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**WEAK SIGNALS IN MANAGEMENT CONTROL SYSTEMS**

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**ABSTRACT:**

The study reports a survey of 58 large and middle-sized Finnish companies, and uses partial least squares modeling to examine the effects of two contingency factors; perceived environmental uncertainty and strategy on the use of weak-signal-based foresight approach in organizations. In more detail it is explored if weak-signal-based foresight approach is a part of management control systems (MCS) of organizations. Furthermore it is explored if the integration of weak signals to MCS increases product innovation and improves performance in the organizations.

The results indicate that the companies detect weak signals and that detection and utilization of weak signals is in a way or another a part of MCS. Also the positive relationship between prospector-strategy and detection of weak signals seems to be significant. Direct significant relationship between MCS that includes weak-signal-aspects and product innovation or performance was not found. However, a significant positive relationship between weak-signal-based foresight and product innovation was discovered. Also weak-signal-based foresight approach seems to improve performance via increased product innovation.

# 1. INTRODUCTION

The task of anticipating the future is getting more crucial for companies operating in the increasingly turbulent business environment of today. The risk of strategic surprise is rising and the time to cope with the unexpected is getting shorter (Ilmola & Kuusi 2006; Ansoff 1984). Reacting after the change has happened is often too late. The last century is full of examples of surprises that have entirely changed many businesses and the whole economy. The year 2010 has continued the same direction, the crisis of the Irish banks as the latest example of sudden large-scale incidents. In smaller scale unexpected changes happen all the time. How early companies can detect that something is going wrong and something should be done differently? On the other hand, how the companies manage to seize the right opportunities, the ones that match their core competencies?

Ansoff (1984) has suggested already in the 70s that to achieve and sustain competitive advantage companies in turbulent environments need to scan the business environment to capture weak signals of opportunities and threats. Ansoff (1984: 22) defined weak signals as imprecise early indicators about impending impactful events and suggested that every impact goes through a succession of levels of knowledge, from weak signals to strong signals. Ilmola et al. (2006: 909) suggest that to capture the essential weak signals companies need to develop and employ systematic methods for scanning the dynamic and volatile environment.

Previous research indicates that perceived environmental uncertainty is the prominent force to increase the managers' use of accounting information and control systems (Hoque 2005). A need for a fit between environment and organizational systems is the underlying assumption of contingency-based MCS studies (Baines & Langfield-Smith 2003: 676). Hoque (2003: 2-3) states that strategy- and environmentally oriented MCS that allows flexibility and supports fast response capability is essential for companies to track their performance in comparison to its competitors. MCS that enhances foresight activity and innovation in organizations, is referred as interactive (Simons 1995, 2000).

1.1. Purpose and contribution of the study

The purpose of this research is to map whether the Finnish organizations detect and exploit weak signals and is this kind of foresight activity connected to management control systems. The study combines findings from the contingency studies of management control systems and studies of foresight, innovation and weak signals in organizations. Though the study falls to the field of management accounting, the study is multidisciplinary in a way that management studies and future studies are a strongly involved.

This study suggests the detection and utilization of weak signals to be a part of MCS. The definition of MCS in this study is relatively broad; it refers to the set of procedures and processes that managers and other organizational participants use in order to help ensure the achievement of their goals and the goals of their organizations (Otley & Berry 1994) and it encompasses formal control systems as well as informal personal and social controls (Otley 1980).

The research model is based on contingency theory, which suggests that control systems should be designed specifically to fit the special circumstances in which the organization operates (Chenhall 2003). The contingency characteristics included in this study are perceived environmental uncertainty and strategy. In this study it is examined whether these contingency factors have an influence on the detection of weak signals.

Secondly, the aim of this study is to find out how systematic the detection of weak signals is in the organizations and to what extent is this kind of foresight activity connected to the MCS. Thirdly, it is explored whether the inclusion of weak signals in MCS increases product innovation in the organizations. Finally, the impact of MCS that includes weak signals on performance is explored.

As there is no existing research about the detection of weak signals as a part of MCS, the purpose of this study is to map whether the organizations in Finland detect weak signals at all and do management control systems have any role in the detction and utilization of weak signals. Thus the approach of this study is inductive. The emphasis is not on how in detail the weak signals are detected and what do the companies do for the signals. If weak signals are included in MCS, it can be assumed that the utilization of weak signals is systematic in companies.
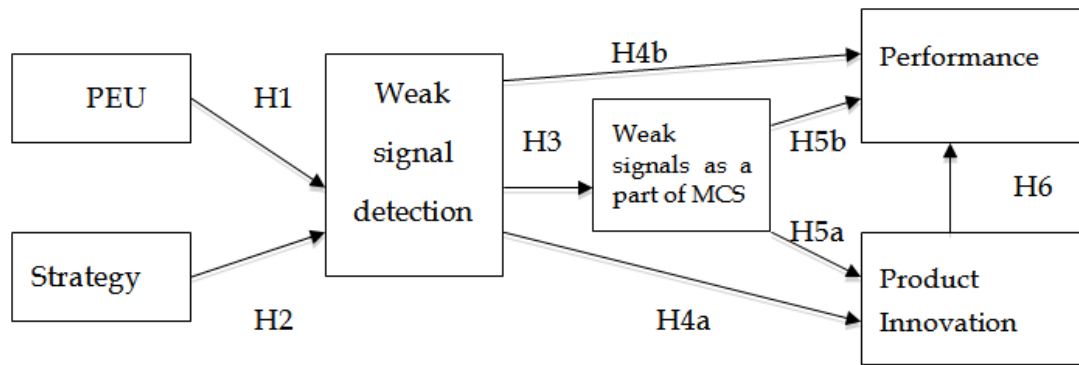
**Figure 1.** Proposed research model.

Figure 1 illustrates the proposed research model, which is a path model. The research aims to find the answers for the following research questions:

Research question 1: Does perceived environmental uncertainty increase detection and utilization of weak signals in organizations?

Research question 2: Is detection of weak signals dependent on the organization´s strategy?

Research question 3: Is detection and exploitation of weak signals a part of MCS in the organizations?

Research question 4: Does detection and utilization of weak signals improve organization´s product innovation and performance?

Research question 5: Does detection and exploitation of weak signals as a part of MCS improve organization´s product innovation and performance?

Research question 6: Does increased product innovation improve performance?

In chapter 3 more detailed hypotheses are formulated based on these research questions.

The research contributes to the existing research in several ways. First the study extents the contingency studies of MCS by exploring the relationship between the chosen contingency factors and MCS that include weak signal aspects. The previous studies indicate that strategy and perceived environmental uncertainty have an effect on how sophisticated the MCS is (Chenhall 2003).

Secondly the study deepens the existing studies of the relationship between foresight activities and MCS by focusing on weak signals as a foresight activity. Thirdly this study explores the relationship between the utilization of weak signals and product innovation, which in turn, extends the research that studies the relationship between foresight activity and innovation.

In practice, as this research maps the level of weak-signal-thinking in the Finnish companies, it opens the discussion to consider if weak-signal-based foresight is worth to develop further in the organizations, especially in management accounting.

## 1.2. Approach and research method of the study

This quantitative study uses an inductive approach to explore the relationships between the contingency factors, weak-signal-based foresight approach, MCS, product innovation and performance. Contingency theory of MCS provides the framework for this study.

A cross-sectional survey method was chosen to collect the data. The survey questionnaire was sent to 346 largest (based on net sales 2008) Finnish companies, which were drawn from the database of the Research Institute of the Finnish Economy (ETLA). The questionnaire includes questions concerning strategy, perceived environmental uncertainty, detection of weak signals, weak signals in MCS and product innovation and performance.

The statistical analysis is performed using partial least squares path modeling (PLS). PLS is chosen because it allows the analysis of multiple relationships simultaneously. It also provides measures for overall model fit and explains the significance of each of the relationships between the variables. PLS is a version of structural equation modeling (SEM) which also has the previously mentioned qualifications. However, instead of SEM, PLS is chosen because of its ability to cope with small sample size. (Henseler 2009: 282-283; Kline 2005: 9-10.) PLS procedure was run using SmartPLS-program, which is available from the Internet.

## 1.3. Outline of the study

This study is divided into six chapters. After the introduction chapter the second chapter presents the previous studies. First the chapter 2 presents the most relevant contingency studies of MCS. Second, the studies concerning foresight and innovation in organizations are presented. Third group of studies are the studies of weak signals in organizations.

Chapter 3, based on the previous studies, builds the hypotheses of this research. Chapter 4 introduces the methodology used in this study and chapter 5 presents the results. Chapter 6 is provides more detailed discussion of the results, limitations of study and suggestions for future research. The last part of the chapter 6 is conclusion.

# 2. PREVIOUS STUDIES

*Environment* and *strategy* belong to the group of the most influential variables in contingency studies of management controls systems. Therefore contingency theory of MCS forms the base for this study. The contingency studies of MCS belong to a very traditional line of MCS studies. The contingency theory states that the design of an effective MCS depends on contextual variables. In addition to strategy and environment, the other influential variables by far have turned out to be *technology, structure, size,* and *national culture* (Chenhall 2003: 127-128). The contingency studies have focused on different aspects of MCS: Activity-based-costing (Gosselin 1997), dimensions of budgeting (Burns and Waterhouse 1975), strategic interactive controls and diagnostic controls (Simons 1995) to mention a few.

First part of this chapter presents the contingency studies regarding the variables environment and strategy. It aims to illustrate how these variables are connected to the future orientation of organizations and why they are chosen to this study. Chapter 2.3 describes the evolution of MCS with an ambition to point out research the gap for weak signals in MCS.

There are studies that examine the role of MCS in innovation process. Studies which concentrate on foresight/future orientation are fewer in numbers, but they are getting more attention. Chapter 2.4 presents studies relating to future orientation and innovation. Finally the concept of weak signal is presented.

## 2.1. Perceived environmental uncertainty and MCS

External environment is a strong variable in the contingency-based MCS research and uncertainty is probably the most researched aspect of the environment. Uncertainty defines situations in which probabilities cannot be determined and even the elements of the environment may not be predictable (Chenhall 2003: 137). Perceived environmental uncertainty (PEU) is one of the fundamental variables in contingency-based research, as Hartmann (2000) and Chapman (1997) have stated (Chenhall 2003: 137). When the environment

becomes more uncertain, it is suggested that managers´ PEU increases and thus it implies greater difficulty in predicting future events. Therefore managers need timely, relevant and accurate information to deal with uncertain operating situations (Hoque 2003: 7). The research has shown that the PEU is the major force to increase managers' use of accounting information and control systems. A number of studies have explored the relationship between the PEU and the design of MCS as well as the organizational performance (e.g. Baines et al. 2003; Chenhall and Morris 1986; Gordon & Narayanan 1984; Simons 1987, 1990; Hoque 2005). These studies prove, what Gordon & Miller suggested in 1976, that increased PEU seems to lead to more advanced control systems.

According to Chenhall (2003: 138) the studies from the past 20 years have confirmed that uncertainty has been associated with more open, externally focused and non-financial styles of MCS. For example Chenhall et al. (1986) have found that broad scope and timely information is perceived useful when organization is operating in uncertain environment. Also Gordon et al. (1984) have suggested that external, non-financial and *ex-ante* information is used by those decision makers who perceive greater environmental uncertainty. In addition, these organizations seemed to move increasingly toward organic form of organization. Already in 1967 Lawrence and Lorsch have explored the influence of PEU on organizational design and they found that less formal organizational structure (i.e. organic and flexible) leads to better performance in uncertain environment.

The increased use of non-financial information has been one of the fundamental changes in management accounting (e.g. Hoque 2005; Laitinen 1998; Bromwich & Bhimani 1994). Hoque (2005) states, that the use of non-financial information improves the performance when the environmental uncertainty is high. Kaplan and Norton (1996) argue that non-financial performance measures enable a firm to address environmental uncertainty by monitoring the core competencies of the organizational processes as well as creating greater efficiency throughout the organization. Non-financial performance measures help managers to assess changes in their business environments, determine and evaluate progress towards the firm's goals, and affirm achievement of performance. Further, Kaplan et al. (1996) state that monitoring and controlling only financial measures of past performance will not assist a firm to navigate in a more competitive, technological and capability-driven environment.

Chenhall (2003: 138) notes, on the other hand, that hostile and turbulent conditions seem to be best served by formal controls and emphasis on budgets. However there is evidence, that the organizations, which are able to combine tight controls with open, informal and flexible information and communication systems, are effective in uncertain environment (Chapman 1998; Chenhall et al. 1986; Simons 1987; for review see Chenhall 2003: 138). For example Chapman (1998) states that formal accounting information has an important role in conditions of high uncertainty, but the interaction between accountants and other managers is essential for better performance.

2.2. Strategy and MCS

In the context of MCS, strategy has been approached commonly from the view of business strategy (Langfield-Smith 1997: 210). Business strategy (or competitive strategy) describes how the firm, and each business unit, operates and competes in the business markets and what is the mission (Simons 2000: 16-17; Langfield-Smith 1997: 209). Mission according to Simons (2000) is the broad purpose for which an organization exists and it guides the formation of business strategy. Business strategy, in turn, determines the performance goals and measures. Corporate strategy, by contrast, is concerned with decisions about the types of businesses to operate, including what businesses to acquire or divest, and how to best structure and finance the company (Langfield-Smith 1997: 209; Johnson & Scholes 1997).

Generally the research has explored the effects of strategy on MCS rather than the effects of MCS on strategy, and the concept of strategy has been usually examined at a strategic-choice level (Henri 2006: 530). Strategy as a choice is the means whereby managers can influence the external environment, the technologies used in the organization, the organizational structure and the MCS (Chenhall 2003: 150).

Contingency studies of MCS have proposed that MCS should be tailored explicitly to support the strategy of the firm in order to lead to competitive advantage and superior performance (e.g. Simons 1987; Otley 1980). Together with management accounting, MCS has moved towards strategy-focusing direction during the recent years (Jänkälä 2007: 55; Granlund & Lukka 1998:169-

170). Strategic typologies are often used in contingency studies that examine the relationship between strategy and MCS. Typologies are comprehensive profiles of different strategic types and they are widely employed in empirical research because they emphasize the integrative components of each strategy (Langfield-Smith 1997: 211).

In the 1970s and 1980s many of the most influential and still often cited typologies were proposed. There has been discussion about the similarities and differences of these typologies and also attempts to integrate these different classifications, for example by Simons (1990), Govindarajan & Shank (1992), Langfield-Smith (1997) and Kald, Nilson & Rapp (2000). Chenhall (2003) suggested in his review article four typologies to be the most influential ones. These four typologies are developed by Miles and Snow (*prospectors, defenders, analyzers and reactors*) in 1978, Porter (*differentiation, cost-leadership and focus*) in 1980, Miller and Friesen (*conservative and entrepreneurial*) in 1982 and Gupta and Govindarajan (*build, hold and harvest*) in 1984.

