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Roadmapping for Sustainability: Evidence from an Italian-based Multinational Firm

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Abstract
The paper analyses the process through which an Italian-based multinational company that competes in the fashion and accessories industry, developed a roadmap for its sustainability strategy. The paper discusses the use of roadmaps, as a valuable instrument for fostering change and supporting strategic thinking about sustainability. Research methodology is based on participant observation and leverages on a work conducted by the authors in tight relations with key actors in the company on a time frame of 18 months. The paper shows how the case company designed its sustainability roadmap, with the aim of posing individual behaviour at the centre of the change process. The structure of the roadmap is analysed highlighting the design choices that crucially reflect the sustainability strategy developed by the company and enabled its implementation (selection of the layers, and definition of ad hoc sub-layers). Then, examples of the actual use of the roadmap are presented and discussed, in order to pinpoint the benefits of this instrument. The results of the study highlight how firms and organisations can leverage on this type of instruments in order to collect and integrate the proposals of different individuals, aligning their actions to the corporate strategy. Furthermore, this tool can provide a basis for monitoring the results achieved through a proper set of indicators, improving a company’s overall sustainability performance.

Keywords: sustainability, roadmap, participant observation
1 INTRODUCTION

Since the nineties, companies have started to recognize the relevance of integrating sustainability in their corporate strategies (Azzone & Bertèlè, 1994, Dobers & Wolff, 2000; Salzmann, 2005; Porter & Kramer, 2006). Companies have gradually acknowledged the need to consider their broader areas of responsibility and the set of stakeholders to whom they are responsible (Porter & Kramer, 2006; O’Riordan & Fairbrass, 2008; Weber, 2008). Companies have also started to exploit the opportunities offered by the improvement of their environmental and social performances as a potential leverage to increase economic value creation (Aragon-Correa & Sharma, 2003; Murillo-Luna, García-Ayerbe & Rivera-Torres, 2011).

However, despite this increasing awareness, integrating sustainability in corporate strategy remains a challenge for many organisations due to the need of dealing with a wide range of issues (Murillo-Luna, García-Ayerbe & Rivera-Torres, 2007; Bhattacharya, Korschun & Sen, 2009, Spetic, Marquez & Kozak, 2012). These challenges span from the need to select and implement appropriate environmental and social management practices (Paulraj, 2009; Lucas, 2010), to change employee mindsets (López-Gamero, Zaragoza-Sáez, Claver-Cortés & Molina-Azorín, 2011), engage relevant stakeholders (Dobele, Westberg, Steel & Flowers, 2013; García-Rodríguez, García-Rodríguez, Castilla-Gutiérrez & Major, 2013), and create completely new business models (Benjits, 2013).

To effectively deal with these challenges, a crucial aspect consists in the design of an “in-house strategy”, whereby a company can develop its own business case, taking a long term view and considering sustainability in relationship to the other managerial and organisational arrangements through which it creates value (Paramanathan, Farrukh, Phaal & Probert, 2004; Hahn, 2012). Though the need of creating such a plan is widely recognised to be a critical issue, in both the academic and practitioner literature (Murillo-Luna et al., 2011; Rohrbeck & Kallehave, 2012), there is still limited evidence about what instruments companies could exploit to this aim.

Moving from this consideration, this work focuses on a specific instrument – sustainability roadmapping – that we argue has the potential for being useful in supporting companies to plan and monitor their sustainability strategy. Though, at present, there is not consolidated evidence of the use of roadmapping in connection to sustainability, different contributions (Vaneças, 2003; Lee & Park, 2005; Whalen, 2007) suggest the potential benefits of applying similar tools to support the formulation of a sustainability strategy. On the one hand, the literature on R&D management stresses the ability of roadmapping of capturing the dynamic linkages between different corporate resources, company’s objectives and contextual variables. Roadmapping involves intertwined cycles, at the technological, organisational and market level, that are interrelated with an industry’s competitive dynamics. This specific feature appears potentially useful for supporting companies in creating their own business case for sustainability. On the other hand, a few authors provide evidence of the application of strategic mapping approaches to sustainability, as a mean to deal with different sustainability objectives and link them to corporate strategy (Figge, Hahn, Schaltegger & Wagner, 2002; Van Leeuwen, Vermeulen & Glasbergen, 2003; Robinson, Anumba, Carrillo & Al-Ghassani, 2006). Among them, Salzmann (2005) identifies roadmapping as “coaching tools” for managers willing to develop and implement sustainability strategies. Other authors discuss the possibility of implementing technology roadmapping and corporate forecasting tools, with the idea of following the evolution of sustainability objectives and results over time, even though they do not provide an empirical application (Paramanathan, Farrukh, Phaal, & Probert, 2004; Will, 2008).

Moving from these considerations, this paper aims to explore the use of strategic roadmapping for supporting the development and implementation of a sustainability strategy. As discussed in the next section, we argue that the potential benefits that are commonly associated to the development and use of roadmaps for strategic planning, have been realized only to a limited extent in the field of sustainability. To fill this gap, the paper analyses how a multinational company that competes in the fashion and accessories industry exploited roadmapping for embedding its sustainability strategy at different organisational levels (product, process, and enterprise). Relevant design choices (e.g. selection of the layers, definition of the sub-layers) are analysed and the actual use of the roadmap is investigated to understand how it supports the process of change. Then, moving from the empirical evidence, the paper discusses the potential use of strategic roadmapping in order to plan and monitor companies’ journey towards sustainability.

The rest of the paper is articulated as follows: section two briefly introduces the concept of roadmapping as a tool for managing changes and highlights the linkages between roadmapping and sustainability. Section three presents the research method and the case study is outlined in section four. Then, we discuss our results in section five and conclude in section six.
2 ROADMAPPING FOR MANAGING CHANGE: A LITERATURE REVIEW

The use of roadmaps has its roots in the late 1970s in the U.S. automotive industry with Motorola drafting the first example of the tool for showing the evolution of car radio product feature and technologies (Willyard & McClees, 1987). Since then, roadmapping has been widely adopted in many industries (Barker & Smith, 1995; Groenveld, 1997; Albright & Kappel, 2003; Kajikawa, Usui, Hakata, Yasunaga & Matsushima, 2008; Gerdtsri, 2013) mostly as a technique for supporting technology management and technology planning through showing and analysing the dynamic linkages between technological resources, company’s objectives and contextual variables (Phaal, Farrukh & Probert, 2004). The key feature and one of the main benefits of the technology roadmapping is the use of a graphical time-based structured framework for representing the mentioned linkages in a co-evolutionary fashion among technologies, products and markets.

Afterwards, the roadmapping approach has been adapted by firms and organisations to support a number of different aims. Kappel (2001) in one of the first contributions addressing this issue, basing on an empirical analysis of adopters of roadmapping techniques, distinguishes four types of roadmap, accordingly to their purpose (understanding the dynamics at industry level or defining the dynamics at firm level) and emphasis (on future trends and trajectories or on relative positioning). Together with “traditional” product roadmaps, the author points out the usage of roadmaps for setting industry targets. Some of these “industry” roadmaps are then described in details by other authors, as for example Kostoff and Schaller (2001) analysing the case of the Semiconductor Industry Association and Phaal (2002) shedding lights on the applications of roadmaps in the UK Aluminium Industry.

Roadmaps have been then increasingly used for more strategic purposes, on the one side by comprising also the wider concepts of knowledge, capabilities and competences (Phaal et al., 2004), and on the other side by addressing not only products and markets but also organisational processes and routines. In this respect, roadmaps are regarded as instruments for designing the strategic approach of a company, by allowing managers to match the trajectories of technological innovation with the evolution of business models (Tschirky, Jung & Savioz, 2003; Hitoshi, Takashi, Akihiko, Fumio & Hiraku, 2009). This extensive use of roadmaps for strategic planning purpose contributes to let them exit the boundaries of R&D units where they originated to become a management tool used at firm level (McMillan, 2003; Propert & Radnor, 2003; Carvalho, Fleury & Lopes, 2013). As a result of this evolution, different types of roadmaps can be found in literature and in practice. In particular, Phaal et al. (2004) distinguish eight different typologies of roadmaps: (i) Product planning, i.e. the roadmap related to the inclusion of a certain technology into one or more generations of manufactured products; (ii) Service/capability planning, i.e. the roadmap to design how a certain technology can be used within the firm to support organisational capabilities; (iii) Strategic planning, i.e. the roadmap used for the broad strategic appraisal of different opportunities or threats at the business level; (iv) Knowledge asset planning, i.e. the roadmap used by firms willing to align their current knowledge assets to future critical competencies in targeted markets; (v) Process planning, i.e. the roadmap used to design future internal processes and the steps, both in terms of actions and competencies required, to reach the new configuration; (vi) Program planning, i.e. the roadmap used in complex and long term oriented R&D projects to align the steps of the project with the needed technological advances; (vii) Integration planning, i.e. the roadmap often performed at industry level focused on potential future combinations of existing technologies to form new technologies through the combinations of products or systems; (viii) Long-range planning, i.e. the roadmap often adopted at industry level for identifying potential new disruptive technologies or markets.

A common aspect of all these models is that most of the benefits of roadmapping are derived from the roadmapping process rather than the roadmap itself. The process of creating a roadmap brings together people from different firm’s units to share knowledge and vision about a certain issue and, through the number of interactions it usually requires, becomes a holistic instrument for setting a direction for the whole firm. This is particularly true when the roadmap is used to assess internal processes and knowledge and/or to set the strategic positioning of the firm in its industry against external threats or opportunities, i.e. when types process and strategic planning of the above-mentioned taxonomy are concerned (Phaal et al., 2004). Kappel (2001) argues that when properly used roadmaps have also the power of strongly influencing firms at organisational level. First, roadmaps allow a better and widespread understanding of the issue under scrutiny; second, they become a tool for persuading people, influencing their priorities and decisions through and alignment with the steps defined in the roadmap; third, they support the synchronization of activities at firm level, through the continuous coordination provided by the measure of progresses along the roadmap. Hence, roadmaps can be seen as “change agents” (Armenakis & Bedeian, 1999), by creating a sense of urgency about some changes needed at firm level and by guiding, communicating and institutionalising the new order, through consolidating improvements achieved to prevent a slip back to the antecedent status quo.

Based on these characteristics, roadmaps appear particularly suitable for supporting the implementation of sustainability strategies. Paramanathan et al. (2004) have been among the firsts to highlight the potential for applying roadmapping and, more generally, technology planning tools, in connection to sustainability. The authors point out how the lack of a comprehensive and unique framework to assist managers in implementing a
sustainability strategy often determines questions such as “how do we start?” and “what are we heading towards?” and calls for operational tools that could support companies in developing an implementation plan. From this point of view, they highlight strong similarities with the problem of integrating technological considerations into business strategy and planning, and pinpoint how road-mapping and technological foresight methods could be successfully applied to sustainability. Although this contribution underlines the potential use of roadmapping for supporting the implementation of sustainability strategies, it does not give any indication about how a sustainability roadmap could be designed and does not provide evidence of its practical application.

