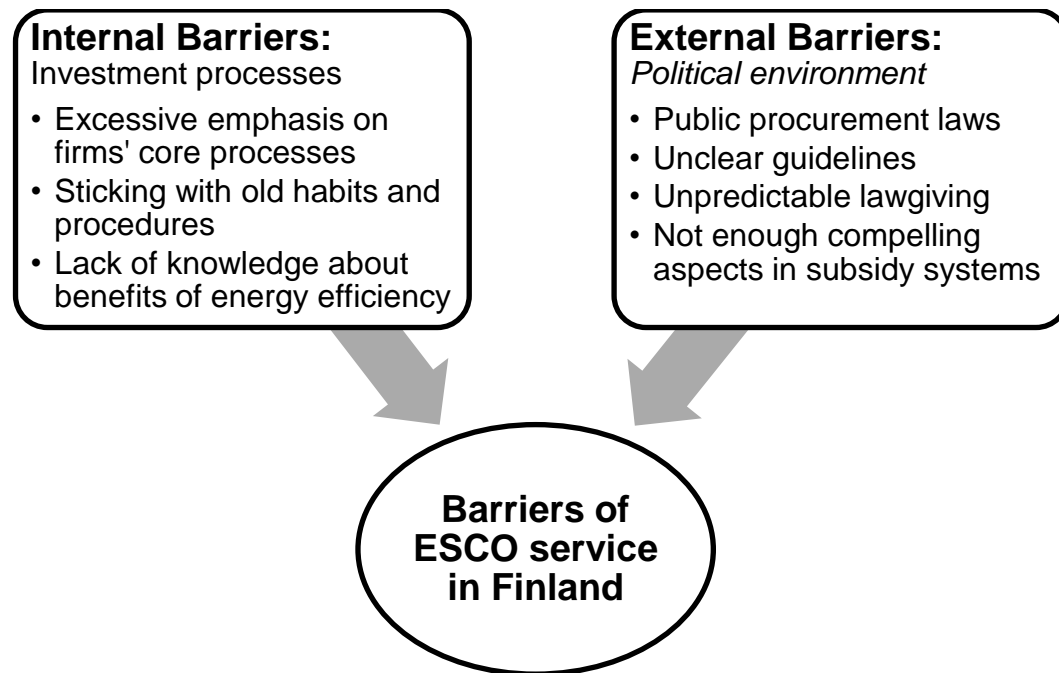
In public sector unsuitable procurement laws are highly problematic for ESCO projects. Current procurement laws make tendering process of ESCO service contracts extremely difficult. Private sector suffers from energy policy guidelines in other ways. In general, political guidelines concerning energy efficiency are far too unclear and unpredictable. For this reason, willingness to invest in energy efficiency remains at relatively low level – it is understandable that decision makers are not keen to make long-term investments if government exercises bouncing energy policy.

Although government subsidies for energy efficiency investments are at sufficient level there are still some major flaws in the system. Subsidies are relatively easy to obtain but there is little mandatory aspects in government's requirements. As long as improving energy efficiency is voluntary and is based on

firms' unprompted will to develop their own processes concerning energy consumption – which in many cases has no significant role in firm's core business – energy efficiency investments are probably not with high importance in firms' agendas. To counter this, government should give firms some stick in addition to carrot so to speak, and motivate firms to improve energy efficiency by granting investment subsidies but at the same time demand firms to stay on the job. Authorities should require firms to exercise on-going energy efficiency improving in order to be eligible to the initial funding. Later discovered energy efficiency improvement targets should also be eligible to subsidies up to a certain point.