The typologies are described in table 1. Chenhall (2003: 150) summarizes the most important findings from the studies that use these typologies to explore the relationship between strategy and organizational design as follows: "-- the strategies characterized by a conservative orientation, defenders, harvest and cost leadership are best served by centralized control systems, specialized and formalized work, simple co-ordination mechanisms and attention directing to problem areas—". On the other hand: "-- strategies characterized by an entrepreneurial orientation, prospectors, build and product differentiation are linked to lack of standardized procedures, decentralized and results oriented evaluation, flexible structures and processes, complex co-ordination of over-lapping project teams, and attention directing to curb excess innovation". Further Chenhall (2003: 150) suggested based on the studies by Chenhall & Morris (1995), Dent (1990) and Simons (1987), that conservatives, defenders and cost leadership strategies emphasize cost control, specific operating goals and budgets more than entrepreneurs, prospectors and product differentiation strategies.

**Table 1.** Strategic typologies (Kald et al. 2000: 200; Simons, 1990: 13).

| Study | Strategic variable | Archetypes | Features |
|---|---|---|---|
| Miles and Snow (1987) | Strategic pattern | Defender | Stable domain, limited product range, competes through low cost and high quality, efficiency paramount, centralized structure. |
| | Strategic pattern | Prospector | Turbulent domain, always seeking new product and market opportunities, uncertain environment, flexible structure |
| | Strategic pattern | Analyzer | Hybrid, core of traditional products, enters new markets after viability established, matrix structure. |
| | Strategic pattern | Reactor | Lacks coherent strategy, structure inappropriate to purpose, misses opportunities, unsuccessful. |
| Porter (1980) | Strategic position | Differentation | Product uniqueness leads to higher prices, emphasis on marketing and research. |
| | Strategic position | Cost leadership | Low price, focus on high market share, standardized products, economies of scale. |
| | Choise within a strategy | Focus | Focus on defined buyer group, product line or geographic market. |
| Gupta and Govindarajan (1984) | Strategic mission | Build | Mission is to increase market share, capacity investments, low relative market share, high growth industries. |
| | Strategic mission | Hold | Mission is to keep existing market share, quality improvements and marketing campaigns crucial for success, high relative market share, mature industries. |
| | Strategic mission | Harvest | Mission is to maximize short-term earnings, investments will decrease rapidly, high relative market share, declining industries. |
| Miller & Friesen (1982) | Innovation strategy | Concervative | Innovation is low and will take place only when there are challenges, instabilities or threats in the environment. |
| | Innovation strategy | Entrepreneurial | Innovation is high unless scanning and control systems warn of the danger of too much innovation: control is positively correlated with innovation. |

The scope of each of these typologies is different. The *prospector-defender* typology has a broader scope and it considers more organizational features compared to the others, which scope are quite narrow. *The cost-leadership – product differentiation* is focused on what customer needs are aimed to satisfy, *conservative* and *entrepreneurial* classification is focused on product innovation and *built-hold-harvest* on market share and short-term profit tradeoffs (Kald et al. 2000: 205; Langfield-Smith 1997: 212; Jokipii 2006: 54).

Consequently the strategy typology by Miles et al. (1978) has been tested in subsequent studies and it is perceived to be useful in classifying generic strategies across diverse industries (Simons 1990: 299; Jokipii 2006: 54). The classification specifies, according to Miles et al. (1978: 550), relationships among strategy, technology, structure and process to the point where the organizations can be viewed as integrated wholes in dynamic interaction with their environments. Strategy types *prospectors, defenders, analyzers* and *reactors* are identified based on rate at which the firms changed their products or markets (Jokipii 2006: 54-55).

According to Miles et al. (1978: 550-551) defenders, which have a narrow product range, compete with high quality or competitive pricing. They undertake little product or market development and aim to produce their narrow selection goods and services as efficiently as possible. Thus they emphasize finance, production and engineering. As technological efficiency is important to defenders, they have often organized their administration to ensure the efficiency. The planning and control systems of defenders are likely to be detailed, focusing on reducing uncertainty and emphasizing problem solving. Defender's environmental scanning is very limited and their MCS do not assist new product development or locating new market opportunities. Defender performs well if the environment stays stable, but if the defender's market shifts dramatically, it has little capacity for locating and exploiting new areas of opportunity. (Miles et al. 1978: 551.)

Prospectors, according to Miles et al. (1978: 552-553), enact an environment that is more dynamic than those of other types of organizations within the same industry. Prospectors' prime capability is that of finding and exploiting new products and market opportunities. They are creators of change and they emphasize creativity and flexibility. Prospectors face the changing demands of their environment, why flexible structures and processes may assist the

organization to respond the rapidly changing environment. They avoid long-term commitments to a single type of technological process, which is why they create multiple, prototypical technologies. Prospectors, contrast to defenders, focus more on problem finding than problem solving. Their planning is comprehensive, problem oriented and cannot be finalized before action is taken (Miles et al. 1978: 552-553).

The control in prospector-type organization is decentralized and information systems are short-looped and horizontal. Organizational performance is measured against important competitors and reward favors marketing and development. On the other hand, information systems of defenders are long-looped and vertical and planning is completed before the action is taken. Organizational performance is measured against previous years and reward system favors production. (Langfield-Smith 1997: 213, 217.)

Analyzers combine the strongest characteristics of the prospectors and defenders. They concentrate on being efficient (defender) and watching their competitors closely to determine the possibility of introducing new products or services as rapidly as possible (prospector). They attempt to minimize the risk and maximize the opportunity for profit at the same time. The fourth type of organization in this classification is reactor, an organization that has faced a strategic failure. The organization can be classified as a reactor when inconsistencies exist among its strategy, technology and process. (Miles et al. 1978: 550.)

In many researches it has been suggested that strategy affects organizations' needs for MCS innovations (Henri 2006). For example Simons (1987, 1990) has applied the typology of Miles et al. (1987) to explore the impact of strategy on cost control. The results are partly contradictory to the previous ones. Simons has examined the control systems of prospectors and defenders through ten different control system attributes; tight budget controls, external scanning, result monitoring, cost control, forecast data, goals relating to output effectiveness, reporting frequency, formula-based bonus remuneration, tailored control systems and changeability of control system. Simons (1987) concluded that successful prospectors are characterized by tight control with emphasis on forecasts, strict budget targets, frequent reporting and careful monitoring of revenues (Kald et al. 2000). Further, Simons (1987, 1990) suggested that prospectors search for new opportunities, require flexible structures and utilize

uniform control systems that change frequently. Dent (1990) suggests that tight control at prospectors would be a result of the desire to harmonize the pro-innovative culture of the typical prospector with a more concervative view of the firms opportunities. Defenders, according to Simons (1987) instead seem to require control systems that rely on formal accounting procedures and cost control. Furthermore, defenders seldom have any changes in the control systems and they use them overall less intensively. The study by Simons (1991) concerns the use of budgets by prospectors and defenders. An interesting finding of this study is that sometimes prospectors uncommonly use tight budgets, but not in the manner that defenders would use. Defenders used tight budgets to maintain tight control, but prospectors used tight budgets to gather information and create discussion, which they need in their search for new opportunities.

Based on these findings, prospectors seem to scan the external environment more actively to find new opportunities and to cope in the turbulent environment. Prospectors also require flexible control systems, which they modify to fit to their needs. Generally contingency-based MCS research has focused on the differences between prospector and defender (Fisher 1995: 31). Analyzers are excluded since it has features of both defenders and prospectors why it is not a pure concept in itself. An organization is classified as a reactor, if it has no real strategy and thus it is not a successful organization in the long run. This is why also reactor is excluded in most of the studies. (Kald et al. 2000: 199.)

## 2.3. Changes in management accounting and MCS

Management accounting (MA) has gone through changes in the past decades (Laitinen 2001, Kasurinen 2003). One of the most outstanding criticism to the existing MA practices has been the book by Kaplan and Johnson in 1987. They stated that the management accounting systems used by companies were too long ago developed and for completely different circumstances. Especially the costing systems, performance measurement systems and the planning practices all needed to be reviewed (Kaplan & Johnson 1991). In the literature three major areas of changes in MA are recognized. First, a variety of new technologies have been developed to assist the management in their planning, decision-making,

control and monitoring tasks. Examples of these are customer profitability analysis, activity-based costing (ABC) and activity-based management (ABM), strategic cost management, value chain accounting, target costing and integrated performance measurement systems, like balanced scorecard. (Laitinen 1998; Govindarajan et al. 1992; Simons 2000.)

The second change in MA is that the traditional financial information has increasingly been completed with non-financial quantitative metrics or qualitative information on both internal and external business environment (Bromwich et al. 1994; Ittner & Larcker 1998). Third important change in MA practices is that the time horizon has been extended toward long-term orientation by emphasizing the importance of goals, strategies and performance measurement (Laitinen 1998; Govindarajan et al. 1992; Simons 2000).

Strategic management accounting (SMA) came to prominence in the late 1980s as one of the new techniques to restore the lost relevance of management accounting. The task of SMA is to help management to make strategic decisions to assess organizational effectiveness (Roslender & Hart 2003; Bromwich et al. 1994: 127-129). According to Bromwich (1990), SMA is externally oriented approach, that entails collecting and analyzing data on costs, prices, sales volumes, market shares, cash flows and resource utilization for a both business and its competitors. Especially long-term -perspective and scanning the external environment differentiates SMA from the parallel developments. (Roslender et al. 2003: 256, Hoque 2003: 2).

The increasing emphasis on strategy can also be noted in the latest definitions of MCS. For a long MCS encompassed largely accounting-based controls of planning, monitoring of activities, measuring performance and integrative mechanisms. Management control was understood as separate from strategic control and operational control (Langfield-Smith 1997: 209). As the business environment in the 80s started becoming constantly more uncertain and turbulent, the definition for MCS needed to be reviewed (e.g. Otley 1994).

For instance Simons (1990: 128) stated that MCS is important in both implementing and forming the strategy. He defines MCS as formal information-based routines and procedures managers use to maintain or alter maintain or alter patterns in organizational activities (Simons 1995: 5). MCS broadly include, according to Simons (1987, 1990: 128), formalized procedures for planning, budgeting, environmental scanning, competitor analyses,

performance reporting and evaluation (performance measurement), resource allocation and employee rewards.  The components of MCS, according to Hoque (2003), are interdependent and encompass internal functions, people's reaction and controls design which should form a suitable mix to end up as an effective MCS. In other words, MCS encompasses formal control systems as well as informal personal and social controls (Otley 1980; Ouchi 1977).

2.4. Innovation and Foresight

Darkow, von der Gracht & Venneman (2009) identify corporate foresight and innovation as key success factors for companies in today's knowledge-intensive economy. The contribution of corporate foresight in the innovation process has been widely researched. Hines (2002: 339) names corporate foresight combined with innovation management, as a way to face the demand of the uncertain business environment. Widespread idea is that innovation supports performance. Also the literature asserts a positive relationship between innovation and performance (Brown & Eisenhard 1995, Drucker 2001, Jiménez-Jiménez & Sanz-Valle 2010).

The role of formal management control systems in  enhancing innovation in organizations has emerged an important research question (Shields 1997). The findings indicate that MCS is an important element in foresight process and enhancing innovation (Davila, Foster & Li 2009).

Following chapters introduce first the concepts and studies of foresight and innovation separately, then the studies of the relationships between MCS, innovation and foresight are presented.

2.4.1 Foresight activity in organizations

Drucker (1998) wrote about the new information revolution, which is making the information about the outer business environment more and more important and urgent. He states that many of the new information concepts, from economic-chain accounting, activity-based accounting, through EVA and

the executive scorecard, still provide inside information only. The focus is on inward costs, rather than outward opportunities, changes and threats. According to Drucker this tendency is dangerous considering the globalization of economies and industries, rapid changes in the markets and in consumer behavior, the criss-crossing of technologies across traditional industry lines, and the increasing instability of currencies. The inside information top management receives, should be balanced by outside information. (Drucker 1998.)

As change is now more rapid than ever, the time to adapt is getting shorter and companies need to anticipate the future in a completely different way than ever. Laitinen (1998: 40) suggests that the rise of strategic management accounting and focus on strategy indicates that there is a need for foresight and forecasting methods for management. In the sense of modern futures research, the systematic examination of future started at the end of the World War II (Darkow et al. 2009: 2). *Environmental scanning* (e.g. Hambrick 1982), *strategic issues management* (Ansoff 1989), *trend monitoring* and *early warning* are examples of earliest management tools and systems that organizations developed to manage the present and prepare for the future in the increasingly unpredictable environment. In the late 80s these tools were followed by *foresight* which in the context of management ended up as *strategic (or management, organizational* or *corporate) foresight* in the late 90s. (Liebl & Schwartz 2010: 1.)

Corporate foresight meaning business-oriented form of futures research has become a widespread term used by many companies for their futures research activities (Darkow et al. 2009: 2). Ruff (2006: 279) defines it as the analysis of long-term prospects of business environments, markets and new technologies, and their implications for corporate strategies (see Darkow et al. 2009: 2).

Daheim & Uerz (2006) distinguish four types of organizational foresight. They also argue these types to be the four phases that describe the evolution of corporate foresight in Europe. These types or phases are *expert-based foresight, model-based foresight, trend-based foresight* and *open foresight*. One distinction between these phases is that the role of external experts diminishes gradually from the first phase to the last one. The expert-based foresight means that the future can be foreseen by means of expertise, whereas the open foresight is characterized by transparency, methodological hybridity, context orientation and participation throughout the organization. The two phases in the middle; model-based and trend-based foresight, assume that future can be known by

means of computer models and by means of scanned developments, respectively. The problem of just scanning the trends and projecting them in to the future is that too much emphasis is placed on the monitoring process itself, which often limits the company to adopt a reactive strategy. (Darkow et al. 2009: 5; Daheim et al. 2006.)

There are several studies that support the view of Daheim et al. (2006) about the evolution of foresight in the organizations. In the past, according to Liebl et al. (2010: 1), the foresight activities were mainly related to avoiding crises and maintaining status quo. Likewise Cunha, Palma & daCosta (2006) state that traditionally organizational foresight has been considered as a technical process carried out by top managers aiming to analyze broadly the structure of the organization's environment. Cunha et al. (2006) suggest that nowadays foresight has been regarded more and more as human process and a social practice employing the whole organization, why foresight should not be taken only as a tool or technique. Kaivo-oja (2006: 7) describes foresight as a relevant competence of an organization: "It includes the ability to think in terms of forces that are not obvious and cannot be measured but are shaping the future. In business, it means sensing a coming wave so you can ride it or conscious choice to work and innovate against the trends and waves." Ratcliffe (2006: 40) states, that foresight as a capability and capacity, founded on flexible and adaptable systems, is the secret of success. Further, Ratcliffe (2006: 42) suggests that futures and foresight-based planning requires foremost the right kind of corporate culture starting from the assumptions, attitudes and aspirations of the management.