On the other hand, a few authors apply this concept in the field of sustainability, for specific purposes or specific organisational dimensions. Robison et al. (2006) exploit the concept of roadmapping to propose a methodology, named STEPS, that consists in a knowledge management maturity roadmap for corporate sustainability. The authors highlight how developing a knowledge management strategy is central to operationalise the concept of sustainability and the STEPS maturity roadmap is a structured approach to determine the steps involved and the actions required to implement knowledge management in this specific context. More recently, Will (2008) tries to link sustainable development and strategy setting with corporate foresight in small and medium enterprises (SMEs). In particular, he proposes a step by step approach, derived from innovation and technology analysis, to be applied in SMEs to support the development and implementation of sustainability strategies.


Moving from the analysis of prior literature that is outlined in Table 1, we argue that the key benefits that are commonly associated to the development and use of roadmaps for strategic planning, have found, so far, very limited application in the field of sustainability. As highlighted by the literature about strategic roadmapping, this tool has a potential of answering to the high level of “at-stakeness” (Petrick and Echols, 2004), that is implied when developing and applying a sustainability strategy: concomitance of multiple stakeholders that can provide inputs to the decision-making process, existence of multiple and potentially contrasting objectives, presence of multiple interdependencies. However, the contributions that specifically deal with the application of roadmapping in the field of sustainability address only at a limited extent the ability of this instrument of capturing the dynamic linkages between different corporate resources, company’s objectives and contextual variables. Most of these contributions, in fact, focus on specific organisational domains (see Table 1), without tackling the issue of the application of strategic roadmapping to the development and implementation of a corporate sustainability strategy.

Table 1 Literature review outline

<table>
<thead>
<tr>
<th>Literature streams</th>
<th>Topics</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adoption and development</td>
<td>Groenveld (1997); Albright &amp; Kappel, (2003); Kajikawa et al. (2008); Gerdtsri (2013)</td>
</tr>
<tr>
<td></td>
<td>Industry roadmap</td>
<td>Kostoff and Schaller (2001); Phaal (2002)</td>
</tr>
<tr>
<td></td>
<td>Link to strategic management</td>
<td>Tscharky et al. (2003); Hitoshi et al. (2009); McMillan (2003); Propert &amp; Radnor, (2003); Carvalho et al. (2013)</td>
</tr>
<tr>
<td>Roadmapping &amp; sustainability</td>
<td>Potential use of roadmapping for the development of sustainability strategy</td>
<td>Paramanathan et al. (2004)</td>
</tr>
<tr>
<td></td>
<td>Knowledge management</td>
<td>Robison et al. (2006)</td>
</tr>
<tr>
<td></td>
<td>Corporate foresight</td>
<td>Will (2008)</td>
</tr>
<tr>
<td></td>
<td>New product development</td>
<td>Petrick and Echols (2004); Waage (2007)</td>
</tr>
</tbody>
</table>

3 RESEARCH METHODOLOGY

This research aimed to analyse how a multinational organisation, producing fashion products, designed its roadmap towards sustainability and exploited it to embed sustainability ideas at different organisational levels. The case setting, hereinafter named The Company for reasons of confidentiality, is based in Italy, but competes in more than one hundred and thirty countries, with approximately seven thousand retail stores in North America, Asia-Pacific, China, South Africa, Latin America and Europe. The Company vertically integrates all
the phases of the production process: design and manufacturing activities are carried out worldwide, with six manufacturing plants in Italy, two plants in China, one plant in Brazil and one plant in the United States. The corporate strategy is strongly oriented to quality, technological innovation, style and design. These principles allowed The Company to consolidate its global position with positive financial results. In 2012, The Company registered net sales of more than seven billion euros, with net profits of about five hundred million euros.

To perform the analysis the research relied on a qualitative methodology. This research method offers the possibility of gaining greater insight into how sustainability has been defined and how the general idea has been operationalised and translated into concrete action plans. Within this paradigm, the research was conducted through participant observation (Becker & Geer, 1957; Jorgensen, 1989), since one of the researchers was involved in the “Green Company” project as a member of the project team (see the next section for details).

This research method is coherent with the aim of the paper of enhancing our understanding of the processes by which companies can rely on the concepts of roadmapping to develop and deploy their own “in-house strategy” for implementing sustainability. The presence of the researcher at the premises of the Company enabled the behaviour and actions of individuals to be observed as they occurred. In particular, by living the field, it offered the possibility of better capturing the variety of languages of the actors, and of dealing with the matters that the interviewees could be unable or unwilling to talk about in more formal interviews (Becker & Geer 1957).

The researchers were allowed to study the organisation over a period of 18 months, between 2012 and 2013, during which data were collected longitudinally. The researchers had the possibility of observing managers and employees during their daily activities; they had the possibility of discussing the undertaken transformation with The Company’s employees and collecting evidence of their discussions with project managers and other personnel. Overall the researchers participated in 12 internal meetings, ranging from staff communication sessions, monthly project meetings, and internal presentations, and 2 public presentations in 2013 at Politecnico di Milano and at the CSR Italian Summit. To better exploit the potential benefits associated to the role of participant observers, the following protocol was adopted. Prior to enter the field, information about the Company, its strategy and its results was collected through secondary sources and a general list of things to be observed and themes to be discussed was prepared (see annex 1). This list was updated, during the period of observation, as the researchers got acquainted with the project, when new themes emerged. Detailed notes were taken concerning these themes during meetings, chats and informal interviews, internal and official presentations.

In addition, 10 semi-structured interviews were performed with key informants in order to deepen our understanding of specific issues related to the roadmap construction. The interviews were carried out according to the following protocol. A checklist with the key questions was prepared prior the interviews and shared with the interviewee. The interviews (lasting on average between one and two hours) were carried out at the Company’s premises; they were tape recorded and transcribed, to better support the subsequent analysis. After the interviews, the transcript was shared with the interviewee, and emerging findings were further investigated through follow-up questions (generally during informal meetings). The actors we had to opportunity to observe or interview are the following: CEO of the Company, CSR (Corporate Social Responsibility) Director, Business Development Manager for Italy, Marketing Manager Europe, Project leader in the R&D Unit, Head of the “Green Unit”, several members of the “Green Unit”. Archival material was also included in the analysis: official documents and presentations, internal memos, press releases and press articles.

Concerning data analysis, first we drew a timeline of the development of the ‘Green Company’ project based on the interviews and archival material. In doing this, we gave particular attention to highlight the key steps in the development and the implementation of the strategy, the main changes that took place and the tools that were used to support them. Then, we specifically focused on the development and use of the roadmap, giving particular attention to how it was developed and how it was used to guide the deployment of the ‘Green Company’ project. The contents of the transcribed interviews and the archival materials were thematically analysed, with each researcher highlighting emerging issues and outlining circular and contingent causalities.

4 ROADMAPPING FOR SUSTAINABILITY: THE CASE OF AN ITALIAN-BASED MULTINATIONAL

In the late 2000’s the attention towards sustainability started growing also in the fashion accessories industry and several firms, particularly in US and Europe, launched “green products”, i.e. products that either in their production process or, more frequently, in their main components were “environmental friendly”. Aware of this trend, the CEO of the Company required a market analysis to better understand the competitive positioning of the main players in the industry and the customers’ response to these new products. However, collected data showed a market reaction significantly weaker than expected. The large majority of “green products” were reporting market trends very similar to those of their “traditional” counterparts. Starting from these considerations, the CEO of the Company decided not to redefine the strategy of the Company for integrating sustainability.
Until the end of 2010, the situation did not change. The Company did not sell any “green product”. Therefore, no internal actions or marketing campaigns of any relevance were taken to increase or communicate the sustainability of the products or processes of the Company.

However, the reason for such a delay was due, accordingly to the words of the CEO, to “the search for a differential approach to sustainability that would create a truly sustainable competitive advantage for The Company against other major players in the industry”, rather than in the lack of perception of the relevance of the issue. At that time, the CEO of the Company started being involved in the activities of the Zero Waste Alliance (www.zerowaste.org), promoting an alternative approach to sustainability. Indeed, the Alliance focused mostly on how to make sustainable the internal processes of companies rather than just their final products. This alternative approaches seemed to the CEO of the Company more coherent with his idea of sustainability.

Influenced by these stimuli and with the willingness to design an independent and ad hoc approach, at the beginning of 2011, the CEO launched a new global project called “Green Company” that became part of the strategic plan 2011-2015 of The Company. The goal of the project is to:

“Foster a cultural change truly diffused in the whole company and even beyond its boundaries among suppliers and customers that will value sustainability as a crucial issue for creating a better society in the future.” (Internal Presentation)

This goal was made also very practical by setting a measurable target of reduction in 2015 by 30% of the overall CO2 emissions. The target included emissions coming from electricity and thermal energy consumed by the Company, emissions coming from the production processes of products and services supplied to the Company, and emissions from the selling and distribution of the Company’s products. The Company rewarded as crucial the “cultural change” needed to embrace the new approach to sustainability and the idea of “measuring results through indicators”. The CEO taught these two issues would fit the aspiration of the Company to “be truly different”.

4.1 Setting up the organisation

The “Green Company” project was very ambitious both in scope and target. Therefore, it was immediately clear to the CEO that the project needed a dedicated organisational unit.

Hence, a new independent organisational unit, purposely named “Green Unit”, was set in 2011. The unit leader was appointed among the most experienced product managers of the Company. The unit was entitled with the task of defining specific targets for the other functional units of the Company as well as promoting and evaluating specific projects for improving sustainability. The unit, moreover, coordinated and supervised all the actions taken at firm level about this issue.

The “Green Unit” was further strengthened by the creation of two flexible ancillary organisational structures: the “Green Team” and the “Green Ambassadors”. (i) The “Green Team” is a task force of 24 people (one for each functional unit and site of The Company all over the world) with the goal of collecting on field new project ideas and of monitoring the progresses of sustainability projects launched by the “Green Unit”. (ii) The “Green Ambassadors” are a light network of about 300 employees with the goal of further share knowledge and diffuse within the firm the results of the “Green Company” project.

The “Green Unit” and its two ancillary organisational structures were operative after just two months by the official launch of the project and a dedicated website within the intranet of The Company was created to share all information about the “Green Company” project. The website was kept constantly up to date, allowing people within the Company to follow the progresses of the project and to make their own project proposals. A directory of e-mail addresses of the Green Ambassadors was also made available on the website, in order employees to be able to share their opinions and suggestions in their own organisational units.

The head of the Green Unit underlined the numerical unbalance between the central structure (small and flat) and the network of the task force and the green ambassadors (made by many different people). In particular, he explained the choice of this organisational structure with the need of making all the employees part of the project. This allowed for the employees to become themselves agents of change in different functions/organisational units:

“I will be able to say I succeeded with this project, when my unit will disappear, because it won’t be necessary any more, I won’t be necessary any more. Then I can say I did my job well.” (Head of the Green Unit)

4.2 Designing the Roadmap

“When I took the lead of the Green Unit it was clear to me that without a clear vision about what sustainability does it means for us and what are the real ways of differentiating from competitors, there were no chances of success.” (Head of the Green Unit)
These are the words of the head of the “Green Unit” explaining the decision to adopt a roadmap approach to address the issue. He started from the idea that sustainability is a broad concept that can mean different things to different people. Hence he stated the need to formulate and communicate a “unified vision” to the organisation, ensuring everybody to “row into the same direction”.