Government's political obscurity is external hindering factor of ESCO business in Finland. There are severe hindrances in firm's internal processes as well. These hindrances lie mostly in customer's sphere but can still be influenced by ESCO service provider. In fact, what ESCOs should do is to try track down fundamental reasons for investment process problems and fix them. Decision making in firms is largely based on developing core processes which in industrial environment usually correspond to manufacturing of something. Often energy consumption is not included in these core processes, and therefore improving energy efficiency is not seen particularly interesting investment even though these investments could end up being more lucrative ventures than investments in core processes. This is a huge fault in firms' decision making process, and it creates high ESCO service success barriers. This kind of behavior can be changed only if firms start to view their business more broadly and understand the financial benefits of saving energy. ESCO service providers must start taking more responsibility in ESCO model promotion and in changing present attitude among potential customers, and not to expect that organizations such as Motiva Oy does the job for them. Figure 14 summarizes the most relevant barriers of ESCO business success in Finland.





**Figure 14** Major barriers of ESCO service business in Finland

In addition to identified success barriers some notable issues were discovered in this study as well. It seems that importance of the starting phase of ESCO project cannot be over-emphasized. The beginning of the project determines, by far, the overall success of the whole ESCO project. At the beginning trust is formed between ESCO and the client because at this point savings potential, project design and investment negotiations are done. If savings potential is calculated carelessly and investment decisions are done according to erroneous calculations success of the whole project is questionable. Failure in the starting phase also ruins trust between ESCO and the client, and consequently preclude possibility to carry out any future energy efficiency projects. For this reason, ESCO's should focus extremely well on the first stages of ESCO projects.

Another important development target for ESCO service providers seems to be identification of real customer needs and development of suitable service models according to identified customer needs. ESCO's have sufficient skills to provide quality services for their clients if they first identify what customers regard quality. Also whole new service concepts should be examined more thoroughly. For instance, new business models could be sought from customer business. At this point, possibilities of consumer ESCO services have not been widely dis-

cussed even though some small efforts by individual ESCO service providers have already been done. This could be one source of new business models for ESCO service, and therefore worthwhile deeper examination.

### **4.3 Contributions of the study**

This study has plumbed ESCO service business model in Finland through TCE and service business frameworks. By doing this, new and more exact insight about characteristics of Finnish ESCO business has been discovered. In addition, this study has shown that both transaction cost economics as well as service business theory can be successfully utilized in study of Finnish ESCO service business.

Method for gathering data in this study was Delphi questionnaire. Experiences obtained from this process point out that Delphi questionnaire suits well for this kind of research setting. Since there is limited amount of ESCO experts available in Finland and most of them are extremely busy, Delphi questionnaire via Internet is very effective tool for obtaining high-quality data. These experiences about Delphi-method, TCE and service business theory can be used in designing of future ESCO studies.

New insight about the reasons for poor growth of ESCO business discovered in this study can be exploited by many different actors involved in ESCO business. Firstly, study has pointed out issues in which ESCO service providers should pay more attention, and in which direction ESCOs should develop their services. Secondly, and perhaps even more importantly, this study elaborates problems in Finnish political framework from the ESCO industry's point of view. Discovered hindrances could be taken into consideration by government's legislators when making future political guidelines. Thirdly, this research helps also current and potential ESCO customers to understand characteristics of ESCO service and ESCO energy efficiency projects, and familiarize problems which ESCO projects may encounter. Especially useful from clients' point of view in this study are the brief summarizing review of ESCO model principles, and issues concerning different project phases and project finance. Fourthly, this

study summarizes useful insights about ESCO service which ESCO business researchers can exploit. From this study researchers can find new perspectives for outlining their own studies.

It is quite absurd to expect that one thesis would have any real effect on government's decision making. Instead, when it comes to people working in studied industry, even results of one thesis might have wide audience. And if industry experts have been included in research process, as in this thesis, there is a good chance that findings and suggestion of the study are acknowledged by relevant people. The most important contributions of this study to ESCO service provider managers are the suggestion to start courageously develop firm's service proposition towards customer needs and according to their core abilities. In general, due to this study future development needs of ESCO service can be identified more detail.