In practice, according to Roveda and Vecciato (2010: 5) the foresight is established in different ways in today's organizations. Some firms have an autonomous and permanent unit with full time staff and its own budget. This foresight unit is established either at corporate or business level and it may be specialized in specific field, like science and technology for supporting the R&D planning. The foresight unit may also be a group of futurists, researchers and experts of different fields who deliver more comprehensive investigation of different fields in macro and microenvironment of business. Sometimes foresight unit is embedded, without its own budget, in other strategic activities or business department usually by focusing on a specific field of investigation, and it is carried out by a few people as one of their several tasks. Other firms set up a temporary unit, which has to cope with specific issue on an ad hoc basis

and may rely on contribution of external experts. Also there are a growing number of multi-client foresight projects. The goal of these studies is to cope with some complex issues of common interest and these studies are often financed by several companies and/or governmental bodies. (Roveda et al. 2010: 5.)

## 2.4.2. Innovation and MCS

Due to rapidly changing technologies and environment, shorter product life-cycles and overall increased competition, innovation is of "paramount importance" for companies (Little 2005: 2). Further, Little suggests in his empirical study that management of innovation, meaning systematic generation of ideas and development of those to goods and services, has become a crucial competitive factor in today's business environment. Innovation is essential according to Drucker (2001: 21-22), because "a business enterprise can exist only in an expanding economy, or at least in one that considers change both natural and acceptable-- --and business has to provide better and more economic goods and services". Drucker (2001) defines innovation as a task of endowing human and material resources with new and greater wealth-producing capacity. It is not confined to engineering or R&D, but it extends across all parts of the business, all functions and activities.

In many management studies especially product innovation (including services) has been considered as a source to sustain competitive advantage and to increase performance. Understanding how an organization can use its formal control systems to support product innovation has emerged as an important research question (Shields 1997). According to Bisbe and Otley (2004: 710), most of the studies that study the relationship between formal MCS and product innovation, study it in the subunit level, like R&D department or product development teams (e.g. Abernethy & Brownell 1997; Brown et al. 1995; Davila 2000). However, studies that focus on the relationship between the use of formal MCS at top management level and product innovation from an organizational perspective are limited in number (Bisbe et al. 2004: 710).

Simons (1995, 2000) has explored the problem of how organizations could balance between innovation and predictable goal achievement and turn this

tension between these two aspects in to a profitable growth. In Levers of Control framework (LOC) developed by Simons, strategic control is achieved through *beliefs systems*, *boundary systems, diagnostic control systems* and *interactive* control systems. Interactive and belief control systems motivate organizational participants to search creatively and expand opportunity space. Diagnostic and boundary systems are used to constrain search behavior and allocate scarce attention. In effective organizations managers must know how to achieve both high degrees of learning and high degrees of control, a balance between the levers of controls. (Simons 1995, 2000.)

MCS that enhance innovation are in the studies of Simons referred as interactive. According to Simons (1995) the purpose of the interactive control system is to strengthen managers' ability to anticipate and effectively manage future uncertainties. Henri (2006) and Bisbe et al. (2004) have applied the LOC framework to examine among other things, if there exists an indirect positive relationship between interactive use of MCS through innovation on the organizational performance. However, any significant relationship was not found. Jänkälä (2010), instead, has included foresight activity as a new variable to the model. The results of this study will be provided in the following chapter.

### 2.4.3. Foresight and innovation in MCS

Hines (2002) and Ratcliffe (2006) have claimed that future orientation together with strong foresight capability and capacity, based on flexible and adaptable systems is essential for the success of any company. Darkow et al. (2009: 2-3) suggest that foresight can contribute to innovation process in two different situations; before the idea is born and when the idea is already established. In the former situation the foresight is applied to inspire and create new opportunities. In the second situation, foresight helps to cope with the uncertainty by preventing companies from investing resources, like time and money in ideas that might not develop to successful innovations in the future.

A fundamental thought is that firms need some kind of forward thinking to put forward new uses and new combinations (innovations) of existing resources (Kaivo-oja 2006: 9). Therefore there undoubtedly exists a relationship between the foresight activities of some kind and innovation in organizations. Kaivo-oja

(2006) has studied the interaction between organizations' foresight and innovation systems. An important finding from this study is that the differences between the firms' innovation regimes are not fully explained by the differences in R&D systems and innovation systems as such, but they can be explained by the complex nature of the firms' foresight systems. In other words, the strategic role of foresight knowledge is different in different innovation processes.

The role of management control systems in the corporate foresight and innovation processes has been researched, and findings indicate that MCS indeed is an important element in foresight process and enhancing innovation. In these studies according to Davila et al. (2009) MCS are viewed as flexible and dynamic frames adapting and evolving to the unpredictability of innovation, but stable enough to frame cognitive models, communication patterns and actions. MCS as a tool to manage uncertainty is an opposite perspective to the traditional one, which considers MCS as a system of mechanistic organizations, a system that supports the periodic execution of the same routines with little if any changes. (Davila et al. 2009: 322-323, 327.)

Jänkälä (2010) has studied the companies´ foresight activity towards the future business, organizational learning, innovation and performance. More specifically Jänkälä´s study focuses on the interactive use of management control systems of competitive environment and its relationship with companies´ foresight activity. According to the study, more interactive use of management control systems of competitive environment is related to more future oriented foresight activities especially through organizational learning. Furthermore these kinds of activities together seem to increase the product innovation in companies and thus the competitive advantage. This supports the assumption that foresight activity improves capability of an innovation system and supports the innovation activities.

By management control systems of competitive environment Jänkälä (2010: 3) means control systems relating to customers, competitors, developments of technology and more general developments of market. By emphasizing forward-looking, active and frequent dialogue among managers and subordinates in strategic decision-making this type of MCS is used interactively. (Jänkälä 2010:2.)

## 2.5. Weak signals

The discussion about weak signals started in 1970s by Ansoff. In contrast to traditional strategic thinking, which is based on acting on strong signals, Ansoff (1975) suggested organizations to response and act gradually in the base of weak signals. Ansoff (1975: 23) suggested the use of weak signals as the answer for the paradox, which was already present at the 70s as the speed of change had started to accelerate and predicting changes had become more difficult. The paradox was that if the firm waits until information is adequate, it will be surprised by crises. On the other hand if the firm decides to accept vague information, the content will not be specific enough for a thorough analysis and well-considered response to the issue. By early detection of weak signals firm can determine what progressive steps are feasible as strategic information becomes available in the course of evolution of a threat or an opportunity. Ansoff (1982: 12) defined weak signals *as internal or external warnings that are too incomplete to permit an accurate estimation of their impact, and/or to determine a complete response.*

A futurist G. T. Molitor is, besides Ansoff, another weak signal thinking pioneer from the 1970s. He did not use the exact word weak signal, but according to Hiltunen (2010: 53), weak signal thinking can be seen in his works, via phrases of evolutionary process of change. Molitor has focused on the change process, especially in the public sector. Molitor (1981) suggests that by scanning the emerging issues, the future changes may be easier to anticipate. By emerging issues he means for example leading events, leading literature, leading authorities/advocates and leading organizations.

Also Coffman´s contribution to the research of weak signals has been important. Coffman´s series of articles was published in 1997 by the Mc Taylor Consulting Groups Internet journal. Coffman combines theories of information, cybernetics and also complexity and self-organization in his research of weak signals. Coffman´s (1997a) definition for weak signal is following:

1. an idea or trend that will affect how we do business, what business we do, and the environment in which we will work
2. new and surprising from the signals receiver´s vantage point
3. sometimes difficult to track down amid other noise and signals
4. a threat or opportunity to organization

5. often scoffed by other people who "know"
6. usually has substantial lag time before it will mature and become mainstream
7. therefore represents an opportunity to learn, grow and evolve

Citing Coffman (1997d) "investment in weak signals before they come mainstream is risky but includes the greater potential rewards". Thus Coffman links weak signals in high risks; "to maintain homeostasis and stave off threats to this balance", but also to a possibility for greater opportunities; "another realm of whose purpose is to allow systems to evolve and innovate, spotting non-linear, hart to predict ideas long before they reach mainstream recognition".

In Finland, the discussion concerning weak signals has during the past ten years been relatively active (e.g. Mannermaa 1999, 2004; Hiltunen 2006, 2008a, 2008b, 2010; Moijanen 2003; Kuosa 2009). The discussion about the characteristics of weak signals started by Kuusi et al. (2000) as a study called *Delphi* was conducted. In this study the leading futurists in Finland were asked about their views of the characteristics of weak signals. The most supported definition for a weak future signal is according to the study:

> *"A weak future signal is an early warning of change, which typically becomes stronger by combining with other signals. The significance of a weak signal is determined by the objectives of its recipient, and finding it typically requires systematic searching. A weak future signal requires: i) support, ii) critical mass, iii) growth of its influence space, and dedicated actors, in order to become a strong future signal, or to prevent itself to become a strong negative signal. A weak future signal is usually recognized by pioneers or special groups not by acknowledged experts. "*

(Kuusi et al. 2000: 80).

In several studies the problem of accurate definition of weak signal has been acknowledged (e.g. Kaivo-oja, Cunha, Mendoca & Ruff 2004: 205). Hiltunen (2006, 2008a, 2008b) has explored widely the existing weak signal research with an ambition to clarify the concept of weak signals. In doctoral thesis (2010) "Weak Signals in Organizational Futures Learning", Hiltunen calls for more general and universal model of weak signals as there exist so many different definitions for weak signal. Furthermore, various terms are sometimes used as a synonym for weak signal, which Hiltunen (2008: 248) finds problematic, for

example *wild cards* (Mannermaa 1999), *early warning signals* (Nikander 2002) and *emerging issues* (Molitor 2003). Furthermore, there has been discussion whether a weak signal is the emerging issue itself, or is it a signal of an emerging issue (Hiltunen 2010: 75).

Hiltunen (2006) discussed about the definition of wild card and its relationship to weak signals. Hiltunen (2010: 73-74) concluded that wild cards are surprising events with huge consequences and the rapidity is their most important characteristic. By contrast, weak signals are current, small and seemingly insignificant signals of issues and events that can tell us about the changes in the future, which can be mild or huge. Anticipating wild cards is a challenge, but according to Hiltunen (2010: 96), weak signals are one tool to address that challenge. In other words, weak signals are preceding wild card events.

Hiltunen introduced a concept, future sign, to overcome the problems of defining weak signals, like the duration of a weak signal, the objectivity and subjectivity of a weak signal and the intensity and strengthening of weak signals. In the literature, according to Hiltunen (2010: 97), weak signals have been defined as varying from emerging events to future related information. The future sign combines both of these aspects and also includes the aspects of the receiver´s interpretation. Further, the future sign differentiates the two dimensions of the change process: what is objectively happening (objective reality) and how do people interpret that (subjective reality).

Weak signals and megatrends are according to a Finnish future researcher Mannermaa (2004: 42-44), the two extremities of future phenomena. Mannermaa illustrates the relationship between weak signals and trends in a fourfold table (table 2). Mannermaa (2004) defines weak signal as a phenomenon which has a low probability to come true, but when taken place, the impacts are high. A phenomena generated by weak signal can be catastrophic but also positive. When the weak signals begin to strengthen, they may become a trend or even a megatrend. Megatrend can shortly be defined as a big wave of development which has a clear direction, but it might also have smaller, to different directions proceeding phenomena aside. It is typical, for a megatrend, that almost everyone knows it, like globalization or population growth. (Mannermaa 2004: 43, 45.)

**Table 2.** Phenomena of the future (Mannermaa 2004: 44).

|  | Low impact | High impact |
|---|---|---|
| **Low probability to come true** | Insignificant | Weak signals |
| **High probability to come true** | Conventional trends | Megatrends |

Hiltunen (2010) has done a comprehensive research concerning the definition of weak signals and therefore Hiltunen's definition (2010: 104) is adopted to this study:

> *"Weak signals are indicators of possible changes. They are not synonyms to emerging issues. While emerging issues refer to an event or clusters of events, weak signals are signals of those events. In practice these signals can be for example articles in scientific journals, or notes in a diary of a researcher, blog or micro blog posts, rumors and visual observations. The strength of the signal can be measured by its visibility or amount of them. Weak signals have low visibility, and they appear in very few channels. Strong signals, on the other hand, appear in multiple channels, usually in mass media, with wide visibility, and they are known to most people. The absolute strength of a signal is difficult to measure."*

## 2.6. Weak signals in organizational environment

There are several studies and other texts that relate weak signals to organizational environment, for example Coffman (1997a-e), Ansoff (1975, 1984), Day & Schoemaker (2005), Jänkälä (2010) and Hiltunen (2010). Coffman (1997a) suggested weak signals as an asset for an organization to anticipate change, and in addition he provided some practical ideas for organizations on how to utilize weak signals.

Ansoff (1975) was the first one to provide visions on how to use weak signals in strategic planning. Ansoff states that purpose of strategy is to position and relate firm into its environment and when changes in environment occur, the firm needs to adapt the environment real-time. This kind of effective strategic

transition requires clear perception of the prospects and threats in the firm's environment. In order to fulfill these requirements, the organization needs to scan the environment and detect the weak signals of change as early as possible. As Hiltunen (2010: 50) wraps up Ansoff's message, weak signals should not be reacted immediately, but they should be monitored and gradually, as the issue evolves, more should be committed to it. Figure 2 illustrates how weak signals are related to strategic foresight according to Hiltunen (2010: 14).
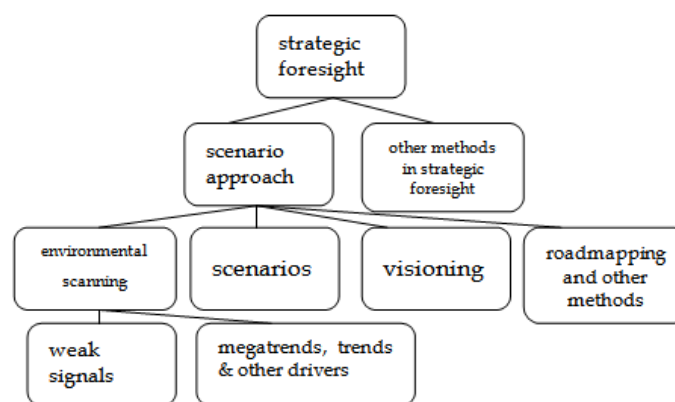


**Figure 2.** Link between weak signals and strategic foresight (Hiltunen, 2010: 14).

Ansoff (1984) developed a theory of information filtering (figure 3) to illustrate the process that information (weak signal) has to go through before any action is taken. In this regularly cited construct, three concepts (filter types) exist before input information reaches decision maker. The filters are *surveillance filter, mentality filter* and *power filter*. The data that gets in to the firm goes first through the surveillance filter, which includes methodology and analysis techniques used in information acquisition by the firm. Ansoff states that improper choice of environmental scanning techniques can make the firm shortsighted. (Ansoff 1984: 327-335.)

The managers to whom the surveillance data is addressed apply the mentality filter, which is the next filter. It identifies the part of the information, which is

perceived to be relevant. This filter becomes critical when the environment moves form one turbulence level to another because over time accumulation of successes and failures form a conviction in the manager's mind about things that work and things that does not. This set of convictions is called *a success model*. An outdated success model becomes a major obstacle to the firm's adaptation to the new reality since the novel signals will be filtered out as irrelevant to manager's historical experience (mentality filter). (Ansoff 1984: 328-329, 335.)