To this aim, the manager decided to purposively develop a roadmap. He was already familiar with this tool for planning the development of new products in his previous organisational unit and he found many similarities with his new goal of managing the Green Unit. (i) The target is clear and measurable (30% reduction of CO2 emissions) like it happens in product roadmaps where the goal is to reach a certain amount of revenues or market share. (ii) Reaching the target would require creating a competitive advantage and involving the whole organisation. (iii) Finally, the paths towards the goal are open and many alternatives surface.

The result of the activity of the Green Unit was the “Green Roadmap” we depicted in Figure 1. A pivotal role in defining this roadmap has to be credited also to the “Green Team”, recording a genuine interest of employees in being part of this process.

It is worth mentioning that, instead of using the format developed internally by the Company, we decided to adapt the “Green Roadmap” to the generalized roadmap architecture proposed by Phaal et al. (2004). This will make it more clearly understandable to scholars and practitioners in the field.

**Figure 1 The Green Roadmap of The Company**

<table>
<thead>
<tr>
<th>Layer</th>
<th>Sub-Layer</th>
<th>Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Products</strong></td>
<td>Design for environment</td>
<td>P9</td>
</tr>
<tr>
<td></td>
<td>Green Procurement</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Green Logistic</td>
<td>P13</td>
</tr>
<tr>
<td></td>
<td>Energy Efficiency</td>
<td>P14</td>
</tr>
<tr>
<td></td>
<td>Waste Management</td>
<td>P12</td>
</tr>
<tr>
<td><strong>Processes</strong></td>
<td>Green Procurement</td>
<td>P8</td>
</tr>
<tr>
<td></td>
<td>Green Logistic</td>
<td>P15</td>
</tr>
<tr>
<td></td>
<td>Energy Efficiency</td>
<td>P11</td>
</tr>
<tr>
<td></td>
<td>Waste Management</td>
<td>P6</td>
</tr>
<tr>
<td><strong>Organization</strong></td>
<td>Energy Efficiency</td>
<td>P5</td>
</tr>
<tr>
<td></td>
<td>Waste Management</td>
<td>P7</td>
</tr>
<tr>
<td></td>
<td>People Engagement</td>
<td>P1</td>
</tr>
<tr>
<td><strong>Layers</strong></td>
<td>Sub-Layers</td>
<td>Projects</td>
</tr>
</tbody>
</table>

Starting from the analysis of the y-axis, the layers of the “Green Roadmap” are designed to fit the idea of the head of the Green Unit of developing the concept of sustainability starting from a cultural change within the Company. The bottom layer (know-how) is the “organisation”, i.e. the individual behaviours of employees in their everyday activity.

“It was clear to me that we had first to change the mindset of people, and letting sustainability to be in some way part of everyday life of our employees. I thought in this way employees would have been able to quickly develop their own practical idea of what sustainability means for them.” (Head of the Green Unit)

The middle layer of the roadmap (know-what), that is used for “providing a bridging or delivery mechanism between the purpose and resources (know-how)” (Phaal et al., 2004), deals with the “processes”, i.e. the organisational procedures and the equipment and machineries used in the different functions of the firm (namely R&D, Production, Logistic & Procurement, Distribution, After Sales). Indeed, if the “know-how” is searched and developed at individual level, the “know-what” should be designed at Company level by properly coordinating the efforts of individuals through the design of sustainable processes.

The top layer (know-why) refers to the “products”. i.e. the design activities and the supplied components
and materials of newly developed fashion accessories. The final purpose of the roadmap is obviously to reach the market with “green” products as many competitors are already doing. The “Green Roadmap”, however, was intended to help the Company reaching this goal in a unique way.

“Starting from the organisation is crucial for differentiating our approach. We want first to change the mindset and behaviour of our employees and then to start redesigning processes and products. This will mean customers will see the changes on the market later but then we will be the only Company in our industry able to ensure them we are truly sustainable.” (Head of the “Green Unit”)

This idea of progresses from the bottom to the top layer is also clear in the x-axis showing the time line of the roadmap. The first layer to be addressed is the organisation (on the time horizon 2011-2015), then it turns to the processes (2012-2015) and finally to products (2013-2015). This means that the first projects to be implemented in 2011 should be related to individual behaviours, whereas the Company expects to design the first sustainable procedures starting from the year 2012 and then finally starting the design of the first fully sustainable product in 2013.

Once layers and time were defined, the Green Unit worked on the definition of sub-layers. These sub-layers are intended to be dimensions of the sustainability concept serving as guidelines for developing and clustering specific implementation projects. Six sub-layers were defined as follows. (i) People engagement, i.e. all the actions aimed at adapting individual behaviours to sustainability. Examples of potential projects in this dimension range from the switch off of computers and lights for reducing electricity consumption, to the proper disposal of waste for improving the recycling process, and to the car sharing among employees for reducing emissions during transportation. (ii) Waste management and (iii) Energy efficiency, i.e. all the actions involving also equipment and procedures aimed at reducing the generation of waste and energy consumption. Examples of potential projects in this dimension are investments in more efficient HVAC (Heating, Ventilation, Air Conditioning) systems and investments in improved production processes reducing waste production or using waste (e.g. broken pallets) to produce thermal energy in biomasses burners. (iv) Green logistics and (v) Green procurement, i.e. all the actions involving external suppliers and dealing with increasing the green footprint of supplied products and services. Examples of potential projects in this dimension are the increase of the mileage of water and rail transportation against truck or air transportation, and the inclusion of environmental friendliness measures in the selection process of suppliers. (vi) Design for environment, i.e. all the actions aimed at increasing the sustainability of products of The Company. Examples of potential projects in this dimension are the increase of the product life time, or the easing of the disassembly and reuse of end life products.

Sub-layers from (i) to (iii) are for the layer “organisation”. Sub-layers from (ii) to (v) are for the layer “processes”, whereas sub-layer from (ii) to (vi) are for the layer “products”.

“The idea of providing dimensions of the concept of sustainability was crucial. At the beginning, we were a bit reluctant as some of the team members wanted to let the process completely free. Taking into account the number of project ideas we received later ... having a clear structure for clustering the projects helped us a lot in our work.” (Member of the “Green Unit”)

4.3 Selecting Projects and Indicators

Once defined the “Green Roadmap”, the “Green Unit” and the two ancillary organisations started working on the generation of project ideas. All the organisational units were involved in this process, proposing specific initiatives, to contribute achieving the overall target of the “Green Roadmap”. Inputs from the employees were stimulated by the commitment given by the CEO to the Green Project:

“Anyone was aware of the support of the top management to this initiative and therefore it was for me almost a work duty to give my contribution.” (Project proponent)

The process of populating the roadmap was therefore mostly bottom-up, rather than top down, with the members of the “Green Unit” and the Green Ambassadors providing to applicants directly or through the dedicated website practical advices to increase the potential fit of the idea with the overall goal.

Once received, project proposals are classified by layer (organisation, processes, products) and sub-layers (people engagement, waste management, energy efficiency, green logistics, green procurement, design for environment) in order to be properly evaluated.

The “Green Unit” evaluated the project proposals (and later monitored the progresses of the projects) using a purposively designed set of indicators. Indicators are used to create a ranking among project proposals. Projects are then approved starting for the one with the highest rank in each layer and sub-layer until there is budget available.

Proposals dealing with the “organisation”, i.e. the bottom layer (know-how), are evaluated against the
specific and goal oriented indicators listed in Table 2. For example a project proposal about waste management is evaluated against the amount of waste saved. The higher is the amount and the share of generated waste per employee addressed by the proposal the higher is the rank of the proposal and its chance to be approved. A strict rule also applies to projects involving the “organisation”. Once approved, they have to be implemented all over The Company. This meant one of the most difficult tasks since the beginning of the “Green Unit” was to homogenize and aggregate similar project ideas coming from different units of The Company.

Table 2 Examples of Goal Oriented Indicators for project (proposals) in the “organisation” layer

<table>
<thead>
<tr>
<th>Dimension of sustainability</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>People engagement</td>
<td>$\frac{\text{Employee}_{\text{inv},t}}{\text{Employee}_t}$ % number of employees directly involved in project</td>
</tr>
<tr>
<td></td>
<td>$\sum_t \text{Portal Visits}_t$ Total number (t = month, T = year) of visits to the intranet section of the “Green Company” project</td>
</tr>
<tr>
<td></td>
<td>$\frac{\sum_t \text{Time Session}_t}{\text{Portal Visits}_t}$ Average time (min) of duration of the visit to the intranet section of the “Green Company” project</td>
</tr>
<tr>
<td></td>
<td>$\frac{\text{Km}<em>t - \text{Km}</em>{t-1}}{\text{Km}_{t-1}}$ Yearly savings (%) in job trips using automotive or airplane</td>
</tr>
<tr>
<td>Waste management</td>
<td>$\frac{\sum_t W_{\text{aste},i}}{\sum_t \text{employee}_t}$ Yearly kilograms of waste generated per employee (t = month, T = year) and typology (i = paper, plastic, …)</td>
</tr>
<tr>
<td></td>
<td>$W_{\text{aste},t} - W_{\text{aste},t-1}$ Yearly savings (kilograms) in waste generated</td>
</tr>
<tr>
<td>Energy Efficiency</td>
<td>$\frac{\sum_t E_{\text{n El},i}}{\sum_t \text{employee}_t}$ Yearly kWh of electricity consumed per employee (t = month, T = year) and destination (i = lighting, conditioning, …)</td>
</tr>
<tr>
<td></td>
<td>$E_{\text{n El},t} - E_{\text{n El},t-1}$ Yearly savings (kWh) in electricity consumed</td>
</tr>
</tbody>
</table>

Source: Excerpt from reports of The Company

Proposals dealing with the other two layers (“processes” and “products”), on the contrary, are applied initially only in the unit of the proponent, thus allowing multiple similar projects to coexist. A two-dimensions reporting system is created measuring the completeness (i.e. how many of the dimensions of sustainability are actually addressed by the approved projects) and the coverage (i.e. how many of the relevant sites and units of The Company are adopting projects). An example of this reporting for projects involving processes is shown in Figure 2, where the dimension of the bubble refers to the actual contribution of each function (R&D, Production, Logistic & Procurement, Distribution, After Sales) to the CO2 emissions of The Company.
The “Green Unit” took care of monitoring and sharing by the mean of the “Green Ambassadors” information about best practices in these projects, fostering cross-fertilisation and the development of new and improved ideas.

“The role of the website on the Company’s intranet was crucial. Employees were constantly updated with information about proposals under evaluation and progresses of the projects already started. The website of the “Green Roadmap” became a sort of “connecting point” between all the members of the organization.” (Member of the Green Ambassadors)

4.4 Implementing projects and collecting results

“First of all we clarified ourselves what is sustainability for The Company and what is the path we started for making us the most sustainable company in the industry.” (CEO of The Company).

At the end of 2013, the Green Project has become one of the cornerstone of the strategy of the Company. After 2 years from the inception of the Green Project, accordingly to an internal survey performed through the Green Ambassadors almost 100% of the employees has been involved, at a different extent, in some of the proposed activities.

“The Green Roadmap has become a reference point and a powerful instrument for the internal debate about sustainability. Every employee looks at the Green Roadmap website at least once a week.” (Member of the Green Ambassadors)

At the end of 2013, about 40 projects were being implemented, with some of them already close to completion.