#### **4.4 Limitations of the study and potential future research topics**

While data for this study was attempted to gather from a group as wide as possible, this was not fully achieved. Although there were extremely high-quality participants representing ESCO specialists and researchers, as well as ESCO service providers with customers from different segments, one major respondent group was missing from the study: ESCO service customers. This decision was done partly deliberately because ESCO customer field is scattered and actual decision makers are hard to identify. Hence, lack of customer view is the largest single limitation of this study. Views of industrial as well as public customers, and for instance real-estate owners would have been very welcome. Also some extra views of public decision makers and legislators would have been useful.

Absence of customer side views does not necessarily impair quality of obtained results but it may reduce generalizability of the findings because notions of customer behavior found in this study cannot be verified by actual customers – suggestions about customer behavior are based on supplier and expert impres-

sions. This may have some effect on findings concerning problems found in firms' internal investment process decision making, and relationships between ESCO service provider and customer.

Some flaws may inhere in existing respondent group as well. Since significant proportion of the respondents was representing ESCO service providers, respondent group opinions can be biased in an opportunistic way. Obtained responses can reflect ESCO suppliers' objectives too strongly and, for instance, pin the blame of industry problems on others than on ESCOs themselves. Yet, mostly respondents' comments assessed the topic under discussion from different point of views. Hence, level of selfishness in responses was somewhat low. Another obvious limitation of this study is that study is limited to Finnish ESCO companies. Thus, obtained results are not necessarily generalizable to other countries and business environments. Although suggestions and findings from different foreign studies were applied and tested in this study, the results still represent situation in Finland.

During the study some additional questions arose concerning ESCO business. These issues are things which could be useful research topics for ESCO business research in the future. Table 15 presents some possible future research topics.

**Table 15** Potential future ESCO service research topics

<b>Topic</b>	<b>Problem description</b>
Problems of public procurement laws in ESCO business	How public procurement laws and ESCO service could be fitted together?
Flaws of energy efficiency agreements –system	Why industrial actors have not get involved in energy efficiency agreements?
Possibilities of joint discussion forums for ESCO business actors	How fear of unwanted information leakage could be mitigated and joint discussion forums become popular?
Improvement of ESCO service awareness among potential customers	How ESCO service could be communicated effectively?
ESCO service for consumer markets	How ESCO service could be developed to the needs of household consumers?
ESCO project bundling in Finland	Is it possible to increase project implementation in Finland by bundling projects even more?

Problems of public procurement laws were found to be a major barrier of ESCO business in Finland. However, sufficient details about the reasons for the problems and especially possible problem solutions were not discovered in this study. Therefore in future ESCO studies should tackle this problem more thoroughly. Particularly measures for workable public ESCO project tendering should be examined. Also government's energy efficiency agreements system was found flawed. It should be explained why industrial actors are not interested in energy efficiency agreements whereas municipalities are extremely pleased with the system. The big question is how energy efficiency agreement system could be developed in a way that industrial firms would like to participate too.

Joint discussion forums for different actors in ESCO business were seen a good idea in theory but not in reality. It was already argued that the fear of revealing business secrets is the main reason for this. Yet, it would be interesting to find out if there is any mean to overcome current fears and make joint discussion forums reality since it is agreed that they would have positive effects on ESCO industry altogether. Another communication related research topic could be improvement of ESCO awareness. It was stated that a lot of work has been done in this field but it seem that there is no coherent plans on how ESCO service providers should organize their own efforts in communication of ESCO service benefits. What should be government's role in all this?

Development of new ESCO service models was seen important for the future of the ESCO model. One customer group which has not been discussed enough is small consumers. It is worthwhile to find out if ESCO service could be suitable for small consumers as well. This might increase sales volumes significantly. Another possible research topic related to small projects is project bundling. In this study it was noticed that project bundling is not new tool in Finnish ESCO business and it has some advantages as well as hindrances. Yet, project bundling is a topic which requires more detailed examination. Could it be possible to standardize measures for project bundling and overcome existing contractual barriers?