The third filter is related to the power structure of the organization. If the powerful managers lack the appropriate mentality, they will persist in preventing vital novel signals from affecting decisions. Sometimes the environmental discontinuities raise a need to shift the power to other departments than it is used to. Therefore it is natural for managers whose power base is threatened to refuse to recognize the impact of the discontinuity on the firm. Thus it is important, when assuring a firm-wide acceptance of new mentality, that top management is the leading practitioners of this mentality. (Ansoff 1984: 333-335.)
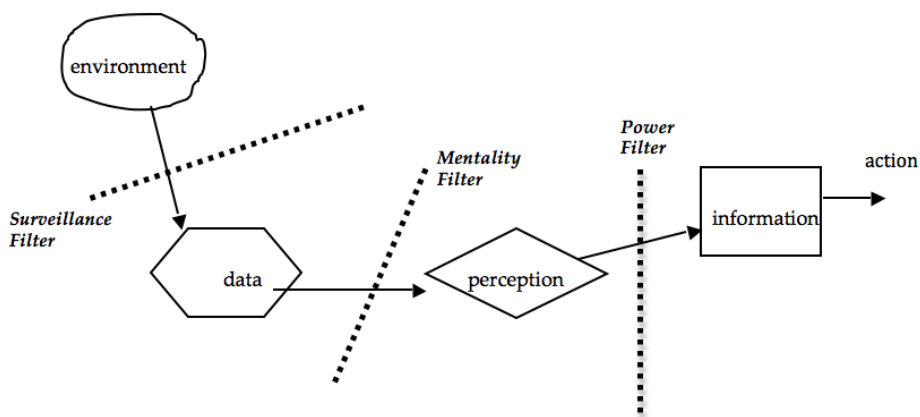


**Figure 3.** Information filtering (Ansoff, 1984: 335).

A study by Ilmola et al. (2006), which explores how weak signal filters can influence the strategic decision making processes, is one of those to base on Ansoff's filter construct. According to Ilmola et al. (2006: 911) Ansoff's filters are an operationalization of mental models used in the evaluation of weak signals in organization. The process of capturing and analyzing weak signals is

connected to organizational cognitive structures, mental models, which have a strong impact on the organization's information acquisition and the processing of the information. The captured weak signal has to change influential mental model(s) in the organization in order to have an impact on the organizations strategy and behavior. Ilmola et al. (2006: 912) state that Ansoff's filter construct describes well the struggle of mental models relevant for company's strategic flexibility.

Companies operating in complex and unpredictable environment need to be flexible and therefore they need to scan and filter complex and conflicting sets of information. It means picking up data and signals from the operating environment, identifying patterns and regularities, and compressing the information into internal models that reflect the complexity of the external environment. The quality of these scanning methods limits the organization's ability to apply the right kind of strategic behavior. (Ilmola et al. 2006: 910.)

Also Hiltunen (2010) refers to mental models in the theory of *Organizational Futures Learning* (OFL). Hiltunen's (2010: 15) OFL theory states, that observing weak signals brings an element of learning to the organization. According to organizational learning theory, learning occurs, when mental models are changed by consequences of actions that are contrary to our existing beliefs. The OFL theory follows Ansoff's footsteps and creates a link between organizational theory, particularly organizational learning theory and futures studies. OFL is different to conventional organizational learning theory in a way that it has a strong emphasis on future, which does not only include anticipating future, but also creating it by being inspired by future-related information. The theory combines theories of organizational learning, strategic foresight and weak signals. (Hiltunen 2010.)

Besides the definition problem of weak signals, another research question in Hiltunen's doctoral thesis (2010) is how organizations could use weak signals in practice. According to Ansoff (1984: 355, 360) the detection of weak signals should be a task of wider net of individuals than only the corporate staff charged with managerial issues. As the detection of weak signals requires sensitivity and expertise from the observer, the individuals involved in detecting the signals should be trained to keep their "ear to the ground". The expertise can be provided by for example socio-political-economic-

technological experts outside the firm, but also by staff inside the company who are in the interface of functions like marketing, purchasing and R&D.

**2.7.** Contingency theory

Contingency-based MCS studies are an important stream of management accounting studies. The original structural contingency framework was developed within organizational theory in the 1960s. The theory considered contextual variables at the organizational level. Later the accounting researchers drew the work to investigate the importance of contextual variables, environment, technology, structure and size, to the design of effective MCS. (Chenhall 2003: 127; Otley 1980: 413.)

The first theoretical choice when applying a contingency theory is made between combination levels. There are three types of combination levels: universalistic, fit and situation-specific (Hambric & Lei 1985: 764). Universalistic approach argues that there must be one best control system that maximizes management effectiveness and that there is only one contingency setting. The opposite extreme is the situation-specific approach, which states that the factors affecting each control system are unique in a way that general rules and models cannot be applied. The contingency fit approach is situated between these two extreme approaches to management control systems. (Chenhall 2003: 157.)

The contingency fit theory states that the design and use of control systems is dependent upon the context of organizational setting. Therefore there is no universally appropriate control system or either one "contingency theory" which applies equally to all organizations in all circumstances. Rather there are many theories that may be used to explain and predict the conditions under which particular MCS will enhance the performance. A better match between the control systems and the contingency variable is hypothesized to result in increased organizational performance. Thus the fit theory differs from the universalistic approach in a way that it allows more than one contingent component to influence the existing control system. In contrast to the situation-specific view, the contingency fit theory suggests that control system generalizations can be made for major classes of business settings. (Fisher 1998: 48; Otley 1980: 413; Chenhall 2003: 157; Jokipii 2006: 44-46.)

This study falls to fit approach, which means that all components of an organization must fit well with each other or the optimal performance will not be reached (Dent 1990; Luft & Shields 2003).

In contingency-based management research two common types of relationships between variables are used: mediation and moderation (Gerdin & Greve 2004). The mediation approach includes a transitive effect (if X $\rightarrow$ Y and Y $\rightarrow$ Z, then X $\rightarrow$ Y transitively) (Jokipii 2006). For example, the more uncertain the managers perceive the environment, the more broad scope and timely information the MCS is designed to produce. MCS that produces broad scope and timely information leads to better financial performance.

The moderation approach says that the effect of one variable on another depends upon some third variable, W. Thus it cannot be stated what the effect of X on Y is, without knowing whether W is low or high, that is, the value of the variable W. In the contingency theory of organization, the relationship is between some characteristic of the organization and effectiveness. The contingency factor determines which characteristic produces high levels of effectiveness of the organization, or some part of it. (Donaldson 2001: 5-6.)

## 2.8. Summary

The previous studies chapter of this thesis discussed first the very traditional line of MCS studies, namely contingency studies. In the contingency studies, in short, the ambition is to find out the type and attributes of MCS that lead to certain outcome, often improved performance, when the contingency factors vary.

In this study it is explored if certain contingency factors (PEU and strategy) have a relationship with the kind of MCS that considers weak signals. The previous research results evidence, that in increasingly uncertain environment, the environmentally and future oriented MCS improve the performance and innovativeness. Also the previous studies indicate that prospector strategy is connected to more future oriented use of MCS.

On the other hand, the theory part dealt with wide and multidisciplinary collection of studies that relate to future orientation and innovation in

organizations and finally studies of weak signals. The main conclusion of the studies that explore foresight in organizations is that foresight in successful organizations means more than technical processes. It is also a cultural matter employing the whole organization. Furthermore, foresight is often in previous studies connected to organizations' ability to innovate. The right kind of futures mentality combined with flexible and adaptable systems is suggested as the success factor of today's organizations. MCS as the system that enhances and supports foresight and innovation processes has been researched. Especially the LOC framework (Simons 1995, 2000) builds an important base for these studies. MCS that Simons describes as interactive is suggested to support foresight activity, innovation and thus improve performance (Jänkälä 2010).

As the purpose of this thesis is to explore if weak signals are considered as foresight activity in Finnish firms, finding studies that combine this type of future orientation and MCS has been important. However, there seem be no studies that would combine exactly these topics. The studies that connect weak signals to organizational environment consider the role of weak signals in strategy work. These studies refer often to *weak-signal-thinking*. Studies that provide practical information on how to scan and exploit weak signals are less in number and no studies that really combine weak signals to management control systems were not found. Jänkälä's (2010) study explores the relationship between interactive use of MCS and foresight activity in organizations. Jänkälä identifies detection of weak signals as one type of foresight activity.

# 3. RESEARCH MODEL

In this chapter the hypotheses of this study are developed based on the previous studies.

## 3.1. PEU and detection of weak signals

According to Ansoff (1975, 1979, 1984) if the organization is operating in complex and uncertain environment, the environmental scanning system has to be open for potential discontinuities. In the previous studies Chenhall et al. (1986) and Gordon et al. (1984) uncertainty has been related to the usefulness of timely and broad scope of information. It is also suggested that high levels of perceived environmental uncertainty has increased the emphasis on long-term perspective in planning in organizations (Hoque 2003). The detection of weak signals is recognized as foresight activity in organizations (Jänkälä 2010: 6, Hiltunen 2010). Thus it can be assumed that as the perceived environmental uncertainty increases, the detection and utilization of weak signals increases the same way as the foresight activity in general increases. Therefore the first hypothesis is:

*H1. As perceived environmental uncertainty increases, detection of weak signals in organization increases.*

## 3.2. Strategy and detection of weak signals

Based on the past studies it can be concluded that prospectors tend be more future oriented and to scan more the environment for opportunities and threats to gain competitive advantage (for example Simons, 1987, 1990, 1991). According to Miles et al. (1978) prospector's aim is to be the first one in the markets to provide new products and services. Therefore the innovation capability is essential for prospector. Future orientation is connected to

innovativeness (e.g. Kaivo-oja 2006; Darkow et al. 2009; Davila et al. 2009). Thereby it can be assumed that prospectors scan more weak signals compared to defenders and analyzers. Thus the second hypothesis is:

*H2. Relationship between prospector strategy and detection of weak signals is positive.*

### 3.3. Detection of weak signals and MCS

Simons (1995, 2000: 214-217) suggests, that the purpose of an interactive MCS is to collect and analyze information related to strategic uncertainties, threats and opportunities regarding the organization's strategy. According to Jänkälä's (2010) study, the use of an interactive MCS has a positive relationship with the future orientation of organizations. Detection of weak signals, alongside with for example scenario analysis, detection and analysis of trends and wild cards, belong according to Jänkälä (2010: 6) to the foresight activity of organizations. Chapman (1998) suggests that when facing highly uncertain environment, accounting information should be tightly integrated to all the other organizational information. The third hypothesis aims to explore whether there exists any relationship between the detection of weak signals and MCS.

*H3. Detection of weak signals is part of organization's management control system, if weak signals are detected in the organization.*

### 3.4. Detection of weak signals, product innovation and performance

For example Hines (2002), Ratcliffe (2006) and Darkow et al. (2009) suggest that foresight activity increases the innovation in organizations. A positive relationship is observed also between innovation and performance, so it can be assumed that foresight activity may increase performance directly. In previous studies detection of weak signals is generally regarded and foresight activity. Therefore to following hypotheses are stated:

*H4a. Systematic detection of weak signals increases product innovation.*

*H4b. Systematic detection of weak signals increases performance.*

3.5. Detection of weak signals as a part of MCS, innovation and performance

Based on the Simons´s LOC (1995, 2000) framework, interactive MCS enhances the management's capability to anticipate and control the future uncertainties. The ability to innovate has been related to MCS that are interactive (Jänkälä 2010). Jänkälä (2010) found a positive relationship between the interactive MCS and the foresight activities in the organization. Jänkälä´s study also indicates that foresight activity enhances the performance via increased product innovation. According to the literature there are different types of innovation in organizations. Damanpour (1991: 561) distinguishes between technical innovation and administrative innovation. Technical innovation includes new process, new product and service innovations. Administrative innovation refers to innovations of new procedures, policies and organizational forms. In this study, the innovation is limited to consider only product innovation, which includes service innovation also. Since detecting weak signals is considered as a foresight activity, the following hypotheses are suggested:

*H5a. Systematic detection of weak signals as a part of MCS increases product innovation.*

*H5b. Systematic detection of weak signals as a part of MCS increases performance.*

3.6. Product innovation on performance

Innovation has long been argued to be an engine of growth. Joseph Schumpeter (e.g. 1934, see Trott 2005: 7) was among the first economists to state that new products are more important stimuli to economic growth than marginal changes in prices (Trott 2005: 7). There are several studies suggesting that the relationship between innovation and performance is positive (Brown et al. 1995; Drucker 2001; Jänkälä 2010; Little 2005; Jiménez-Jiménez et al. 2010). In this study this relationship is also explored and the sixth hypothesis is as follows:

*H6. Increased product innovation increases performance.*

Figure 4 depicts the research model and the assumed relationships between the variables.
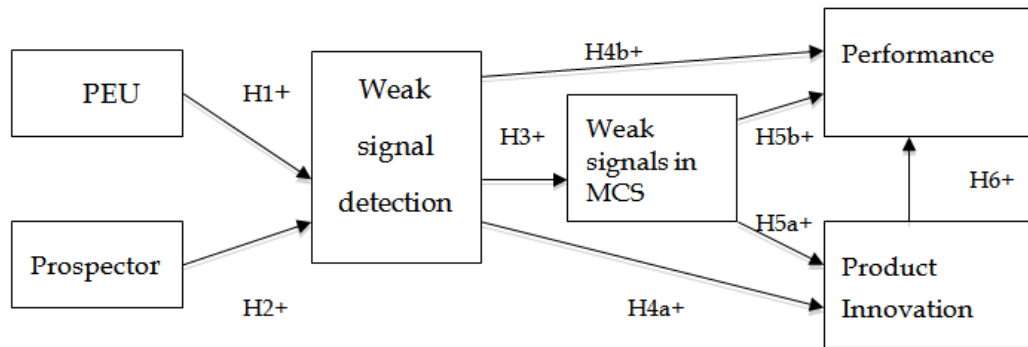


**Figure 4.** Proposed research model with the hypotheses.

# 4. METHODOLOGY

This chapter presents the methodological choices for collecting the data and to test the hypotheses empirically. First the survey design and the sample are described, and then the reliability and validity analyses and the construct operationalization are provided. Finally the statistical methods are described.

## 4.1. Survey design

The contingency theory serves as the theoretical foundation for this study. The research method is survey, because it is a common method in contingency studies of MCS (e.g. Gupta et al. 1984; Simons 1987). The survey was carried out by using Internet-based program provided by *E-lomake*. The questionnaire was sent to the respondents via email.

The first email was sent to the respondents in October 22nd 2010, and the respondents were given two weeks time to answer. The email consisted of a cover letter including information about the study, an URL leading to the questionnaire, and a password and an unique identifier to ensure the secure and confidential use of the questionnaire (Appendix 1). One week after the first contact, a follow-up was sent to those respondents, who had not yet filled the questionnaire (Appendix 2).