Each of the sub-layers in the “organisation” (know-how) layer has at least three projects under development. The reduction of CO2 emissions achieved at the end of 2013 equals about 50% of the global target for the “organisation” layer.

“With the projects about organisation in 2 years we already achieved half of the final target. This demonstrates the way we selected proposals was very effective … and also that our employees are very brilliant in developing new idea.” (Head of the Green Unit)

Examples of projects under implementation in this layer are the followings. For addressing the people engagement, the Company signed agreements with public transportation companies at local level in almost all its sites granting relevant discounts for employees switching from private (i.e., cars) to public transportation. The usage of videoconferencing systems was also fostered with new investments for increasing the number of equipped rooms. Dispensers of fresh water were installed instead of previous dispensers of (plastic) bottled water. Reduction of emissions from the former two projects was about 15%, whereas the latter almost halved plastic waste in offices of the Company.

In the “processes” layer there is still some delay, particularly in those sub-layers (“green logistic” and “green procurement”) where the involvement of suppliers is more relevant.
“Involving suppliers in our goal of being more sustainable resulted much more difficult than initially expected. We decided then to focus on internal processes and at the end of 2013 about 60% of them have been redesigned by taking into account sustainability.” (Member of the Green Unit)

Examples of projects under implementation in the “processes” layer are the “Green P&L” (Profit & Loss), an account system used as a means of placing a monetary value on the environmental impacts of internal processes, and the “Recycling Packages” project, for re-using paper boxes of supplied small components in the final packaging of the products of the Company.

In the “products” layer there were at the end of 2013 just three projects coherently with the proposed timeline (starting of projects in 2013), so no actual results are available. The Company is developing a new software for helping designers of the final products evaluating the environmental impact of their choices. A “green prize” will then be issued to the designers reaching the highest level of environmental friendliness, still keeping the product design in line with market requirements.

5 LEARNINGS FROM THE CASE

The following table provides a snapshot of the key choices performed by the Company in setting up the “Green Roadmap”, from which we aim to derive some considerations of more general value.

Table 3: Case insights

<table>
<thead>
<tr>
<th>Processes</th>
<th>Case insights</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setting of the organization</td>
<td>Creation of a dedicated unit to centrally manage the Roadmap design and implementation processes.</td>
</tr>
<tr>
<td></td>
<td>Development of ancillary organizational structures to ensure the involvement of all the organizational units.</td>
</tr>
<tr>
<td></td>
<td>Exploitation of ICT tools for ensuring appropriate flows of information across the organization.</td>
</tr>
<tr>
<td>Design of the roadmap</td>
<td>Identification of layers and sub-layers to operationalise the concept of sustainability and clustering project proposals.</td>
</tr>
<tr>
<td></td>
<td>Setting of a clear priority of actions and of a bottom-up approach (from individuals within the organization, to processes and finally products).</td>
</tr>
<tr>
<td>Implementation of the roadmap</td>
<td>Fostering of the continuous involvement of different organizational units.</td>
</tr>
<tr>
<td></td>
<td>Identification of measurable indicators and targets to assess project proposals.</td>
</tr>
<tr>
<td></td>
<td>Alignment at organizational level, through a centralized evaluation system.</td>
</tr>
<tr>
<td></td>
<td>Sharing of ideas and best practices through the exploitation of ICT tools.</td>
</tr>
</tbody>
</table>

The first lesson learned from the case of The Company is the potential for using roadmaps in planning strategic actions in the field of sustainability. The concept of sustainability is broad in scope and somewhat indefinite (Elkington, 1997; van Marrewijk 2003). Therefore it requires a holistic instrument (McMillan, 2003) through which the firm can firstly share a vision about the concept itself. The “Green Roadmap” represented a powerful tool for sharing a vision about sustainability during both its creation, with the involvement of people belonging to different units, and its implementation, with the introduction of sub-layers as guidelines for fostering project proposals.

Adopting sustainability requires a firm to change in depth and in an extensive way its internal procedures and competences (Paramanathan et al., 2004). Again roadmaps, as the one adopted by the Company, can support this process of sharing, persuading and supporting the coordination among different actions (Kappel, 2001). The coordination mechanisms (ancillary organisations) put in place by The Company and the typologies of indicators used are a clear example of this usage of roadmap for supporting the change within the firm.

Finally, adopting sustainability requires firm to change individual behaviours, organisational procedures and processes as well as equipment, machineries, and supplied components (Sarkis, 2001; Van Leeuwen et al., 2003; González-Benito & González-Benito, 2005). The strong linkages between soft factors and hard factors and technologies can be properly represented in roadmaps (Carvalho et al., 2013). In this respect, according to the taxonomy proposed by Phaal et al. (2004) the sustainability roadmap designed by The Company is somewhat a mix of a Knowledge asset planning roadmap (for the organisation layer), a Process planning roadmap (for the processes layer) and of a “traditional” Product planning roadmap (for the product layer). Interestingly the Company set the “organisation” layer as the bottom (know-how) layer. This strengthens even more the idea that individuals rather than technologies (Paramanathan et al., 2004) drive the transition towards sustainability.

Another relevant lesson learned about how managing the roadmapping process for sustainability is concerned with the organisational structure adopted. The creation of an independent organisational unit (the
“Green Unit”) for managing the “Green Roadmap” project is rather effective in triggering the change process because it makes the change immediately visible to everyone within the firm, thus representing a strong signal that the status quo had been unfrozen (Lewin, 1947). At the same time, it does not interfere with the basic processes and routines of the firm, i.e., it does not conflict directly with the status quo, thus reducing the inertia to change of extant units. The presence of a dedicated unit ensures the needed control over the process, nevertheless the “Green Team” and even more of the “Green Ambassadors” play the pivotal role of change agents (Kotter, 1995) widespread along the whole organisational structure of the firm. The bottom-up approach adopted for fostering the generation of project ideas is then reinforced by the clearly perceived commitment of the top management (Armenakis & Bedeian, 1999) which is very important for fostering contributions and also making resources (budget, time and facilitations) available (Phaal et al., 2004). The use of a dedicated section on the intranet and the continuous update (on a monthly base) of data about the progresses of projects along the roadmap is crucial in keeping the alignment within the firm. Indeed, the full value of roadmapping can be gained, only if the information that it contains is current and kept updated as the overall process unravels (Probert et al., 2003). The proper identification of sub-layers serving also as guidelines for project proposals further contributes to keep the roadmap alive, allowing proponents to see areas where to focus for submitting ideas.

Even the choice of the path, although it cannot be interpreted as a normative indication, deserves attention and could be adopted by other firms willing to implement sustainability. The roadmap of The Company sets as bottom layer (know-how) the “organisation” and more in details the individuals within the organisation. The reason for such an approach, that is not common in the industry where sustainability projects are usually focused just on products, is in creating a sense of urgency for change and to widespread a culture for sustainability among employees. In order to achieve this goal, however, the project leader should be a very experienced and well-respected manager capable of adopting a true “cultivation” management style (Orlikowski and Hofman, 1997). In this respect, the choice of the Company to appoint as head of the “Green Unit” one of its most experienced project managers appears to be coherent with this innovative approach.

The first projects (e.g., those concerning a more conscious behaviour of using energy or treating waste) are relatively easy to implement, but at the same time, they make clear to the whole firm that something of the general roadmap is already in place. These quick wins (Kotter, 1995) have a strong impact on the perception of people about the issue and contribute to speed up significantly the process.

The second phase concerns the actual implementation of changes through the establishment of new processes and patterns of behaviour consistent with the new vision, acting on organizational capabilities and procedures. This phase is characterised by a truly experimental approach, through which the solutions that are best suited to the firm’s endeavour are identified. Finally, green products are addressed by attempting to extend sustainability to the relationship with the final customers. It is argued that this way of achieving sustainability even if requires significantly more time has more chances to be successful on the long term than starting, as most of the company’s competitors, from final products. In this respect, the paper provides further support to the work of Robison et al. (2006) that argue about the need of different and interrelated steps, starting from basic activities to more complex one, to design a successful path towards sustainability.

6 CONCLUSIONS

The objective of this work was to analyse and discuss the potential benefits associated to the use of roadmapping for supporting the implementation of sustainability strategies. The paper took as its starting point the widely accepted idea that companies that aim to implement sustainability ideas have to undergo a relevant process of change, that touches a broad range of different aspects and practices. In this respect, the paper showed how a multinational company that competes in the fashion and accessories sector exploited strategic roadmapping to deploy its sustainability strategy, for representing its strategic priorities, communicating them through the organisation and measuring the achieved results.

Moving from the analysis of the design and the implementation of the roadmap, the paper highlights how this instrument can become a valuable means as both an interactive and diagnostic system. First, the roadmap can be a useful tool for collecting and integrating the proposals of different individuals within the organisation and align the actions of people from different functions to the company’s strategy. As noted in prior research about technology roadmapping, much of the benefits of the use of these tools relate to the process of development of the roadmap, that becomes the locus for confronting different ideas of sustainability across the organisation and foster the diffusion of a common set of values. This is particularly critical considering that sustainability is much related to the individuals’ behaviour and the extent to which individuals – in the specific case the employees of a company - manage to interiorise a relatively new set of values. Second, the roadmap can be also used as a basis to measure performances and assess the progresses of different projects/activities against pre-defined targets. To this aim, the definition of ad hoc indicators plays a key role to create a sense of urgency, monitor the achieved results, and communicate them to internal and external stakeholders.

In conclusion, the main limitations of the study should be acknowledged. A first limitation is inherent to
the research method adopted: participant observation. Being the researchers directly involved in the change management process, they had the opportunity to observe and directly interact with different organisational actors, achieving a deeper understanding of different organisational dynamics (Argyris, Putnam & Smith, 1985; Kemmis, 1985). However, the article can not be considered as an objective, impersonal description of events, but rather a narration mediated by the researchers’ experiences during the course of the project. A second limitation concerns the generalizability of the results of the study, and the extent to which the use of roadmapping for sustainability could depend on sector specificities and the characteristics of individual companies. The case analysed provide an interesting example of design and use of the roadmap for supporting the embedding of a sustainability strategy. It provides an example of how a sustainability roadmap can be designed, but obviously it is not generalizable in scope. From this perspective, an interesting avenue for future research pertains to the use of sustainability roadmapping in different contexts and business industries.

REFERENCES


Annex 1 List of themes to be observed

- Overall sustainability strategy (priorities, timing)
- Activities performed to improve sustainability (ideas, implementation, timing)
- Role of key actors involved (background, function, role in the Green project)
- Motivations of the key actors
- Relationship between key actors
- Organizational structure (origins, changes)
- Design of the roadmap (formulation of the idea, actors, timing)
- Structure of the roadmap (layers, sub-layers)
- Use of the roadmap (expected uses, actual uses)
- Internal communications about The Company’s sustainability strategy / roadmap
- Indicators
- Sustainability Projects included in the roadmap (ideas, implementation, timing, results)
- Consultation of the roadmap by the employees
- Proposals of the employees
- Reactions of the employees
The Role of Supply Chain Integration in the Relationship between Market Orientation and Performance in SMEs

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Abstract

The purpose of this paper is to verify the alignment between market orientation and supply chain integration practices for improving performance in small and medium-sized enterprises (SMEs). A model of the relationships between variables was derived from the literature. Data from 327 SMEs were analysed by confirmatory factorial analysis (CFA) to verify the relationships. The findings show that market orientation indirectly and positively influences performance via supply chain integration. The direct relationship between market orientation (MO) and supply chain integration (SCI) was also confirmed. Likewise, the relationship between market orientation and supply chain integration was found to be strong and positive. The findings suggest that the generation of information in market oriented SMEs favours their sharing information both inter- and intra-organizational. A discussion of these findings, the implications for practice, and proposals for further research are provided.