## 5 SUMMARY

Environmental concerns and steady rise in energy prices has made managing of energy consumption more important than ever. Since EU, and thus EU's member states, has set targets for reducing CO<sub>2</sub>-emission, energy consumption should be decreased and made more efficient in the future. Therefore the measures of energy efficiency will play significant role in many things in Europe as well as in other parts of the world. These political guidelines create new possibilities for new kind of energy related businesses. One business model which can answer to the demand of energy efficiency improvements is ESCO service business model. However, success of ESCO service has not been as good as expected.

Idea of ESCO service is to fund energy efficiency measures with the forthcoming energy costs savings after the investment has been made. ESCO service provider offers its expertise of energy efficiency to clients who lack their own skills or do not consider energy consumption part of their core processes, and so helps their customer to focus on core business. ESCOs take care of project design, equipment installation, and in some cases funding and equipment operation. ESCO's remuneration is paid by the customer as a part of the investment repayment for which cash flow from calculated energy cost savings is used during the contract period. This remuneration is called ESCO-extra or ESCO-fee. After the contract period, the initial investment has fully been shifted from ESCO ownership to client's ownership and ESCO is able to withdraw from the contract.

There are two main operation models in ESCO business; shared savings contracting model, and guaranteed savings contracting model. In shared savings contracting ESCO provides project design, management, and everything else including finance. In guaranteed savings contracting model ESCO provides project design, and management etc. but not financing. ESCO gives guarantees for future savings instead, and the project financing is handled by the customer as it wishes. Mentioned models are merely rough basic models, and in reality there are many different variations of contracts for different cases.

ESCO project consists of four main stages. First energy efficiency measures are identified. Next financing for the project is acquired. Third phase is the actual implementation of the project. This means designing, purchasing, installing, and commissioning required equipment. Last phase of ESCO project is contract period in which investments are paid back using saved cash flow. In this phase achieved savings are verified as agreed in design phase of the project.

Objective of this thesis was to find out why ESCO model has not succeeded as well as anticipated. Study was limited to examine only situation in Finland, and therefore the aim was to discover the main barriers of ESCO success present in Finland. Data for this qualitative research was collected by using two rounded Internet based Delphi-questionnaire between autumn 2012 and spring 2013. In Delphi-questionnaire participants answer multiple choice questions and are able to give additional comments about topics under discussion. Answers from previous questionnaire rounds are used in formation of questions for following rounds. Therefore Delphi-questionnaire can be described as iterative data collection method.

Participants of the questionnaires represented ESCO experts and researchers, as well as people from ESCO service providers. ESCO service provider participants could be divided in two main groups; ESCO services for industrial firms, and ESCO services of buildings for municipalities. There were in total of 16 and 13 respondents in first and second questionnaire round respectively.

Theoretical frameworks for this study were transaction costs economics (TCE) and service business theory. These selections were justified because decisions concerning utilization of ESCO services are decisions of determining firm boundaries, i.e. buying from outside or doing within the firm, and ESCO model represents service type of business. Determination of firm boundaries, i.e. governance structure, is theorized in TCE, and theory of services give guidelines how service business should work.

Main influence of service business theory to this study was suggestion that all firms should move in their mindset from goods dominant logic towards service

dominant logic. Goods dominant logic emphasizes manufacturing goods efficiently and with high quality, and seeking benefits through product standardization and economies of scale. Whereas in service dominant logic, customers have huge role being a co-creator of value, and quality of interaction between customer and supplier is emphasized over tangible quality of goods and efficiency of manufacturing. Movement toward service dominant logic was found important in terms of Finnish ESCO business; ESCO service providers should pay more attention to identifying true customer needs and develop their offering according to that.