By keeping the questionnaire short the convenience of responding was increased. There are six parts in the questionnaire (Appendix 3). The first two variables measured, strategy (question 1.1.) and perceived environmental uncertainty (question 2.1.), are drawn from the previous studies to increase the reliability and validity of the measures. In the third part of the questionnaire the questions 3.4, 3.5 and 3.6 are built especially for this study.

Questions in part 4 (Innovation) and 5 (Performance) are adopted from the previous studies. Part 6 enquires general information about the companies and the respondents.

## 4.2. Sample

The questionnaire was sent to 346 largest profit-making companies (based on the net sales 2008) operating in Finland. The firms were drawn from the database of the Research Institute of the Finnish Economy (ETLA). The choice of large and medium-sized companies was made based on the assumption that large and medium-sized companies use more sophisticated MCS and scan the environment more systematically (Simons 1995, 2000).

The email-addresses of the respondents were drawn from Internet; from company homepages and from search engines specialized for company information. The use of correct and up-to-date email-addresses is essential when conducting an Internet-based survey. After one week 33 companies had answered the questionnaire and 63 did not receive the email because of wrong or expired email-addresses (see tables 3 and 4). A follow-up was sent to those who had not answered after one week. When closing the survey, a total of 59 answers were received. The response rate is 20.8 % when the respondents who did not receive the questionnaire are excluded. One company was dropped out because of low number (10) of employers. In this study, 50 employers is considered as a minimum for the company to be regarded as a middle-sized company.

**Table 3.** Survey timetable.

|  | Day | No. of responses (cumulative) |
|---|---|---|
| 1st e-mail with link to questionnaire | 1 | 21 |
| Follow-up | 8 | 50 |
| Closing the survey | 16 | 59 |

**Table 4.** Information about the responses

|  | No. of companies | % |
|---|---|---|
| Total number of companies included in the research | 346 | 100 % |
| Companies which did not receive the questionnaire | 63 | 18.2 % |
| Companies that filled and returned the questionnaire | 59 | 17.1 % |
| Number of usable responses | 58 | 18.2 % |
| Actual response-rate |  | 20.8 % |

## 4.3. Reliability and validity

The trustworthiness of the study is usually described by two terms; reliability and validity. Validity and reliability are both important aspects of the accuracy of the results. Reliability refers to the repeatability of the study whereas validity is concerned whether it is measured what it is intended to measure. (Metsämuuronen 2003; 11). The instruments used in this study to measure PEU and strategy are in previous studies proved to be reliable. Also the instruments to measure product innovation and performance are developed based on earlier studies. The reliabilities of the instruments that measure the detection of weak signals were ensured differently, because these instruments are developed only for this study.

Validity in terms of questionnaires refers to the ability of a questionnaire to measure what it is intended to measure. A valid questionnaire will enable the accurate collection of data. If the data is collected consistently, the questionnaire is also reliable. Reliability is concerned whether or not the questionnaire will

produce consistent findings at different times and under different conditions. (Shaunders, Lewis and Thornhill, 2009: 371-373.)

The questionnaire was pilot-tested by group of academics and managers to minimize misunderstandings caused by terminology, to increase the convenience of the use and overall to increase the reliability and validity. Some changes were made in the wording and presentation of the questionnaire based on the feedback by the pilot-testers. Pilot-testing is assumed to increase the reliability especially of the instruments that are developed especially for this study. Furthermore, all the questions are closed questions and Likert-scale is used consistently throughout the whole questionnaire.

Validity is more theoretical problem than reliability since validity is concerned whether a variable measures what it is assumed to measure (Jokipii 2006: 72). Content validity and construct validity are two types of validity that are important to consider when it comes to validity of a questionnaire. Content validity refers to the extent of the measurement questions in the questionnaire provide adequate coverage of the investigative questions. To ensure the content validity, the research should be thoughtfully defined by careful review of the literature. Construct validity is concerned on whether the measurement questions measure the presence of the constructs intended to measure. (Shaunders et al. 2009: 372-373.)

## 4.4. Construct operationalization

As many constructs as possible are drawn from the existing studies (PEU, strategy, product innovation and performance). The items are measured with seven-point Likert scale, except the strategy, which is measured with manifest variable. The instruments to measure the detection of weak signals and the detection of weak signals as a part of MCS are developed especially for this study. The Likert-scale type used in this study is so called positive-positive – scale (1= totally disagree, 2= almost totally disagree, 3= slightly inclined to agree, 4= agree to an extent, 5= almost agree, 6= almost totally agree, 7= totally agree) (Metsämuuronen 2003: 71-72).

*PEU.* Perceived environmental uncertainty is measured with an instrument developed mainly by Govindarajan (1984) and Gordon et al. (1984). The instrument is used by Hoque, Mia & Alam (2001) and Jänkälä (2007). The instrument contains eight items. Jänkälä (2007) changed the last item (item 8), *industrial workplace relations* to *development of industry*, which was considered more understandable by the pilot-testers of the Jänkälä's questionnaire.

1. Suppliers' actions (removed)
2. Customer demands, tastes and preferences (removed)
3. Market activities of competitors (removed)
4. Production technologies
5. Government regulation and policies (removed)
6. Economic environment
7. Development of the industry

According to Chenhall (2003: 138) when measuring environmental uncertainty, a single valid and reliable measure should be used to ensure the comparability of the results of studies examining the effects of this variable on MCS. In the questionnaire the respondents were asked to indicate, on a seven-point Likert-type scale ranging from 1 (very unpredictable) to 7 (very predictable), their perceptions of the relative predictability of the seven items focusing on environmental uncertainty. From the final model, four items were removed because of low item loadings (chapter 5). (Appendix 3: question 2.1.)

*Strategy.* To identify characteristics of control systems appropriate for particular strategies, strategic typologies are applied in numerous studies. The typology developed by Miles et al. (1978) is used in this research. This typology is empirically tested in numerous studies (e.g. Simons 1987, 1990) and it is stated to be applicable to different industries (Chenhall 2003).

In the survey, a short description of the strategies is provided to the respondents who were asked to select the one that the best fits to their organization (Appendix 3: question 1.1). The descriptions are almost the same as Jokipii (2006) has used, but the future orientation of the each strategy type is slightly emphasized. Jokipii adopted the descriptions from the studies of Guilding (1999) and Shortell and Zajac (1990). In strategy research this method is widely accepted (Snow & Hrebiniak 1980).

*1. Defender*

We attempt to locate and maintain a secure niche in a relatively stable product or service area. We are not looking for anything new for our product range, but we aim to operate efficiently with our present products and markets by offering better quality, lower prices, superior service and so forth.

*2. Analyzer*

We offer fairly standardized services or products. We are not first to offer novelties, but we carefully monitor the actions of major competitors and try to offer more cost-efficient product or service. Frequently we may be"second in" in the market with a new product or service.

*3. Prospector*

Our services or products are constantly changing. We endeavor to respond to market needs rapidly and to be the first to offer novelties. Scanning the environment widely and systematically for new opportunities is our way to do our business.

The frequencies of the each strategy are provided in table 5. The aim of this study is to test if the relationship between prospector strategy and weak signals is positive. Therefore analyzers and defenders are combined and coded as 0 and prospectors as 1. In the questionnaire, however, the respondents were asked to distinguish between these three types assuming that it would lead to more truthful number of prospectors.

**Table 5.** Descriptive statistics of the strategy.

| Strategy | Frequency | % |
|---|---|---|
| Defender | 11 | 18,6 |
| Analyzer | 21 | 45,8 |
| Prospector | 27 | 35,6 |
| Total | 59 | 100,00 |

*Detection of weak signals.* In this study, the detection of weak signals means, that the organizations consciously recognize that they detect weak signals. However, it is assumed that there are differences in how organizations understand weak signals. The exact definition of weak signal in this research is not relevant, since it is difficult to predict what is the current assessment and level of adoption of weak signals in Finnish organizations. The use of weak signals as a foresight method to predict the changes in the competitive environment is therefore simply operationalized by first asking the firms whether they detect, monitor and estimate the impacts weak signals (new, yet developing phenomena) in their operating environment, and to what extent (FORWS, Likert scale from 1 – 7). The same question was also asked about trends (meaning familiar, widely spread phenomena) mainly to ensure that the respondents distinguish weak signals from conventional trends (FORT, Likert 1-7). Secondly the respondents were asked whether they follow weak signals in the following areas and to what extent (Likert from 1-7, see Appendix 3: questions 3.1 and 3.2):


(WS1) The development of new technology
(WS2) New fields for the use and application of technology
(WS3) Product and service introductions of competitors
(WS4) Product and service introductions in adjacent industries
(WS5) Market tactics of competitors
(WS6) New industry entrants and exits
(WS7) New business models in the industry
(WS8) Needs and desires of the customers
(WS9) Suppliers' operations in the market (removed)
(WS10) Financial markets (removed)
(WS11) Regulations and norms of public authorities (removed)
(WS12) World economy and political environment (removed)

Jänkälä (2010) used these items to explore whether the top management monitors the changes in these areas to assess the emerging opportunities for and threats to the business. Jänkälä focused specially to MCS of competitive environment and these items focus on the changes in the competitive environment. Since weak signals can be considered as signals of emerging opportunities and threats, these items suit well to measure the detection of

weak signals in different areas. However, four items of the items were removed from the final model because of low item loadings (chapter 5).

*Weak signals in MCS.* To measure how tightly weak signals are connected to MCS firms were given seven statements (WSMCS) which described the level of the connection (Appendix 3, question 3.6). If the weak signals are not detected and thus not connected to MCS, firms chose statement 1. Statement 2 states that weak signals are detected randomly and unofficially and the attained information is provided to the management when needed. The last statement (7) describes the highest level of connection; the detection of weak signals is systematic and automatic part of MCS, and information attained is exploited systematically in the management's decision-making and planning.

In addition, the firms were asked three questions that aim to address how systematic and organized the detection of weak signals is. First it was asked whether the firms used any kind of information system to detect and analyze weak signals and how complex the system possibly is (WSIS; Likert 1-7: 1= no system, 2= very simple system.. 7=very complex system). Secondly it was asked if the firms used the detection of weak signals to control their business and how systematically (WSF; Likert 1-7: 1=not used, 2=used very randomly.. 7= used very systematically). Thirdly it was asked whether weak signals are used to develop and expand their business and how systematically (WSB; Likert 1-7 as in the previous item). (see Appendix 3: questions 3.3, 3.4. and 3.5.)

*Product Innovation.* The four-item instrument to measure product innovation is drawn from Jänkälä's (2010) study. Jänkälä based the instrument on one of Bisbe and Otley's (2004). The respondents were asked to indicate the position of their organization in comparison to their industry average during the past three years. The same kind of approach is used in studies of Capon et al. (1992), Scott & Tiessen (1999) and Ferreira, Moulang and Hendro (2010). (Appendix 3: question 4.1.)

*Performance.* Performance was measured with eight items used by Bisbe et al. (2004) and by Jänkälä (2010). Bisbe et al. (2004) based this instrument on the well-known instrument developed by Govindarajan (1984). The respondents were requested to indicate how well they have performed on each of the items compared to their competitors during the past three years (Appendix 3: question 5.1). The items regard both financial and non-financial measures. Two

of the items (PERF1 and PERF4) were removed from the final model because of low item loadings (chapter 5).

(PERF1) Rate of sales growth (removed)
(PERF2) Rate of profit growth
(PERF3) Return on investment
(PERF4) Profit/sales ratio (%)
(PERF5) Increase in market share (removed)
(PERF6) Customer satisfaction
(PERF7) Customer retention
(PERF8) Acquisition of new customers

## 4.5. Partial least squares path modeling

The relationships between the variables are examined using partial least squares path modeling (PLS). PLS is one type of structural equation modeling (SEM) technique. SEM is a causal model and advantage of a causal model is that it makes possible to research theory and measures at the same time (Hulland, 1999: 195). Further, the SEM enables simultaneous examination of both mediation and moderation models and the differentiation between observed and latent variables (Baines et al. 2003).

In this study, PLS is chosen instead of SEM, because PLS has an ability to cope with small sample size (Ferreira et al. 2010). PLS models can be very complex and include many latent and manifest variables without leading to estimation problems. PLS does not have either strict assumptions about the distribution of variables and error terms. PLS is recommended especially in an early stage of theoretical development in order to test and validate exploratory models. PLS is also suitable for prediction-oriented research. (Henseler et al. 2009: 283.)

PLS delivers latent variable scores, which are measured by one or several indicators (manifest variables). PLS path models can be thus defined in two sets of linear equations: the inner and outer model. The inner model estimates the relationships (path coefficients) between different constructs (unobserved/ latent variables). The outer model specifies the relationships (loadings) between

measures (observed/ manifest variables) and construct. (Henseler et al. 2009: 284, Hulland 1999: 198.)

The inner model for the relationships between the latent variables can be written as:

(1) $\xi = B\xi + \zeta$

where $\xi$ = the vector of latent variables

$B$ = denotes the matrix of coefficients of their relationships

$\zeta$ = inner model residual

However, the equation is reduced to $\xi/\xi = B\xi$, since the basic PLS model assumes a recursive inner model which is subject to predictor specification. The inner model constitutes a causal chain system, which means that the residuals are uncorrelated and there are no correlations between the residual term of certain endogenous latent variable and its explanatory latent variables. (Henseler et al 2009: 285).

There are two types of outer models: reflective and formative. The choice of the type is a subject of theoretical reasoning. In this study reflective model is chosen, which means that the manifest variable in a certain measurement model is assumed to be generated as a linear function of its latent variables and the residual $\varepsilon$ (not vice versa):

(2) $X_x = \Lambda_x \xi + \varepsilon_x$

where $\Lambda$ = loading coefficient

Also the outer model equation is subject to predictor specification (no correlations between the outer residuals and the latent variable of the same block), and thus it is reduced to $(X_x/\xi) = \Lambda_x \xi$. (Henseler et al. 2009: 285).

PLS model is usually analyzed and interpreted in two stages. First assessed is the reliability and validity of the measurement model (outer model), and secondly the structural model (inner model) (Hulland 1999: 198; Henseler et al. 2009: 298).

The reliability of the reflective outer model is usually checked by applying the composite reliability. Composite reliability estimates the internal consistency

reliability of the latent variables, and generally the value should be above 0.7 in early stages of research. The reliability of indicators is connected to composite reliability. If the outer standardized loading of the indicator is smaller than 0.4, it should be eliminated, but only if it goes along with a substantial increase of composite reliability. Composite reliability is used instead of Chronbach´s alpha because composite reliability takes into account that indicators have different loadings. However composite reliability can be interpreted the same way as Chronbach´s alpha. (Henseler et al. 2009: 299.)

The validity is assessed by examining convergent validity and discriminant validity. Average variance extracted (AVE) of at least 0.5 is recommended as a criterion of convergent validity. A sufficient AVE signifies that the set of indicators represents one and the same underlying construct. To measure the discriminant validity, two measures are suggested: Fornell-Larcker criterion and cross-loadings of the indicators. The former states that the AVE of each latent variable should be higher than the squared correlations with all other latent variables. This means that each latent variable shares more variance with its own block of indicators than with another latent variable representing different block of indicators. The latter measure suggests that if an indicator has a higher correlation with another latent variable than with its respective latent variable, the appropriateness of the model should be reconsidered. (Henseler et al. 2009: 299-330.)