Keywords: market orientation, supply chain integration, performance, SMEs
1 INTRODUCTION

Since the beginning of the discussion surrounding market orientation (MO) in the early 1990s, there have been many different studies regarding the phenomenon. Within which, stand out some more important aspects and studies than others in the literature, and to the extent that research on MO advances, even more aspects of the theme are discovered. For instance, there continue to be inconsistent results regarding the MO-performance relationship (see Langerak, 2003; Raju, Lonial, & Crum, 2011; Liao, Chang, Wu, & Katrichis, 2011). This relationship has been considered the starting point of research since the initial theoretical propositions of Narver and Slater (1990) and Kohli and Jaworski (1990). As to inconsistent results in the MO-performance relationship, Langerak (2003) concluded that the weak or non-existent association between the two reported in different studies is due to the variety of scales used in measuring the concepts, the context in which the research takes place, i.e. different countries, and the type of sample used, i.e. cross-sectional, single-corporation survey, etc. Furthermore, despite the number of studies about MO and its relationship to performance, little is known about the scope of the concept relationships beyond the limits of the organization. Research that relates MO to inter-firm practices and the result of both on performance remain incipient (Cambia-Fierro, Florin, Perez, & Whitelock, 2011). This is the case of the relationships among MO, supply chain management (SCM) and performance (Jütten, Christopher, & Godsell, 2010). As Min, Mentzer, and Ladd (2007, p.508) point out “despite apparent logical association between MO and SCM concepts and the possible mediating role of SCM concepts in the MO-performance link, there have been few, if any, attempts to investigate MO in a supply chain context”.

To insert SCM discussion in the MO context implies to recognize that, in order to respond to customer needs - and consequently achieve better performance - firms not only have to manage their own resources and capabilities, but they are dependent on the resources and capabilities of supplying firms (Kibbeling, Bij, & Weele, 2013; Green, Whitten, & Inman, 2012). Kibbeling et al. (2013, p.500) state that firms now realize that “some value-creating activities are carried out in the supply chain beyond the firm’s direct control”. Therefore, the ability to integrate and coordinate activities across the supply chain becomes crucial to satisfying the demands of the ultimate customers of the supply chain (Green et al., 2012). This means, that MO key concepts become a supply chain concern as they move beyond the boundaries of the individual firm (Baker, Simpson, & Siguaw, 1999; Min et al., 2007; Martin & Grbac, 2003). Furthermore, MO can affect firm performance by influencing its supply chain management (Green, McGaughey, & Casey, 2006).

Despite mutual benefits of a close alignment between market orientation and supply chain management (Jütten et al., 2010), research on MO and SCM have been developed in parallel to each other and there have been few studies that emphasize the joint effects of the practices on business results (Green et al., 2012). Among studies that have examined market orientation in a supply chain setting, a group of researchers focus on how market orientation influences buyer-supplier relationships (Siguaw, Simpson, & Baker, 1998; Langerak, 2001; Kibbeling et al., 2013). Other researchers oriented their studies to understand the mediating role of SCM in the relationship between market orientation and organizational performance (Min et al., 2007; Green et al., 2006). In addition, the role of supply chain management in leveraging a firm’s market orientation has been also studied (Martin & Grbac, 2003; Jütten et al., 2010; Liu, Ke, Wei & Hua, 2013).

In the few relationships established between MO and SCM, the studies reinforce the importance of supply chain management and/or its integrating concepts, that is, supply chain orientation and supply chain management (Min et al., 2007), but do not explore specific aspects such as supply chain integration (SCI) (Liu et al., 2013). SCI is oriented to coordinating intra- and inter-organizational information flows by means of adopting information technologies (Kim, 2006) and can integrate a SCM perspective in firms (Min et al., 2007).

Considering that the flow of information in the supply chain facilitates intra and inter-firm integration and that this flow is facilitated by MO (Martin & Grbac, 2003; Liu et al., 2013), exploring the practices of supply chain integration and their relationship to market orientation seems to be a natural route in this process. This is specifically important if we consider that market oriented firms are able to respond better to the requirements of their customers through the information obtained from the market and shared within the firm in a coordinated manner (Kohli & Jaworski, 1990; Narver & Slater, 1990).

Liu et al. (2013) studied the effect of SCI and two dimensions of market orientation, i.e. customer and competitor orientation on performance in large and SMEs firms. In their research model, both dimensions of MO moderate the relationship between SCI and performance. However, the referred authors did not explore the entire MO construct in this relationship and did not considered the opposite side, i.e., how MO can leverage SCI and how can both improve firm performance. Evidence is needed on this perspective, since MO helps the firm to produce and store market information needed to build and maintain collaborative relationships with other firms in the supply chain (Min et al., 2007). Likewise, there is even less research dedicated to deepen knowledge of the relationships between the two themes and the performance of firms in specific contexts of analysis, as it is in the case of SMEs, and specific countries as well.
Studying MOSCI-performance relationships in different contexts and countries should report different results and help the understanding of MO formation in firms (Langerak, 2003; Ellis, 2007). This can also help the understanding of the practice and structure of SCM in a specific context, i.e. country (Chow et al., 2008).

To summarize, the MO-SCM-Performance relationship was not sufficiently explored in prior studies, and even less studies refer specific concepts of SCM, i.e. supply chain integration in this relationship. Furthermore, little is known about this relationship in SMEs and in developing countries as it is in the case of Chile.

Based on these considerations, this study tries to fill a part of this research gap by examining the mediating role of supply chain integration in the MO-Performance relationship. Following previous studies in a supply chain-market orientation relationship context (Min et al., 2007; Green et al., 2006; Kibbeling et al., 2013; Liu et al., 2013; Martin & Grbac, 2003; Jüttner et al., 2010; Siguaw et al., 1998; Langerak, 2001), we focus on a specific SME context for analysis in Chile, South America. Therefore, the objective of this work is to verify the role of SCI in the MO-Performance relationship in Chilean SMEs.

Specifically, SMEs are an interesting context of analysis as they are considered inherently vulnerable in the reliance on SCM partners for relation-based rents (Arend & Wisner, 2005) instead of obtaining advantage through relationships between customers and suppliers in the supply chain (Bordonaba-Juste & Cambra-Fierro, 2009). Thus, SMEs can take advantage of both MO and SCI activities to compensate for their vulnerabilities in the supply chain. In this sense, studying this group of firms can generate insights in terms of the balance that SMEs can obtain between both perspectives and how this can improve their organizational performance.

Chile also offer an interesting context for the study due to its macroeconomic profile. The country occupies first place among the countries of Latin America and the Caribbean in the global competitiveness ranking of the World Economic Forum (2013). Sustainable economic growth, commercial openness, macroeconomic stability, institutional efficiency and transparency are some of the aspects that justify Chile's leadership in the region (World Economic Forum, 2013). Additionally, the country’s openness index indicates that Chile has an exposure level of 70 percent to international trade (Milesi, Moori, Robert, & Yogueu, 2007), which can be translated into greater competitiveness for its domestic industry. As for SMEs, they contribute a total of 13 percent of the country’s gross domestic product (GDP) and provide 38 percent of the total employment according to the 2006 data from the National Institute of Statistics (Instituto Nacional de Estadística [INE], 2008). In the northern region of Chile, SMEs contribute 7.4 percent of the GDP of the district of Antofagasta, where the study was conducted.

The article proceeds in the following manner. In the next section, we present the theoretical framework and the study hypotheses of the research, followed by the methodology used. Subsequently, we present the analysis and discussion of the results found and finally present the managerial implications based on the results and the limitations and future research directions.

2 CONCEPTUAL MODEL

The theoretical foundations for the relationships between market orientation, supply chain integration and organizational performance can be based on the configuration theory and the boundary theory.

According to the configuration theory, a configuration represents any multidimensional constellation of distinct attributes inside or outside the organization that occur together within an unifying theme (Meyer, Tsui, & Hinings, 1993). Configurations are generated by exogenous organizational forces, e.g. environmental selection for competitive fitness, and by endogenous pressures towards uniform configurations, e.g. functional relationships among organizational components (Meyer et al., 1993). Hence, the configuration approach involves identifying dominant gestalts or configurations of observable characteristics or behaviors that may lead to a particular performance outcome (Ward, Bickford, & Leong, 1996; Ketchen, Thomas, & Snow, 1993). As Hambrick (1984) notes, these gestalts clarify how strategic attributes work in combinations and often indicate an entire group of strategies that is associated with high performance in a given setting.

The boundary theory involves the discussion about boundaries and boundary roles. The former are a defining characteristic of organizations. The last ones are the link between the environment and the organization concerning resource acquisition and disposal (Aldrich & Herker, 1977). The boundary theory confirms the importance of the environment as a contingency factor and identifies boundary-spanning activities (Jemison, 1984). These activities link the organization with its environment and are related with a better organizational performance (Dollinger, 1984). They are commonly considered in relation with suppliers and/or customers in the marketing literature (e.g. Stock, 2006; Singh, 1998; Stock & Zacharias, 2011).

Both configuration and boundary theories contribute to this study: the configuration theory indicates the need to consider organizational arrangements, i.e. configurations, in order to obtain high performance. We consider the combination of MO and SCM resources as a configuration of organizational resources in order to obtain better performance. The boundary theory relates the links that are established between environment and organizations through boundary-spanning activities in order to acquire resources and disposal. MO and SCM present some boundary-spanning activities as they combine external and internal resources in their development. Both theories indicate implications for organizational performance that are applied in this study to develop
hypotheses about the relationship between MO and SCM activities, i.e. supply chain integration, and their impact on performance.

The test model of this research (Figure 1) comprises three constructs: market orientation, supply chain integration, and organizational performance.

**Figure 1: Test Model**

Market orientation is composed of customer orientation, competitor orientation and interfunctional coordination (Narver & Slater, 1990). Supply chain integration comprises practices of supply chain integration by means of the use of information technology (IT) both within firms and between firms (Kim, 2006; Bayraktar et al., 2010; Welker, Van der Vaart, & Van Donk, 2008). The organizational performance dimension considers net profit as a variable of financial performance (Kim, 2006), market share (Zhou, Yim & Tse., 2005) and market performance as measures of overall performance (Slater & Narver, 1994).

2.1 Market Orientation in a SME context

Market oriented firms respond better to the requirements of their customers through the information obtained from the market and shared within the firm in a coordinated manner (Kohli & Jaworski, 1990). This practice allows for improving business results, whether in the context of large enterprises (Slater & Narver, 1994; Jaworski & Kohli, 1993; Panigyrakis & Theodoridis, 2007; Menguc & Auh, 2006) or in SMEs (Pelham, 2000; Martin, Martin & Minillo, 2009). In this sense, MO is considered a unique and inimitable resource, which is able to conduct business to create superior value and competitive advantages (Hsieh, Tsai, & Wang, 2008; Hult, Ketchen, & Slater, 2005). The theoretical background of this argument is the resource-based view of the firm (RBV) (Wernerfelt, 1984). This argument is also related to the configuration and boundary theories in the same way as MO configures resources in order to contribute to better organizational performance and combines external and internal resources for developing its activities.