TCE argues that determination of firm boundaries is minimizing transaction costs – firms should choose its governance structure and size in transaction cost economizing way. There are three key dimensions in transactions which determine the correct governance structure. These dimensions are (1) uncertainty, (2) transaction frequency, and (3) asset specificity, i.e. how transaction specific the asset is, can it be used easily elsewhere for some other transaction occasion. Simplified rules of thumb for choosing correct governance structure are; the higher the uncertainty, transaction frequency and asset specificity, the better choice internal procurement is, and vice versa. Also human behavior in form of bounded rationality and opportunism has important role in TCE. Bounded rationality refers to humans' inability to take all possible outcomes into consideration in its decision making, and opportunism refers to people habit of making decisions according largely to their own interests. Key dimensions of TCE determine the optimal governance structure but final success of the structure affected by human behavior in forms of bounded rationality and opportunism.

In case of Finnish ESCO service business uncertainty, asset specificity, bounded rationality, and opportunism were relevant TCE dimensions. General uncertainty in world's economy hinders demand for ESCO service, and the asset specificity of ESCO contract might reduce financier's willingness to participate in ESCO projects. ESCO contracts are asset specific because there are no existing aftermarkets for the contracts; once entered contract is difficult to withdraw from. Bounded rationality and opportunism, in turn, manifests in customers limited understanding of ESCO project benefits, and customers fear of being vic-



tims of opportunistic behavior from suppliers' side. Fear of opportunism was also found among ESCO service providers; ESCOs are not willing to participate in joint discussion forums because they are afraid that the information they provide is being used against them in opportunistic way even though joint forums would benefit industry as a whole.

There were various reasons for poor ESCO service success found in previous ESCO studies. However, only few of them turn out to be essential in case of Finnish ESCO service business. For instance, project financing and issues of mistrust between current as well as potential customers and ESCOs were not seen as major barriers of ESCO service in Finland. Instead, issues related to legislative and political framework, and investment processes were discovered to be major hurdles for success of ESCO business in Finland.

Problems in legislative and political framework were unsuitable procurement laws, unclear political guidelines, unpredictable lawgiving, and lack of compelling aspects in government's energy efficiency investment subsidy system. These hurdles can be described external hampering factors since they are given by government, whereas problems in investment processes are mostly internal hampering factors which reside in customer sphere. In spite of the fact that investment process problems are mostly in customer's side, ESCOs can and they should try to influence them. Identified problems in investment processes were customers' excessive emphasis on firms' core processes and neglecting of support processes such as energy consumption, sticking with old familiar habits, and lack of knowledge about benefits of energy efficiency. Many of mentioned problems can be affected via proper communication about ESCO service benefits.

In addition to ESCO success barriers some important aspects of ESCO projects were identified. Especially important for the ESCO project is the starting phase of the project. First phases of the project determines, by far, success of the whole project because at this stage basis for achievable energy savings are calculated, bonds between customer and ESCO are formed, and technological decisions are made. Therefore ESCOs should focus on first phases of ESCO

project extremely well. This is, in part, closely related to suggestion of determining customer needs better.

This study demonstrated that both TCE and service business theory can be used for ESCO service business research. This study also showed that Delphi-questionnaire, especially if conducted via Internet, is suitable tool for conducting research and gathering data from small and scattered group of experts such as ESCO experts. Therefore it is reasonable to utilize Delphi-method in future ESCO studies as well.

Results of this study can, at least in principle, be used in political decision making, but obtained results are most useful for ESCO service providers. Also current and potential ESCO customers can utilize obtained results. In addition to ESCO service providers and customers, results of this thesis provided useful information for ESCO business researchers. Thesis also raised some potential ESCO business research topics for the future.

Largest single limitation of this study was lack of ESCO customers' view. Even though there were extremely high-quality experts participating questionnaires, there were no representatives of ESCO customers among them. For this reason the generalizability of this study in terms of questions about, for instance, customer relationships must be examined in somewhat critical manner.

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