The evaluation of the inner path model estimates is permitted by the estimation of reliable and valid outer model. $R^2$ of 0.67, 0.33 or 0.19 values for the endogenous latent variables in the inner path model are described as substantial, moderate or weak (Henseler et al. 2009: 303).

PLS path modeling allows the use of nonparametric bootstrap procedure to build confidence intervals for all parameter estimates and thus to aid to validate the results of the PLS model. Bootstrapping treats the observed sample as if it represents the population by creating a large, pre-specified number of samples. PLS estimates the path model for the bootstrap sample and provides the mean value and standard error for each path model coefficient. This information, in turn, permits a student's t-test to be performed for the significance of path model relationships. (Henseler 2009: 305-306.) In this research the pre-specified number of bootstrap samples is 100.

# 5. RESULTS

First some descriptive statistics of the sample firms are presented. The examination of industry distribution between the companies (table 6) points out two dominating industries: wholesale (n= 10) and metal (n=11). Therefore the relationship between these industries and the detection of weak signals was explored by setting the industry as a dummy-variable. However, any significant differences in the results were not found and therefore it can be assumed that the industry distribution of this sample does not affect the final results of this study and the results can be generalized for different industries.

**Table 6.** Industry distribution.

| Industry | Number of companies | Industry | Number of companies |
|----------|--------------------|--------------------|--------------------|
| Car retail | 2 | Chemicals and plastic | 2 |
| Conglomerate | 2 | Construction | 5 |
| Energy | 3 | Enterprise services | 1 |
| Finance | 5 | Forest and pulp | 3 |
| Grocery | 4 | IT | 1 |
| Insurance business | 1 | Metal | 11 |
| Retail business | 1 | Transport and forwarding business | 4 |
| Wholesale | 10 | Other | 5 |

The company size was also set as a dummy-variable (table 7). The companies were divided to middle-sized and large based on the number of employees. Company was considered as middle-sized, if there were fewer than 700 employees. Either in this case there seems to be no difference.

**Table 7.** Descriptive statistics of the sample firms (N = 58).

|  | Mean | STD | Min | Max |
|---|---|---|---|---|
| Net Sales (M€) | 968,8 | 1651,8 | 99,0 | 8917,5 |
| Staff | 3121 | 6773 | 70 | 39000 |

In table 8 the group relationships of the companies are depicted. The distribution is quite even and thus the results can be generalized for companies with different group relationships.

**Table 8.** Group relationships (N = 58).

|  | Number of firms | Percentage |
|---|---|---|
| No group membership | 7 | 12,1 % |
| Parent company in a group | 21 | 36,1 % |
| Subsidiary in a group | 14 | 24,1 % |
| Both parent and a group | 16 | 27,6 % |

Table 9 depicts that most of the respondents are chief financial officers while the rest are other top managers. If the email-address of the chief financial officer was not attained from the Internet, the questionnaire was sent to the chief executive officer instead. The recipients had also an opportunity to forward the questionnaire to a person in their organization who they find the most suitable to fill in the questionnaire. The different positions of the respondents will not harm the reliability and validity of this study because it can be assumed that if weak signals are systematically detected in the organization, all the top managers are aware of that.

When examining the PLS results, first measurement model analysis is performed to ensure that each variable is valid and reliable. The examination of individual item loadings makes it possible to determine, which items are suitable for the final model and which items should be removed (Hulland, 1999). As the minimum acceptable loading is generally 0.50 (Ferreira et al. 2010:

930), total of eight items out of 36 were removed from the model. First, from the PEU construct, four items (PEU1, PEU2, PEU3 and PEU5, Appendix 3) were removed. Second, from the dimension of the detection of weak signals, four items out of thirteen were discarded (WS9-12, Appendix 3). Third, two items (PERF1: Rate of sales growth and PERF2: Increase in market share) from the performance construct were removed. The first-order loadings of the items accepted to the model are provided in table 10.

**Table 9.** Respondents' position.

|  | Number | Percentage |
|---|---|---|
| Chief Financial Officer | 32 | 55,2 % |
| Other top manager | 26 | 44,8 % |

**Table 10.** Descriptive statistics and item loadings in the PLS model (N=58).

| Latent construct and items | Loadings | Min | Max | Mean | Std. Dev. |
|---|---|---|---|---|---|
| **1. PEU** |  |  |  |  |  |
| (PEU4) Production technologies | 0,838 | 3 | 7 | 5,53 | 0,959 |
| (PEU6) Economic environment | 0,632 | 2 | 6 | 4,21 | 1,005 |
| (PEU7) Development of the industry | 0,738 | 3 | 7 | 5,33 | 0,735 |
| **2. Detection of weak signals** |  |  |  |  |  |
| (WS1) The development of new technologies | 0,690 | 2 | 7 | 5,19 | 1,29 |
| (WS2) New fields for the use and application of technology | 0,725 | 2 | 7 | 4,97 | 1,35 |
| (WS3) Product and service introductions of competitors | 0,827 | 2 | 7 | 5,34 | 1,305 |
| (WS4) Product and service introductions of adjacent industries | 0,740 | 1 | 7 | 4,4 | 1,35 |
| (WS5) Market tactics of |  |  |  |  |  |

| | | | | | |
|---|---|---|---|---|---|
| competitors | 0,735 | 2 | 7 | 5,74 | 1,001 |
| (WS6) New industry entrants and exits | 0,622 | 2 | 7 | 4,81 | 1,357 |
| (WS7) New business models in the industry | 0,700 | 1 | 7 | 4,86 | 1,249 |
| (WS8) Needs and desires of competitors | 0,737 | 1 | 7 | 5,47 | 1,096 |
| (FORW) The level of utilization of weak signals | 0,704 | 2 | 6 | 3,97 | 1,376 |
| **3. Weak signal in MCS** | | | | | |
| (WSIS) Information system to collect weak signals | 0,757 | 1 | 6 | 2,28 | 1,484 |
| (WSF) Weak signal are exploited in controlling activities | 0,820 | 1 | 6 | 3,34 | 1,332 |
| (WSB) Weak signals are utilized in expanding the business | 0,843 | 1 | 6 | 4 | 1,311 |
| (WSMCS) Weak signals are a part of MCS | 0,846 | 1 | 6 | 3,02 | 1,177 |
| **4. Product innovation** | | | | | |
| (IN1) New product launching during the past 3 years | 0,865 | 1 | 7 | 4,41 | 1,534 |
| (IN2) First-in in the market | 0,915 | 2 | 7 | 4,52 | 1,501 |
| (IN3) Percentage of new products in the product portfolio | 0,935 | 2 | 7 | 4,12 | 1,365 |
| | 0,924 | 1 | 7 | 4,28 | 1,461 |
| (IN4) New products at the developmental phase | 0,829 | 3 | 7 | 4,93 | 1,241 |
| **5. Performance** | | | | | |
| (PERF2) Rate of profit growth | | | | | |
| (PERF3) Return on investment | 0,817 | 3 | 7 | 5 | 1,243 |
| (PERF4) Profit / Sales Ratio (%) | 0,880 | 3 | 7 | 5,03 | 1,228 |
| (PERF6) Customer satisfaction | 0,667 | 4 | 7 | 5,16 | 0,834 |
| (PERF7) Customer retention | 0,786 | 3 | 7 | 5,28 | 1,056 |
| (PERF8) New customer acquisition | 0,673 | 3 | 7 | 4,9 | 0,968 |

After removing the items mentioned, the values of composite reliability of all the latent variables exceed 0.7 indicating a good level of internal consistency of

the construct. Figure 5 presents the results from PLS related to structural model and table 11 provides the correlations between the latent variables of the model. Table 12 presents detailed information on the path coefficients and the total effects. Composite reliability, R² and AVEs are presented in table 13. As the table 13 displays, AVEs of all the constructs are over 0.5 and therefore reach the adequate convergent validity. Also square roots of the AVEs (table 11: bolded numbers) are greater than the respective correlations. In conclusion, the structural model seems to reach satisfactory reliability and convergent validity.
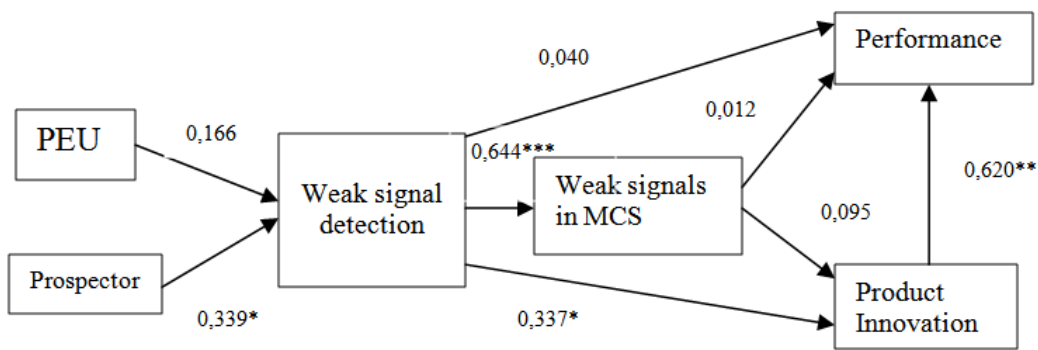


(*** p < 0.001, ** p < 0.01, * p < 0.05, two-tailed t-statistics)

**Figure 5.** The research model with second order PLS –loadings and levels of significance.

**Table 11.** Correlations between the latent variables and square roots of AVEs in the PLS model.

| | Innovation | Performance | PEU | Prospector | WS detection | WS in MCS |
|---|---|---|---|---|---|---|
| Innovation | **0.910** | | | | | |
| PERF | 0.639*** | **0.779** | | | | |
| PEU | -0.070 | 0.163 | **0.741** | | | |
| Prospector | 0.542*** | 0.370*** | 0.104 | | | |
| WS detection | 0.306** | 0.226* | 0.288* | 0.388*** | **0.817** | |
| WS in MCS | 0.389*** | 0.287** | 0.287** | 0.351*** | 0.643*** | **0.722** |

*** p < 0.01, ** p< 0.05, * p < 0.10

**Table 12.** Structural PLS model, total effects. [1])

| Paths from | Paths to | | | |
|---|---|---|---|---|
| | *3.* | *4.* | *5.* | *6.* |
| 1. Prospector | **0.339**** | (0.218) | (0.132) | (0.339) |
| 2. PEU | 0.116 | (0.074) | (0.045) | (0.033) |
| 3. Detection of WS | | **0.633**** | **0.388**** | **0.287*** |
| | | | 0.327 | 0.030 |
| 4. WS in MCS | | | 0.950 | 0.070 |
| | | | | 0.012 |
| 5. Product Innovation | | | | **0.620**** |
| 6. Performance | | | | |

\*\*\* p<0.001; \*\* p<0.01; \* p< 0.05 (two-tailed t-statistic)

[1]) If path the coefficients between the latent variables differ from the total effect, the path coefficient is provided in table underlined.

**Table 13.** Measures of reliability and validity.

| | Composite reliability | AVE | R Square |
|---|---|---|---|
| 1. Prospector | n/a | n/a | n/a |
| 2. PEU | 0,783 | 0,549 | n/a |
| 3. Detection of WS | 0,907 | 0,523 | 0,137 |
| 4. WS in MCS | 0,890 | 0,668 | 0,414 |
| 5. Product Innovation | 0,951 | 0,828 | 0,156 |
| 6. Performance | 0,902 | 0,607 | 0,410 |

When exploring the path coefficients between the latent variables, four out of eight hypotheses are supported. As stated in the hypothesis H2, figure 5 shows positive relationship between prospector strategy and weak signal detection ($p < 0.05$). The relationship between the detection of weak signals and connecting weak signals to MCS (H3) seems to be very strong ($p < 0.001$). Also the hypothesis H4a stating that detection of weak signals increases product innovation is supported ($p < 0.05$). Consistent with the findings of the previous studies, the relationship between product innovation and performance is strong, and thus the hypothesis H6 is supported ($p < 0.01$). When looking at the total effects in the model also the hypothesis H4b is supported ($p < 0.05$).

The rest of the hypotheses do not receive support. The relationship between PEU and the detection of weak signals (H1) is weak. Also there seems to be no significant relationship between the MCS that includes weak signals and performance (H5B) and product innovation (H5A). Because there seems to be a strong relationship between product innovation and performance and also between detection of weak signals and product innovation, it can be stated that the detection of weak signals improves performance trough the intervening variable, product innovation.

The respondents were also asked the following controlling questions regarding the effect of the detection of weak signals on performance and product innovation:

Controlling question no. 1 (WSPERF): In your opinion, has the systematic detection of weak signals improved the performance of your organization?

Controlling question no. 2 (WSINN): In your opinion, has the systematic detection of weak signals increased the product innovation of your organization?

These questions are used as controlling questions to support the hypothesis H4a and H4b. Table 14 indicates that the managers perceive a small increase in the performance and in the product innovation as a result of the detection of weak signals.

**Table 14.** Managers' opinions regarding the effects of the detection of weak signals on performance and product innovation. (N=58).

|  | *Min* | *Max* | *Mean* | *STD* |
|---|---|---|---|---|
| Controlling question no. 1 (WSPERF) | 1 | 6 | 3,7 | 1,475 |
| Controlling question no. 2 (WSINN) | 1 | 6 | 3,83 | 1,378 |

Figure 6 presents the final PLS model as statistics program Smart PLS depicts it. Figure provides item loadings between items and constructs and path-coefficients between constructs. Items with too low loadings are excluded.
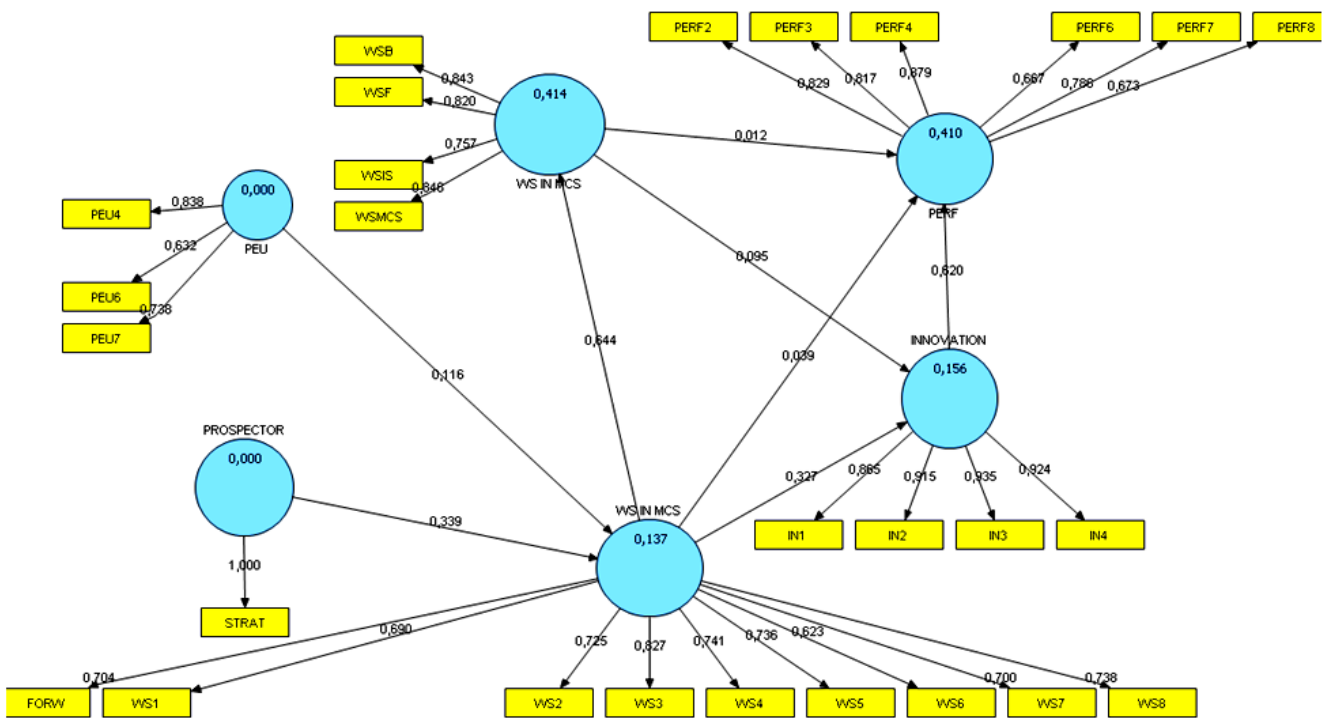


**Figure 6.** PLS model with item loadings and path coefficients.

# 6. DISCUSSION

While the previous chapter provided the results of the study, this chapter aims to discuss the results in more detail and provide contribution to the existing studies and practices. After that limitations of this study are presented and some suggestions for future research are provided. The last part is conclusion.