For SMEs, MO can mean better abilities to compete with large companies in industries with high growth and high profit margins (Pelham, 2000). Furthermore, it helps SMEs in commodity industries that are characterized by low levels of market segmentation and little product variety (Pelham, 2000). Taking into account the possible homogeneity of products in commodity industries, MO is useful in the search for differentiation (Verhees & Meulemburg, 2004) based on the ability of SMEs to approach their customers and generate knowledge about the market. This ability arises from the capacity for adjustment and the facility to change, that are characteristics of small businesses (Appiah-Adu & Singh, 1998). Likewise, MO in SMEs represents a rapid response to consumer dissatisfaction, the development of strategies based on the creation of value to the customers, immediate response to competitive challenges and rapid detection of changes in consumer preferences (Pelham, 2000). Equally, market oriented SMEs have internal processes of support to the consumer that involve the development of products made to measure for the client, which means encouraging incremental product innovation as the basis of the response to customers (Golann, 2006). In addition, MO is an important facilitator of flexible planning in SMEs, as well as improving the performance of enterprises in dynamic environments (Alpkân, Yılmaz & Kaya, 2007). In fact, the more market-oriented SMEs are, the more they are able to adjust themselves to these environments (Didonet, Simmons, Díaz-Villavicencio, & Palmer, 2012).
2.2 Supply Chain Integration in SMEs

The supply chain literature has explored a group of concepts related with supply chain management, i.e. supply chain orientation, supply chain management, and supply chain integration (e.g. Min et al., 2007; Kim, 2006; Liu et al., 2013). Supply chain management represents cooperative actions with other firms based on multilateral efforts to manage supply chain processes (Min et al., 2007); supply chain orientation is a unilateral policy of the firm based on interactions with supply chain partners (Min et al. 2007; Schulze-Ehlers, Steffen, Bush, & Spiller, 2014); supply chain integration refers to the degree to which a firm coordinates intra- and inter-organizational processes with channel partners in a collaborative way (Liu et al., 2013; Kim, 2006). Essentially, supply chain integration is associated with firm information sharing and operational coordination with channel partners and the degree to which partners are provided with information that might help them (Liu et al., 2013).

The central argument of SCI is that all of the individual organizations that comprise the supply chain should be managed as a single entity – a complete system (Li, Zhao, Tan, & Liu., 2008). The theoretical foundation for this argument can be the value chain model, which refers the linkages within firm’s value chain and the linkages among the firms in the value chain (Porter, 1980). In addition, this argument can be based on configuration and boundary theories considering that SCI represents value chain activities which are oriented to generate better firm performance and also combines external and internal resources in doing so.

The supply chain integration contributes not only to improve partner-related routines and processes through collaboration but also to respond to technological and market changes (Rosenzweig, 2009). In doing so, SCI can improve organizational performance either in large or small firms (Li et al., 2008; Liu et al., 2013; Frohlich & Westbrook, 2001; Kim, 2009; Bayraktar et al., 2010). In the context of SMEs, the SCI activities – e.g. information sharing and operational coordination – are also positively related with innovation activities (Redoli, Mompó, García-Díez & López-Coronado, 2008; Drayse, 2011; Didonet & Díaz, 2012) and market orientation perspective (e.g. Liu et al., 2013; Martin & Grbac, 2003).

3 HYPOTHESES

3.1 The Relationship between Market Orientation and Supply Chain Integration in SMEs

Discussing the supply chain risk management literature, Singhal, Agarwal and Mittal (2011) suggested that market orientation factors such as customer expectations, market fluctuations, competitor moves, etc, are significant to characterize the risk issues in a supply chain. MO can also affect business performance by influencing its supply chain management (Min et al., 2007).

The Martin and Grbac (2003) research findings suggest that sharing information among the different functional areas of the firm is a meeting point between market orientation and supply chain relationships in SMEs (Martin & Grbac, 2003). According to the authors, “customer and supplier-oriented information help to build strong supplier relationships because different functional areas of the firm are given market information” (Martin & Grbac, 2003, p.34). As Murray, Gao & Kotabe (2011) evidenced in their study, high levels of within-organizational communication of different functions create the appropriate environment for market orientation activities to be performed more effectively (Murray et al., 2011) which could contribute to better supply chain performance. Davis and Golicic (2010) research findings also revealed that the firm’s ability to deploy an information technology infrastructure in support of the market orientation activities contribute to a comparative advantage in supply chain relationships.

Furthermore, Liu et al. (2013) research findings in SMEs and large firms revealed that supply chain integration is improved by customer orientation and competitor orientation, which are both dimensions of market orientation. This occurs because SCI enables firms to obtain knowledge to serve better customers from its supply chain partners (Liu et al., 2013). According to the authors, “the firm with customer orientation perceives the value of SCI and exerts effort in leveraging SCI to enhance its operational efficiency and effectiveness” (Liu et al., 2013, p.329). Thus, we hypothesized:

\[ H1: \text{ MO directly and positively influences SCI in SMEs. } \]

3.2 Market Orientation, Supply Chain Integration and Performance in SMEs

Lado, Paulraj and Chen (2011) research findings revealed positive associations among customer services, financial performance, relational capabilities, and focus on the customer (one of the dimensions of MO) in medium and large firms. The focus on the customer positively impacts on supply chain relational capabilities and customer service (Lado et al., 2011; Zhou, Brown & Dev, 2009). Likewise, supply chain relational capabilities have a positive relation with customer service, and the latter in turn positively affects the financial performance of firms (Lado et al., 2011).

The results of the research by Min et al. (2007) indicated that MO-firm performance is mediated by supply chain orientation (one SCM dimension). Green et al. (2006) observed a positive support for the path MO-SCM-Performance in their study. Exploring two different dimensions of organizational performance, i.e., marketing
performance and financial performance, the authors found that supply chain management strategy mediate the impact of MO on marketing performance (Green et al., 2006). 

Liu et al. (2013) suggest that customer orientation is an important activator in the influencing processes of SCI on organizational performance in SMEs. As indicated in the findings of the authors, the greater the customer and competitor orientations, the stronger the relationship between SCI and SMEs performance is (Liu et al., 2013). Considering that customer and competitor orientations are sometimes encompass in the composite construct of market orientation (Narver & Slater, 1990), we hypothesized:

H2: SMEs MO indirectly and positively influences the organizational performance of SMEs via SCI.

3.3 Supply Chain Integration and Performance in SMEs

The results of the study by Martin and Grbac (2003) evidenced that stronger supplier relationships are directly and positively associated to higher performance of SMEs. Findings from Min et al. (2007) indicated that SCM is positively associated to performance when MO and supply chain orientation are not involved in the relationship.

In particular, Liu et al. (2013) examined two dimensions of supply chain integration, i.e. operational coordination and information sharing, in SMEs and found that the operational coordination has a positive relationship with business performance. Information sharing, in turn, has a positive influence in operational performance (Liu et al., 2013). Thus, we hypothesized:

H3: Supply chain integration positively influences the organizational performance among SMEs

4 METHODOLOGY

4.1 Sampling and Data Collection

The data used in this study were taken from the database of the project ‘Demography of the Regional Small and Medium size Enterprises’, undertaken by researchers at the Entrepreneurship and SME Center at Universidad Católica del Norte, Chile. The current database employs a sample of 550 micro and small to medium-sized companies in the district of Antofagasta, northern Chile. The criterion adopted for the definition of SME was the sales volume of each company, according to the government criterion in Chile. In accordance with this criterion, a SME has an annual sales volume of no less than US$ 104,375.00, and no more than US$ 4,348,980.00 (reference values in Chilean pesos, the national currency, converted to US dollars according to the exchange rate of 15th July, 2014). Considering this criterion and excluding micro firms and missing values, a sample of 327 SMEs was considered valid for this study. Of the 327 SMEs researched, 270 were small enterprises (82.6%) and 57 corresponded to the category of medium sized enterprises (17.4% of the total).

The data was collected between September 2009 and August 2010 via a cross-sectional survey. The questionnaires were administered by a team of interviewers via personal interviews with directors or owners of SMEs. Once they completed the questionnaire component, the project coordinator followed up the work of the interviewers by randomly selecting and then telephoning some of the businesses to confirm the data obtained. This procedure ensured control over the work carried out and guaranteed the reliability of the information.

4.2 Variables and Measurement Model

As shown in Figure 1, three constructs were considered in the measurement model: market orientation, supply chain integration, organizational performance. The variables of market orientation correspond to the three dimensions of the construct defined by Narver and Slater (1990), that is, customer orientation, competitor orientation and interfunctional coordination. The variables of SCI include intra- and inter-organizational practices associated with the flow of products and information in the supply chain, and developed with the contribution of information technology (Kim, 2006; Bayraktar et al., 2010). The variables associated with performance include net profit as a measurement of financial performance (Kim, 2006), and market share (Zhou et al., 2005) and market performance as measures of overall performance. Market performance was measured as the evaluation of the owner of the firm over the position of the firm in the market in relation to the competition (Slater & Narver, 1994).

The variables of the Supply Chain Integration were originally measured in a continuous scale of seven points, ranging between the extremes of ‘never’ and ‘always’. Redoli et al. (2008) and Li et al. (2008) use a similar approach to carry out their research in similar themes. Respondents were asked to indicate the intensity of integration in the supply chain, at one extreme ‘1’ being considered “I never use IT for post sales service” and at other, ‘7’ being considered “I always use IT for post sales service”. The respondents could mark any point in the scale.

The same continuous scale was used for measuring market orientation variables. However, the extremes of ‘strongly disagree’ and ‘strongly agree’ were the range used in this case.
A four-point scale was used for the variables of performance that considered the response options: 0 = don’t know; 1 = has decreased; 2 = has stayed the same; 3 = has increased. For example, the respondents were asked to indicated the market share of their firm in the last two year, at one extreme ‘0’, ‘don’t know the situation of the market share of my firm’ and at the other extreme, ‘the market share of my firm has increased’.

## 5 ANALYSIS AND RESULTS

Confirmatory factor analysis (CFA) (using AMOS 18 software) was used to verify the relationship among market orientation, supply chain integration and performance in SMEs, after verifying the reliability of the scale with Cronbach’s alpha (MO = .79; SCI = .69; PERF = .82). In this previous analysis of the data, the variable ‘market performance’ was discarded from the organizational performance dimension due to the low alpha of the construct. The final Cronbach’s alpha result is now acceptable for further analysis, in particular when considering reflective constructs as it is the case of this research (Petter, Straub, & Rai, 2007).

In addition, correlations among the observed variables were verified. The results showed three correlations between 0.6 and 0.73 and nothing higher than 0.73, which can be considered reasonable for subsequent analysis (Lin & Chen, 2005).