Low path coefficient indicates that the H1 (*As perceived environmental uncertainty increases, detection of weak signals in organization increases*) is to be rejected. The organizations stated to be able to estimate the environmental uncertainties relatively well. Also, on average, the organizations stated to follow weak signals relatively actively in various different fields (table 10). However, significant relationship between these variables was not discovered in this study. This result could mean that utilizing weak-signal-information does not necessarily work when perceived environmental uncertainty is very high. Instead there might be an optimum level of PEU where utilizing weak-signal-information provides the best results.

H2 (*Relationship between prospector strategy and detection of weak signals is positive*) is supported ($p < 0.05$). This result supports the findings of the previous studies of the characteristics of prospectors. It is stated that prospectors scan the environment actively to detect the opportunities and threats before the competitors. The control systems of typical prospectors are suggested to be decentralized and the information systems short-looped and vertical (Chenhall 2003). This type of control system could probably support weak-signal-based foresight approach. The connection between prospectors and detection of weak signals indicates that prospector-type firms would benefit from the utilization of weak signals. When considering the other strategy-classifications desrcibed in this study, three of them, namely *entrepreneurial* (Miller et al. 1982), *build* (Gupta et al. 1984) and *product differentiation* (Porter 1980), are stated to have the same kind of qualities as prospectors (Chenhall 2003). This could mean that weak-signal-based foresight approach may be applicable for these strategy types as well. Furthermore exploring how successful prospectors utilize weak signals would be useful for the research and practice.

H3 (*Detection of weak signals is part of organization's management control system, if weak signals are detected in the organization*) gains strong support. This could imply, that companies have some kind of systems to follow weak-signal-like

## 6.1. Limitations and future research

Next, some limitations of this study are discussed. There are not many studies in the field of management accounting concerning foresight practices and particularly weak signals. The novelty of the topic causes most of the limitations, which will be decreased if the topic is researched further.

The novelty of the topic means that weak signal-based foresight practices generally in organizations, especially in management accounting, may be rather unofficial and occasional. Foresight and strategy work is usually in the responsibility of other functions or persons than accounting and finance functions or persons. Moreover, despite the debate of the changing role of management accounting, in some companies management accounting still performs mainly traditional tasks and as a consequence it is difficult to address the questionnaire for the most suitable respondent. Also, weak signals may be unfamiliar concept in the organization.

The actual contribution of the utilization of weak signals on financial and non-financial performance is difficult to measure. In this study the validity of this measurement is aimed to increase by asking the managers´ perception about the impact. Certain limitations causes also the low number of the responses. A larger sample size would increase the validity and reliability of the results. Using PLS however, helps to overcome the problem of low number of responses.

Distributions of industries and sizes of the companies in this study are relatively uneven. On the other hand, performing the PLS model by using the data of the dominating industries did not alter the results significantly. Neither there was a difference in results when comparing the results between companies with less than 700 employees and 700 or more. A next step to study regarding the industry selection could be to concentrate on differences between high- and low-technology firms with an assumption that high-technology firms detect weak signals to greater extent than the others.

In this study the relationship between strategy and detection of weak signals is limited one-sided (strategy affects detection of weak signals and further the MCS). However the findings of the previous research suggests that strategy may be influenced by MCS (Bisbe & Otley, 2004; Davila, 2000). This could mean

that detecting weak signals as a part of MCS could change the firm's strategy for example towards prospector-like direction. This kind of viewpoint considers MCS more as a tool in the strategic management process, than the static view used in this study. Studying the effect of MCS including weak signals on strategy or strategy process of an organization could be one possible step to continue studying this topic.

Also a deeper examination of which strategy type (analyzer, defender or prospector) benefits the most of the utilization of weak signals could be useful. As well the most suitable practice for organizations of different strategies to detect and utilize weak signals could be explored.

Innovation in organizations seems to be generally considered as a lifeline to survive. More innovation the better, or as Freeman puts it; "not to innovate is to die" (Freeman & Soete 1999: 266). Undoubtedly detecting weak signals widely could yield to more innovations than detecting them only inside the core business environment. But going far from the core business is riskier. How do firms know what is the appropriate amount of innovation? Weak-signal-thinking could be a useful approach in this problem, which actually brings the discussion to strategy and how weak signals influence the strategy; when to innovate and expand and when to stick to the existing operations?

Conducting a case study of this topic could be a possible way to continue the research. The study could explore how organizations detect weak signals, how they integrate them to MCS and what are the effects on the performance.


## 6.2. Conclusion


Whether or not the hypotheses are accepted, the research reaches one goal, which is to continue the discussion of the usefulness of the detection of weak signals throughout the whole organization.

One of the main purposes of this study was to track, if the organizations detect weak signals at all or apply some kind of weak-signal-based thinking. The result seems to be, that the organizations understand the idea of weak signals and they also detect them more or less systematically because the research indicates that weak signals are somehow connected to MCS. However the

effects of the detection and utilization of weak signals as a part of MCS cannot yet be seen in the performance or in the increase of product innovation. This could mean that the companies have probably started to consider more systematic practices for exploiting weak signals quite recently, and thus the effects will realize later. Regardless, the positive relationships between the detection of weak signals without the connection to MCS and performance and product innovation indicate that weak-signal-thinking is useful for organizations, which is a good starting point for further research.

The past two years have been extremely turbulent in the world economy. In Europe, the results of the recession are currently being realized. There are plenty of hindsight-colored writings, opinions and discussions in the media about the signs of the recession that were not noticed or perhaps did not wanted to be noticed. People are actually talking about weak signals, usually with different names. What went wrong and what was not noticed on time? For example the stress tests made in the summer 2010 to find out the situation of the European banks did not, in the end, reveal the true situation.

If this kind of survey study is made later, the results would probably be different. If the changes happen faster all the time, could it be that the amount of weak signals increases and accordingly, the "lifetime" of a single weak signal, in some cases, gets shorter. This would really mean that companies have to make the detection and analyzing process systematic. In management accounting it would mean, that the weak signal data is finally turned to numbers.

However, utilizing weak signals effectively is first of all a mindset in an organization. It is important to clarify, where to look for the signals and what are the essential signals considering the organization; which signals are worth to examine further? Like Ansoff's information filters illustrate, detecting weak signals require sensitivity, but also honesty.

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## Appendix 1. The cover letter translated in English

Dear Recipient,

I am a student from the University of Vaasa. My major is management accounting and I am almost completed my Master's degree of Economics and Business Administration. Now I request you as the experts of the business world to provide valuable assistance to my Master's thesis.

The role of strategic foresight has reached completely new dimension in today's organizations. Weak signals are early signs of the possible changes in the environment. An organization that is capable, before its' competitors, to detect and utilize the weak signals, can achieve competitive advantage by avoiding threats and catching opportunities.

The ambition of this Master's thesis, is to explore, how systematic and advanced is the utilization of weak signals in Finnish companies. In more detail, it is aimed to map, whether weak signals are utilized to enhance product innovation and performance and is the detection of weak signals interated to management control systems.

I kindly request you to fill in a short questionnaire, which will take only approximately five minutes of your time. Each answer is valuable. I request you to fill in the questionnaire as soon as possible, however before 7th November 2010.

Your answers will be treated confidential and any identifiable information of any organization or respondent will not be shown in any circumstances.

The following link will lead to the questionnaire:

I will be delighted to answer any requests or questions regarding the topic, so do not hesitate to take contact.

The questionnaire is directed primarily to CFOs. However, if you feel that you are not the right person to answer these questions, you may forward this mail to a person you find the most suitable in your organization. Please note that you may log in the questionnaire only once.

Kind regards,

Laura Sippola

email: laura.sippola@student.uwasa.fi

## Appendix 2. The Follow-up letter translated in English

Dear recipient,

A week ago I sent you a questionnaire regarding my master's thesis. I kindly remind you that the questionnaire will close in November 8th 2010. Filling in the questionnaire will take only five minutes of your time, but each answer is valuable for my master thesis and my degree.

The following link leads to the questionnaire:

The topic is extremely contemporary. The importance of foresight is rising to a new level in today's organizations. Weak signals are early signs of the possible changes in the environment. An organization that is capable, before its' competitors, to detect and utilize the weak signals, can achieve competitive advantage by avoiding threats and catching opportunities.

This master's thesis explores, how systematic and advanced is the utilization of weak signals in Finnish companies. In more detail, it is aimed to map, whether weak signals are utilized to enhance product innovation and performance and is the detection of weak signals integrated to management control systems.

The questionnaire is directed primarily to CFOs. However, if you feel that you are not the right person to answer the questions, you may forward this mail to a person you find the most suitable in your organization. Please note that you may log in the questionnaire only once.

Your answers will be treated confidential and any identifiable information of any organization or respondent will not be shown in any circumstances.

The following link will lead to the questionnaire:

I will be delighted to answer any requests or questions regarding the topic, so do not hesitate to take contact.


Thank you for your help!


Kind regards,

Laura Sippola

# Appendix 3. The questionnaire translated in English

## Survey: Weak Signals as a part of Management Control Systems

### 1. Business Strategy

*1.1.* The following three statements describe different types of businesses. Please indicate which of the statements best describes your firm.

A. We attempt to locate and maintain a secure niche in a relatively stable product or service area. We are not looking for anything new for our product range, but we aim to operate efficiently with our present products and markets by offering better quality, lower prices, superior service and so forth.

B. We offer fairly standardized services or products. We are not first to offer novelties, but we carefully monitor the actions of major competitors and try to offer more cost-efficient product or service. Frequently we may be "second in" in the market with a new product or service.

C. Our services or products are constantly changing. We endeavor to respond to market needs rapidly and to be the first to offer novelties. Scanning the environment widely and systematically for new opportunities is our way to do our business.

### 2. Environmental uncertainty

2.1. How well can you predict the changes in the environment of your organization? 1 = not at all forseeable… 7 = completely forseeable

1) Suppliers' actions (PEU1) *(EXCLUDED)*
2) Customer demands, tastes and preferences (PEU2) *(EXCLUDED)*
3) Market activities of competitors (PEU3) *(EXCLUDED)*
4) Production technologies (PEU4)
5) Government regulation and policies (PEU5) *(EXCLUDED)*
6) Economic environment (PEU6)
7) Development of the industry (PEU7)

### 3. Weak Signals

3.1. To what extent are the following foresight methods used in your organization? 1 = not used, 2 = used a little… 7 = used all the time

1) We follow trends and anticipate their effects on our own business environment. (FORT) *(EXCLUDED)*
2) We detect and observe weak signals (the hints of the possible new phenomena) and anticipate their effects on our business environment. (FORWS)

3.2. Are weak signals from the following areas detected in your organization? 1= not detected… 7 = detected to a very great extent

1) The development of new technology (WS1)
2) New fields for the use and application of technology (WS2)
3) Product and service introductions of competitors (WS3)
4) Product and service introductions in adjacent industries (WS4)
5) Market tactics of competitors (WS5)
6) New industry entrants and exits (WS6)

7) New business models in the industry (WS7)
8) Needs and desires of the customers (WS8)
9) Suppliers' operations in the market (WS9) *(EXCLUDED)*
10) Financial markets (WS10) *(EXCLUDED)*
11) Regulations and norms of public authorities (WS11) *(EXCLUDED)*
12) World economy and political environment (WS12) *(EXCLUDED)*

3.3. Is there any information system in your firm that is used to assist the detection of weak signals and how complex the system is? 1 = no system, 2 = very simple system … 7 = very complex system.

3.4. Do you utilize weak signal information to control your business and how systematically? 1 = not used, 2 = used very seldom.. 7 = used very systematically

3.5. Is weak signal information used to develop and expand your business? 1 = not used, 2 = used very seldom … 7 = used very systematically

3.6. Is the detection of weak signals in your organization a part of management control system? Which of the following statements describe your firm the best? Choose one.

1) Weak signals are not detected consciously, so they do not belong to any of our systems.
2) Weak signals are detected sometimes and unofficially. The information is reported to the management when necessary.
3) Detecting weak signals is becoming a practice in our organization and the utilization of weak signal information in decision making and planning is currently being improved.
4) Weak signals are detected quite systematically with a tool separate from MCS and the management utilizes the information in decision making and planning quite systematically.
5) Weak signals are detected systematically with a tool separate from MCS and the management utilizes the information in decision making and planning very systematically.
6) Detecting weak signals is a part of MCS and the management utilizes the information in decision making and planning very systematically.
7) Detecting weak signals is highly integrated to MCS and the management utilizes the information in decision making and planning very systematically.

**4. Product Innovation**

*A new product means besides products also services and various packages of products and services that are new and distinctive in the markets.*

4.1. Please indicate the extent to which the following items describe your organization. 1 = not at all… 7 = to a great extent

1) During the past three years we have launched many new products in the market in comparison to the industry average. (IN1)

2) With new products we are very often first-in –market in comparison to the industry average. (IN2)

3) The percentage of new products in our portfolio is much higher than the industry average. (IN3)

4) Our business probably has more new products at the developmental phase to be commercialized in the next year in comparison to the industry average. (IN4)

4.2. In your opinion, is the detection of weak signals increased the product innovation in your organization? 1 = weak signals are not detected, 2 = has increased a little… 7 = has increased to a great extent

**5. Performance.**

5.1. In comparison to the competitor average in the industry, how would you qualify the performance of your company over the current year (past three years) in terms of the following indicators?