Second order factors were considered for the MO and SCI constructs. They were previously defined based on the literature and ratified by an exploratory factorial analysis. This is appropriate when the latent variables are formed by a large number of indicators (Bagozzi & Yi, 2012). Thus, market orientation was represented by the dimensions customer orientation, competition orientation and inter-functional coordination. SCI was represented by the dimensions intra-organizational supply chain integration and inter-organizational supply chain integration. Convergent and discriminant validities were verified by comparing the models, as indicated by Widaman (1985) and Byrne (2010) in such case. Model 0 was defined by individual items as a unique factor in a construct. For model 1, individual items were loaded on 1 first order factor. Model 2 was defined by individual items loaded on any one of the appropriate first order factors that, in turn, are loaded on the second order factor. The significant improvements in adjusting model 0 for model 1 confirmed the convergent validity, and the improvements in adjusting model 1 for model 2 confirmed the discriminant validity of the three constructs (Widaman, 1985). Results for convergent and discriminant validity tests are shown in Table 1.

### Table 1. Model comparisons for convergent and discriminant validity tests

<table>
<thead>
<tr>
<th>Model</th>
<th>Chi-sq</th>
<th>Df</th>
<th>Diff Chi-sq</th>
<th>Df-diff</th>
<th>RMSEA</th>
<th>p-close</th>
<th>CAIC</th>
<th>CFI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 0</td>
<td>2278.2</td>
<td>231</td>
<td></td>
<td></td>
<td>0.165</td>
<td>&lt;0.001</td>
<td>2427.6</td>
<td>0.000</td>
</tr>
<tr>
<td>Model 1</td>
<td>1049.3</td>
<td>207</td>
<td>1228.9</td>
<td>24</td>
<td>0.112</td>
<td>&lt;0.001</td>
<td>1361.7</td>
<td>0.589</td>
</tr>
<tr>
<td>Model 2</td>
<td>461.0</td>
<td>201</td>
<td>588.3</td>
<td>6</td>
<td>0.063</td>
<td>0.003</td>
<td>814.08</td>
<td>0.873</td>
</tr>
</tbody>
</table>

Once the validity of the proposed model was tested, adjustments were made to the dimensions of the constructs to ensure statistical significance. Four variables were eliminated in the client orientation dimension with the market orientation construct, owing to the low statistical significance in the confirmatory analysis. Rhee, Park and Lee (2010) made a similar treatment for the variables of the MO construct, considering the adjustment of the scale to the specific context of the analysis and different sizes of enterprises. Likewise, one variable was eliminated from the supply chain intra-organizational construct.

### 5.1 Common Method Bias

A common method bias may occur considering the fact that all the measures of the constructs were collected from the same source (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). This potential problem was checked with the Harman one-factor test (Podsakoff & Organ, 1986). A factor analysis of focal variables resulted in the six focal factors with eigen values greater than 1, which accounted for 58.9% of the total variance. The first factor accounted for 19.6% of the variance. Because a single factor did not emerge and factor 1 did not explain most of the variance, common method bias is unlikely to be a concern in the data.

We also examined the data for empirical evidence of common method bias by applying the single-common-method-factors approach, as recommended by Podsakoff et al. (2003, p.898). We conducted a CFA which included a construct representing an unmeasured methods factor. Each variable was specified to load onto this factor in addition to its theoretical construct. The results showed all item loading significantly on its intended theoretical construct, with no load in the unmeasured methods factor, excepting two items that represent the MO construct. Despite this potential problem, we decided to maintain both MO variables in the SEM model. In doing so, we established a correlation between them, which allowed a good fit of the model. Overall, the item loadings were substantially higher on their intended construct than on the unmeasured methods factor and we can conclude that common method bias does not appear to be a problem in the study.
5.2 Results and Discussion
Taking MO and SCI into account as second order factors and PERF as a first order factor, the model with final adjustments showed good adjustment indices (Bagozzi & Yi, 2012). The relationships were calculated considering the direct and indirect effects among the constructs.

Table 2 exhibit the overall results for relationships established in Figure 1, including the adjustment indices of the model.

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Relationship</th>
<th>Total Effect</th>
<th>Direct Effect</th>
<th>Indirect Effect</th>
<th>Hypothesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>MO ---&gt; SCI</td>
<td>.338***</td>
<td></td>
<td></td>
<td>Supported</td>
</tr>
<tr>
<td>H2</td>
<td>MO ---&gt; SCI</td>
<td>.053**</td>
<td>.157**</td>
<td>.053*</td>
<td>Supported</td>
</tr>
<tr>
<td>H3</td>
<td>SCI ---&gt; PERF</td>
<td>-.157</td>
<td></td>
<td></td>
<td>Supported</td>
</tr>
</tbody>
</table>

Note: ***p<.01; **p<.05; *p<.10

Based on the results noted in Table 2 (standardized coefficients), market orientation significantly and positively influences supply chain integration. The p-value of .01 and the positive coefficient of .336 confirm this influence, which leads to accepting H1. Min et al. (2007), Zelbst, Green, Abshire, and Sower (2010), Green et al (2006) and Martin and Grbac (2003) found similar results on the relationship between MO and supply chain management, showing that MO positively affects supply chain management and actions and practices related to it.

Considering the initial assumption that MO indirectly and positively affects performance via SCI, the results allow us to accept H2. However, although the p-value = .05 confirms a high significance for the relationship, the coefficient reveals a low indirect influence of MO on performance. Taking into account this low result, we tested the mediating role of SCI in the MO-Performance relationship as indicated by Baron and Kenny (1986). According authors, some conditions must hold to prove the mediating role of a variable in a model: the independent variable must affect the mediator; the independent variable must affect the dependent variable; and, the mediator must affect the dependent variable (Baron and Kenny, 1986). This means that; market orientation (the independent variable in the model) must influence SCI (the mediator) and performance (the dependent variable). Also, SCI must affect performance. Following these considerations, we tested the influence of MO on Performance. The result revealed a null direct relationship between both constructs as well, which can partially explained the low coefficient verified in H2. The non-impact of MO on SMEs performance corroborates prior SMEs studies on the theme (see Laukkane, Nagy, Hirvonen, Reijonen, & Pasanen, 2013; Eggers, Kraus, Hughes, Laraway, & Snykerski, 2013). This result is somewhat unexpected considering the importance of MO to firm performance although some inconsistencies in this relationship has been reported in previous studies (see Raju et al., 2011; Liao et al., 2011; Langerak, 2003). However, our result attests the importance of MO in influencing performance through mediating variables. This finding gives support to Demirbag, Koh, Tatoglu, and Zaim (2006) and Keskin (2006) research findings, which reported a non-direct impact of MO on SME performance but revealed a positive indirect MO-SCI performance relationship when the analysis included total quality management implementation, firm innovativeness, and learning orientation as mediating variables. Moreover, the relatively low impact of SCI in PERF is another aspect that can influence this result. Thus, based on Baron and Kenny (1986) assumptions, the mediating role of SCI in the MO-Performance relationship cannot be proved in the model.

In regard to the H3, result of this study reveals that supply chain integration influences the performance of SMEs and leads to accept H3. Despite positive relationship between constructs, the only marginal significance of the SCI-performance path (p<.10) leads to be cautious in making claims based on this result and calls for the need of further investigation. Furthermore, the coefficient of 0.157 shows the relatively low intensity of influence. Based on this result, we could suppose that this weak relationship reveals the incipience of the SCM practices in the studied SMEs (Didonet & Diaz, 2012) and the consequent difficulty of SMEs in understanding and benefitting from the broad proposal of SCM (Arend & Wisner, 2005). As noted by Didonet and Diaz (2012, p. 105), Chilean SMEs present deficiencies in their integration in SCM which “can raise difficulties in the exchange of technology and be resulting in poorer performances than what can potentially be expected.” The result of this study corroborates this assumption. In general, SCM literature reveals SMEs difficulties in adopting information technologies (IT) which are the base of sharing information in the SCI (Stefansson, 2002; Eagan, Clancy, & O’Ttoole, 2003; Bayraktar et al., 2009). The result can be the loss of competitiveness by SMEs and, consequently, poor performance (Kauremaa, Karkkinen, & Ala Risku, 2009). Independent of this specific context, the finding is an attempt to indicate the importance of integrating the supply chain for the firm performance as revealed in previous studies (Min et al., 2007; Green et al., 2006).
6 CONCLUSIONS

This study provides empirical evidence regarding the importance of supply chain integration in the relationship between market orientation and performance in SMEs. This research extends MO and SCM literature in SMEs, as it explores a specific dimension of SCM, i.e. supply chain integration, in the MO-Performance relationship. Supply chain integration was related to inter- and intra-organizational activities of information sharing in the supply chain. Findings revealed that greater market orientation leads to a stronger supply chain integration in SMEs. Likewise, supply chain integration has a direct and positive impact on SMEs' organizational performance. Furthermore, market orientation indirectly and positively influences organizational performance in SMEs through supply chain integration.

The current research contributes to theory building in terms of highlighting the importance of supply chain integration in the relationship between market orientation and organizational performance in SMEs. This adds knowledge about how MO affects business performance, one perspective that is still inconclusive in the literature (Langerak, 2003; Raju et al., 2011; Liu et al., 2011). Specifically, this research infers that market orientation indirectly affects SMEs' performance through supply chain integration. This is consistent with previous empirical results which revealed that, in the specific context of SMEs, the performance is improved by a combination of MO and other intermediate variables (Demirbag et al., 2006; Keskin, 2006).

6.1 Research Implications

This study contributes to and complements previous ones (Min et al., 2007; Jüttner et al., 2010; Ellis, 2007; Zelbst et al., 2010; Green et al., 2006; Martin & Grbac, 2003; Lado et al., 2011; Liu et al., 2013) from various perspectives.

Firstly, we respond to recent discussions about the need to integrate marketing and supply chain strategies to generate higher value for the customer (Kibbeling et al., 2013; Green et al., 2006; Jüttner et al., 2010; Min et al., 2007; Jraisat, 2011). The findings of this study confirm that MO could be a way to obtain better business performance via integration of other practices beyond the limits of the firm, as in the case of supply chain integration. The generation of information in market-oriented SMEs favors the integration of firms with their customers and suppliers and the integration of internal functions associated with the flow of products. This is in line with the perspective of MO as a strategic orientation that helps firms to understand customers’ needs (Lamberti & Paladino, 2013). The understanding of these needs implies to share information among supply chain partners - including the customers - which is one of the most important aspects of supply chain management (Hsu, Kannan, Tan & Leong, 2008).

Furthermore, the MO-SCI relationship allows the connection of firms in a supply chain and to orient themselves to the customer’s needs and, consequently, to obtain better organizational performance. Thus, the SCI is one way for understanding the role of MO beyond the limits of the firm, and some mechanisms that improve the MO-Performance relationship. Considering that market orientation cannot be considered separately from inter-organizational relationships (Webster, 1992), SCI could be a value-creating activity that helps firms to respond to the customer needs and consequently achieve better performance (Kibbeling et al., 2013; Green et al., 2012).

Secondly, this research contributes to previous studies about MO-Performance relationship by examining the role of supply chain integration in this context. It helps the understanding of “how” MO influences performance in organizations. As Langerak (2003, p. 459) pointed out, “the inconsistencies in studies looking for if (i.e. direct effect) and when (i.e. moderating effect) market orientation has positive effects on business performance induced researchers to examine how (i.e. mediating effect) market orientation influences business performance”. In regard to this, the strong relationship between MO and SCI leads one to assume that MO moves beyond the boundaries of an individual firm through the information flow (that is the base of SCI). Otherwise, instead of the positive indirect effect of MO on performance through SCI, the mediating role of SCI in MO-performance relationship could was not proved in the studied SMEs.