1. Rate of sales growth (PERF1) *(EXCLUDED)*
2. Rate of profit growth (PERF2)
3. Return on investment (PERF3)
4. Profit/sales ratio (%) (PERF4)
5. Increase in market share (PERF5) *(EXCLUDED)*
6. Customer satisfaction (PERF6)
7. Customer retention (PERF7)
8. Acquisition of new customers (PERF8)

5.2. In your opinion, is the detection of weak signals improved the performance of your organization? 1 = weak signals are not detected, 2 = has improved a little… 7 = has improved to a great extent

**6. Background information**

6.1. Which is the main industry of your organization? Indicate one.

6.2. The number of employees in current financial year?

6.3. Is your organization a parent company of a concern?

6.4. Is your organization a subsidiary of a concern?

6.5. Respondents position.

## Appendix 4. The original cover letter in Finnish

Arvoisa vastaanottaja,

Opiskelen Vaasan yliopistossa kauppatieteitä pääaineenani yritysjohdon laskentatoimi. Maisterin tutkintoni on loppusuoralla ja tarvitsen nyt teiltä, yritysmaailman asiantuntijoilta apua graduuni.

Ennakointi on nykyajan yrityksessä nousemassa uudelle tasolle. Yritys, joka havaitsee ja hyödyntää ympäristön mahdollisesta muutoksesta viestivät heikot signaalit ennen kilpailijoitaan, voi paitsi torjua uhkia, myös tehostaa toimintaansa ja saavuttaa kilpailuetua.

Tämän gradutyön tarkoituksena on tutkia, kuinka systemaattista ja pitkälle vietyä heikkojen signaalien hyödyntäminen Suomessa toimivissa yrityksissä on. Erityisesti kiinnostuksen kohteena on, hyödynnetäänkö heikkoja signaaleja liiketoiminnan kasvattamisessa, innovaatioiden kehittämisessä ja yrityksen talouden ohjaamisessa. Lisäksi tutkitaan, onko heikkojen signaalien seuraamista kytketty yrityksen johdon ohjausjärjestelmiin.

Toivon teidän vastaavan lyhyeen, noin viisi minuuttia aikaa vievään kyselyyn. Jokainen vastaus on tärkeä. Pyydän vastausta mahdollisimman pian, kuitenkin 7.11.2010 mennessä.

Vastauksenne käsitellään ehdottoman luottamuksellisesti, eikä yksittäisten yritysten tunnistettavia tietoja esitetä missään yhteydessä.

Kyselyyn pääsee oheisesta linkistä:
https://eforms.uwasa.fi/lomakkeet/1072/lomake.html. Tunnus on 36630 ja salasana JH8BH7.

Vastaan mielelläni kaikkiin asiaa koskeviin tiedusteluihin ja kysymyksiin, joten älkää epäröikö ottaa yhteyttä.

Kysely on kohdistettu ensisijaisesti yrityksen talousjohtajalle. Jos kuitenkin tunnette, että ette ole oikea henkilö vastaamaan tähän kyselyyn, voitte välittää tämän yrityksessänne sille, joka asiasta eniten tietää. Huomatkaa kuitenkin, että kyselyyn voi kirjautua vain kerran.

Terveisin, Laura Sippola
Vaasan yliopisto / kauppatieteellinen tiedekunta
sähköposti: laura.sippola@student.uwasa.fi

## Appendix 5.  The original follow-up letter in Finnish

Arvoisa vastaanottaja,

Viikko sitten lähetin teille kyselyn liittyen heikkoja signaaleja käsittelevään graduuni. Muistuttaisin ystävällisesti, että kyselyyn voi vastata vielä viikon ajan (viimeistään 8.11.2010). Kyselyyn vastaaminen vie noin viisi minuuttia aikaanne, mutta jokainen vastaus on todella arvokas gradutyöni ja kauppatieteiden maisterin tutkintoni loppuunsaattamiseksi.

Kyselyyn pääsette oheisesta linkistä: https://eforms.uwasa.fi/lomakkeet/1072/lomake.html. Tunnus on 36630 ja salasana JH8BH7.

Aihe on hyvin ajankohtainen, sillä ennakointi on nousemassa aivan uudelle tasolle yrityksissä. Yritys, joka havaitsee ja hyödyntää ympäristön mahdollisesta muutoksesta viestivät heikot signaalit ennen kilpailijoitaan, voi paitsi torjua uhkia, myös tehostaa toimintaansa ja saavuttaa kilpailuetua.

Tämän gradutyön tarkoituksena on tutkia, kuinka systemaattista ja pitkälle vietyä heikkojen signaalien hyödyntäminen Suomessa toimivissa yrityksissä on. Erityisesti kiinnostuksen kohteena on, hyödynnetäänkö heikkoja signaaleja liiketoiminnan kasvattamisessa, innovaatioiden kehittämisessä ja yrityksen talouden ohjaamisessa. Lisäksi tutkitaan, onko heikkojen signaalien seuraamista kytketty yrityksen johdon ohjausjärjestelmiin.

Kysely on tarkoitettu ensisijaisesti yritysten talousjohtajille, mutta jos tunnette, että ette ole paras henkilö vastaamaan kyselyyn, voitte välittää kyselyn yrityksessänne sellaiselle henkilölle, joka asiasta eniten tietää. Huomatkaa kuitenkin, että kyselyyn pääsee kirjautumaan oheisilla tunnuksilla vain kerran.

Kysely on ehdottoman luottamuksellinen, eikä yksittäisten yritysten tunnistettavia tietoja mainita missään yhteydessä.

Vastaan mielelläni kaikkiin asiaa koskeviin tiedusteluihin ja kysymyksiin. Kaikille halukkaille lähetetään tiivistelmä tutkimuksen tuloksista.

Kiitokset avustanne!

Ystävällisin terveisin,
 Laura Sippola
Vaasan yliopisto/ kauppatieteellinen tiedekunta
sähköposti: laura.sippola@student.uwasa.fi

# Appendix 6. The original questionnaire sent to the respondents in Finnish

## Kysely: Heikot signaalit osana yritysjohdon ohjausjärjestelmää

### 1. Yrityksen strategia

1.1. Alla on kuvattuna kolme yrityksen strategiaa. Valitkaa YKSI lähimpänä yritystänne oleva strategia.

A. Tavoitteenamme on saavuttaa ja säilyttää vakaa markkina-alue suhteellisen vakaalla tuote- ja/tai palvelualueella. Emme etsi valikoimaamme uutuuksia, vaan toimimme tehokkaasti nykyisillä tuotteilla ja markkinoilla tarjoamalla parempaa laatua, hintaa, palvelua jne.

B. Tarjoamme melko vakiintuneita tuotteita ja/tai palveluita. Emme ole ensimmäisinä tarjoamassa uutuuksia, mutta seuraamme huolellisesti toimintaympäristömme muutoksia ja kilpailijoiden toimintaa, ja pyrimme tarjoamaan tuotteita ja palveluita kustannustehokkaammin.

C. Palvelumme ja tuotteemme muuttuvat jatkuvasti. Pyrimme vastaamaan markkinoiden tarpeisiin nopeasti ja tarjoamaan uutuuksia ensimmäisenä. Toimintaamme kuuluu laaja ja systemaattinen ympäristön seuraaminen uusien mahdollisuuksien löytämiseksi.

### 2. Toimintaympäristön epävarmuus

2.1. Kuinka hyvin pystytte ennakoimaan yritysenne ympäristöön liittyviä tekijöitä? 1 = ei lainkaan ennakoitavissa… 7= täysin ennakoitavissa

- Toimittajien ja alihankkijoiden toiminta
- Asiakkaiden käyttäytyminen
- Kilpailijoiden käyttäytyminen
- Tuotantoteknologioiden kehittyminen
- Valtiovallan toiminta ja politiikka
- Yleinen kansantalouden kehittyminen
- Yrityksen toimialan kehittyminen

### 3. Heikot signaalit

3.1. Käytetäänkö yrityksessänne mielestänne seuraavia menetelmiä kilpailuympäristön ja liiketoiminnan ennakoinnissa? 1= ei käytetä, 2 = käytetään vähän… 7 = käytetään jatkuvasti

Tunnettujen, laajojen ilmiöiden eli trendien seuraaminen ja niiden vaikutusten ennakointi omassa liiketoimintaympäristössä.

Uusien, vasta kehittymässä olevien ilmiöiden, heikkojen signaalien, tunnistaminen, tarkkailu ja vaikutusten arviointi omassa liiketoimintaympäristössä.

3.2. Seurataanko yrityksessänne heikkoja signaaleja seuraavilta aloilta? 1 =ei seurata, 2= seurataan vähän… 7 =seurataan erittäin aktiivisesti

- Uusien teknologioiden kehitys
- Teknologioiden uudet soveltamisalueet
- Kilpailijoiden uudet tuotteet ja palvelut
- Läheisten toimialojen uudet tuotteet ja palvelut
- Kilpailijoiden toiminta markkinoilla
- Alalle tulevat ja alalta poistuvat toimijat
- Liiketoimintakonseptien kehitys toimialalla
- Asiakkaiden tarpeiden ja mieltymysten kehitys
- Toimittajien toiminta markkinoilla
- Rahoitusmarkkinoiden kehitys
- Ohjaus ja sääntely julkisen vallan taholta

- Maailmantalouden ja poliittisen ilmapiirin kehitys

3.3. Käytetäänkö yrityksessänne tietoteknistä järjestelmää, jonka avulla heikkoja signaaleja voidaan seurata? Jos käytetään, kuinka monipuolisena pidätte kyseistä järjestelmää? 1 = ei ole järjestelmää, 2= käytössä on hyvin yksinkertainen järjestelmä… 7=käytössä on hyvin monipuolinen järjestelmä

3.4. Hyödynnetään yrityksessänne heikkoja signaaleja talouden ohjauksessa? Jos hyödynnetään, niin kuinka systemaattisesti?

1= ei hyödynnetä ollenkaan, 2= hyödynnetään satunnaisesti… 7= hyödyntäminen on erittäin systemaattista

3.5.Hyödynnetäänkö yrityksessänne heikkoja signaaleja liiketoiminnan kasvattamisessa? Jos hyödynnetään, niin kuinka systemaattisesti? 1 0 ei hyödynnetö ollenkaan, 2 =hyödynnetään satunnaisesti.. 7=hyödyntäminen on erittäin systemaattista

3.6. Onko heikkojen signaalien seuraaminen hyödyntäminen sisällytetty yrityksessänne osaksi johdon ohjausjärjestelmää? Mikä väitteistä kuvaa parhaiten tilannettanne? Valitkaa YKSI.

1. Heikkoja signaaleja ei seurata tietoisesti, joten ne eivät kuulu johdon ohjausjärjestelmiin.
2. Heikkoja signaaleja seurataan jonkin verran ja epävirallisesti, ja niistä raportoidaan johdolle tarvittaessa.
3. Heikkojen signaalien seuraaminen alkaa olla käytäntö yrityksessä, ja tiedon hyödyntämistä päätöksenteossa ja suunnittelussa kehitetään.
4. Heikkoja signaaleja seurataan johdon ohjausjärjestelmästä erillisellä työkalulla melko systemaattisesti ja saatua tietoa myös hyödynnetään johdon päätöksenteossa ja suunnittelussa melko systemaattisesti..
5. Heikkojen signaalien seuraaminen on johdon ohjausjärjestelmästä erillinen, mutta systemaattisesti käytettävä työkalu, ja saatua tietoa käytetään systemaattisesti johdon päätöksenteossa ja suunnittelussa.
6. Heikkojen signaalien seuraaminen on käytäntö yrityksessämme, ja kiinteä osa johdon ohjausjärjestelmää ja johdon päätöksentekoa ja suunnittelua.
7. Heikkojen signaalien seuraaminen on kiinteä, systemaattinen ja pitkälle automatisoitu osa johdon ohjausjärjestelmää ja saatua tietoa hyödynnetään systemaattisesti johdon päätöksenteossa ja suunnittelussa.

## 4. Tuoteinnovatiivisuus

Uudella tuotteella tarkoitetaan seuraavassa varsinaisten tuotteiden ohella myös palveluja, sekä erilaisia tuotteiden ja palveluiden yhdistelmiä ja niiden uusia versioita, jotka ovat omaperäisiä ja uusia markkinoilla.

4.1. Missä määrin seuraavat väittämät kuvaavat yritystänne?

1= ei kuvaa ollenkaan, 2=kuvaa jokseenkin…7=kuvaa erittäin hyvin

Viimeisen kolmen vuoden aikana olemme tuoneet markkinoille paljon uusia tuotteita verrattuna muihin toimialamme yrityksiin.

Yrityksemme on usein ensimmäinen markkinoilla tarjoamassa uusia tuotteita verrattuna muihin toimialamme yrityksiin.

Uusien tuotteiden osuus kaikista tuotteistamme on paljon suurempi kuin toimialalla keskimäärin.

Luultavasti yrityksellämme on toimialan keskiarvoa enemmän kehitteillä uusia tuotteita, jotka tullaan kaupallistamaan ensi vuonna.

4.2. Onko heikkojen signaalien systemaattinen seuraaminen mielestänne parantanut yrityksenne tuoteinnovatiivisuutta?

1= heikkoja signaaleja ei seurata, 2=on parantanut, mutta hyvin vähän…7=on parantanut merkittävästi

## 5. Yrityksen suorituskyky

5.1. Verrattuna kilpailijoidenne keskiarvoon, kuinka luonnehditte yrityksenne viimeisen kolmen vuoden suorituskykyä seuraavien mittareiden osalta?

1= paljon alle kilpailijoiden keskiarvon… 4= noin kilpailijoiden keskitasoa…7=merkittävästi kilpailijoiden keskitasoa parempi

- Liikevaihdon kasvunopeus
- Liikevoiton kasvunopeus
- Sijoitetun pääoman tuotto
- Liikevoitto/Liikevaihto –suhde
- Markkinaosuuden kasvu
- Asiakastyytyväisyys
- Asiakkaiden pysyvyys
- Uusien asiakkaiden hankinta
-

5.2. Onko heikkojen signaalien sysremaattinen seuraaminen mielestänne parantanut yrityksenne suorituskykyä?

1= heikkoja signaaleja ei seurata, 2= on parantanut, mutta hyvin vähän…7=on parantanut merkittävästi


## 6. Yrityksen ja vastaajan taustatiedot

6.1. Mikä on yrityksenne pääasiallinen toimiala? Valitkaa YKSI.

6.2. Arvionne yrityksenne henkilöstömääräksi tällä tilikaudella

6.3. Onko yrityksenne jonkin konsernin emoyhtiö?

6.4. Onko yrityksenne jonkin konsernin tytäryhtiö?

6.5. Asemanne yrityksessä

-toimitusjohtaja (CEO)

-talousjohtaja (CFO)

-muu, mikä?

6.6. Haluatteko tiivistelmän tuloksista sähköpostiinne?

6.6. Vapaa tila viesteille ja kommenteille…