Finally, this study reveals a specific context of analysis, whose market conditions and political and legal context contribute to understanding the results of the null relationship between MO and performance. According to Ellis (2007), market orientation is affected by the location of the firm, that is, the firm’s geographic context can be favorable or unfavorable to its market orientation initiatives, which in turn can affect its performance. In the case of the studied SMEs, located in Chile, a country with a small domestic economy and with an important level of openness to international markets (Milesi et al., 2007), possibly evidence these weaknesses in terms of the market orientation-performance relationship.

6.2 Practical Implications

The results of this study reveal implications for SMEs in terms of the relationship between supply chain and market orientation, as well as having some implications for public policies.

In the case of SMEs, market orientation can be an important aspect to facilitate the integration into the supply chain. Considering the difficulties of SMEs in adopting information technologies that facilitate such
integration (Bayraktar et al., 2010) and the difficulty in understanding and benefitting from the broad proposal of supply chain management (Arend & Wisner, 2005), the decision to strengthen market orientation can facilitate information flows within and among firms, which finally contributes to improve firm performance.

In the public sphere, this study contributes to the definition and implementation of policies that strengthen SMEs. Essentially, the contribution lies in generating information in terms of SMEs associated with the adoption of strategies of integration with suppliers and customers and drawing closer to customers by means of market orientation. In terms of supply chain integration strategies, a basic element of the process is adopting information technologies that facilitate the flow of information among the agents. Information technologies oriented to supply chain management and market orientation strategies can contribute to better performance of SMEs and enhance their market competitiveness and innovation initiatives (Didonet & Díaz, 2012). As a result, public policies that foster the adoption of information technologies among SMEs to strengthen with customers and suppliers can be an important means to increase the competitiveness of firms, as can policies to train firms in relation to strategies to draw closer to customers.

6.3 Research Limitations

Highlighting the contributions to this research evidences the limits of the study and the potential areas for future research on the topic. For example, this study did not consider the effect of external variables that possibly intervene in the relationship between market orientation and performance, as is the case of the context of the studied firms. Following the proposal of Ellis (2007), variables such as dependence on external markets and the diversity of markets contributes to there being a null relationship between market orientation and performance. These aspects could be considered in future studies as a better way to understand this relationship.

Another limitation of the study is that it did not explore the inter-relationships among the dimensions of market orientation and the impact of these on the considered variables. As the study of Tsiontsou (2010) showed, the dimensions of MO affect performance in different ways. Future studies could explore this aspect in the proposed relationship, which could improve understanding of the phenomenon of MO. Finally, the present study did not consider the impacts of the relationship between market orientation and supply chain management in the value for the client. This should be a natural consequence of the relationship (Jüttner et al., 2010), which should be further explored in future studies.

Also, the SCI scale measures ideally ought to have been corroborated with data from supply chain partners, since the construct is about how integrated the firm is at the supply chain level. We are not able to perform this corroboration in this study; thus, this is an important aspect that should be considered in future studies or in replications of the current study.

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Revisiting the Impact of Social Performance on Financial Performance from a Global Perspective

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Abstract

There is a continuing debate in the Corporate Social Responsibility literature as to whether and how firms’ social performance (SP) affects their financial performance (FP). Theoretical arguments as well as empirical measurements point to somewhat contradictory results. Most of the empirical work is predicated on rigid conventional models, expressing constant or strictly monotonic marginal returns in the assumed SP-FP relationship. This paper revisits this relationship from a global perspective, relaxing the range of admissible models. A non-monotonic framework incorporating contextual factors is proposed. Five models are tested over a common 17 years horizon. They yield consistent significant estimates and concur on the existence of such a relationship although the latter has evolved over time. They support the notion of a complex SP-FP impact.

Keywords: social performance, financial performance, contingency factors, industrial context, strategy, valuation

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1 INTRODUCTION

While gaining increasing attention, the concept of Corporate Social Responsibility (CSR) has evolved over recent decades, from “surpassing legal requirements” (Bowen, 1953) to “heeding demands from main stakeholders” (Freeman, 1984; Clarkson, 1995). Over the years, a number of disasters related to the environment (e.g. Exxon Valdez 1989, BP 2010), corporate governance (Enron 2001), social accountability (Rana Plaza 2013) have contributed to increased public awareness of CSR issues. Civil society campaigns against particular practices have developed into organized networks. The years 2000 mark a turning point where social responsibility became more systematically assessed and integrated into firms’ valuations. This is exemplified by the development of specific social and environmental indices such as KLD, by the inclusion of social and environmental dimensions into financial analyses and financial information databases, and by the creation of a number of CSR-oriented mutual funds and pension funds.

The impact of social conduct on the firm’s strategic posture has long been debated. Supporting organizational theories of the firm have significantly evolved, from a neo-classical outlook (Friedman, 1970) to more descriptive frameworks such as stakeholder theory (e.g. Freeman 1984), and financial strategy or specific managerial theories (Merton, 1987; McGuire et al., 1988; Waddock and Graves, 1997).

In parallel to this evolving theoretical perspective, numerous empirical studies have examined the impact of SP on FP. The results of these studies are largely contradictory, however. Some (e.g. Kurtz and DiBartolomeo, 1996) conclude to the inexistence of a SP-FP relationship. Others do detect a significant positive (Wang and Choi, 2010) or negative (Garcia-Castro et al., 2010) relationship in specific circumstances. We hold that these inconsistencies may in large part be attributable to methodological issues. Among these are (i) rigid, simplistic forms for the assumed relationship, (ii) restricted time frames, and (iii) ad hoc associations with specific background variables hampering meaningful comparisons. Thus we deem it important for further empirical work to refine model specifications, to qualify the simultaneous influences of intervening variables, and to test the robustness of results on a longer time frame.

This paper revisits empirically the SP-FP relationship from a global perspective, based on a large sample and identical SP and FP measures over 17 years, incorporating contextual factors and lending a particular attention to the form of this relationship. Our main conclusions are that (i) it has a non-monotonic form, (ii) contextual factors seem to intervene significantly, with a synergistic effect (iii) such a relationship does seem to exist although it has evolved over time.

2 LITERATURE REVIEW

The SP-FP relationship can be analyzed from the standpoint of industrial organization, encompassing economic and managerial theories of the firm and of its institutional (e.g. markets) environment (Table 1). In the neo-classical framework, the profit-maximising firm merely balances costs and benefits of its SP posture. The latter thus does not deserve any special strategic status.

By contrast, stakeholder theory (e.g. Freeman, 1984) views the firm in symbiotic exchange (an implicit, open contracting mode) with multiple parts of its environment, in a more or less direct way. Customers, suppliers, employees, shareholders, neighborhood communities exert direct influences on the firm’s options. More mediated influences may originate in the evolving institutional environment (laws and norms, regulators, social groups, information and communication structures…). Stakeholder theory thus emphasises the variety of actors and of points of view that must be dealt with. Prominent examples of evolving multiple stakeholder demands are found in the mining industry.

Some organisational theories focus on the firm’s financial strategy. The risk management perspective views SP as its systematic risk (Boutin-Dufresne and Savaria, 2004; Lee and Paff, 2009), as well as a means of preserving reputation and goodwill (Godfrey, 2005; Godfrey et al., 2009). In a context of imperfect information, attention to CSR is viewed as favouring transparency and expanding the investor base (Merton, 1987; Barnea et al., 2005; Mackey et al., 2007).

Finally, less testable theories focus on managerial discretion or the lack thereof. For instance, slack resources theory suggests that profitable firms can improve their SP through CSR investments, whereas others cannot (McGuire et al., 1988; Waddock and Graves, 1997). The theory of managerial opportunism, in a vein similar to agency theory, suggests that managers extract personal benefits from CSR investments by enhancing their own managerial reputation at the expense of shareholders’ interests (Barnea and Rubin, 2010; Cespa and Cestone, 2007).

Although none of these theories leads to a direct prediction as to a possible SP-FP relationship, they rest on incompatible premises.
Table 1: Organizational Theories

<table>
<thead>
<tr>
<th>Theory</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neo-classical (Friedman, 1970)</td>
<td>SP is a cost to be compensated</td>
</tr>
<tr>
<td>Stakeholder theory (Freeman, 1984)</td>
<td>The firm is embedded in a transactional network with multiple stakeholders such as customers, investors, regulators, etc.</td>
</tr>
<tr>
<td>Risk management (Godfrey, 2005)</td>
<td>Firm serves as an insurance mechanism to preserve rather than generate FP</td>
</tr>
<tr>
<td>Reputation and Investor base (Merton, 1987)</td>
<td>Firm expands its investor base from conventional to more idiosyncratic.</td>
</tr>
<tr>
<td>Slack resources theory (McGuire et al., 1988)</td>
<td>SP results from organizational slack, e.g. excess resources</td>
</tr>
<tr>
<td>Managerial opportunism</td>
<td>SP as private benefits that managers extract at the expense of shareholders</td>
</tr>
</tbody>
</table>

Source: Bouslah et al., 2013

Similarly, a large number of empirical studies have taken place over the recent years, yielding a wide variety of results, which may in part be due to several methodological choices (Tebini, 2012). Two main streams must be distinguished: one is concerned with the impact of SP on companies’ returns, the other with the impact on companies’ risk.

The first stream is mostly concerned with testing a linear SP-FP relationship. The results are not univocally conclusive. This work is summarized in Table 2.

Table 2: Empirical Tests of the Relationship between SP and Return on Assets

<table>
<thead>
<tr>
<th>Form of relation</th>
<th>Sign</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>( FP = f(SP) )</td>
<td>linear</td>
<td>+ Bradgon &amp; Marlin (1972); Belkaoui (1976); Shane &amp; Spicer (1983); McGuire et al. (1988); Luck &amp; Plotte (1993) ; Hart &amp; Ahuja (1996); Griffin &amp; Mahon (1997); Waddock et Graves (1997); Vershoor; Berman et al. (1999); Graves &amp; Waddock (2000); Jones &amp; Murrell (2001); Ruf et al. (2001); Simpson &amp; Kohers (2002); Verschoor &amp; Murphy (2002); Tsoutsoura (2004); Goukasian &amp; Whitney (2007) ; Siegel &amp; Vitaliano (2007); Garcia-Castro et al. (2008); Lankoski (2008); Choi &amp; Wang (2009); Hull &amp; Rothenberg (2008); Callan &amp; Thomas (2009); Choi et al. (2010); Wang &amp; Choi (2010); Kapoor &amp; Sandhoo (2010); Mishra &amp; Suar (2010)</td>
</tr>
<tr>
<td>( FP = f(SP) )</td>
<td>linear</td>
<td>– Bradgon et Marlin (1972); Vance (1975); Langbein &amp; Posner (1980) ; Freedman &amp; Jagg (1982); Ingram &amp; Frazier (1983); Aupperle et al. (1985); Freedman &amp; Jagg (1992); Meznar et al. (1994); Wright &amp; Ferris (1997); Cordeiro &amp; Sarkis (1997); Ogden &amp; Watson (1999); Knoll (2002); Paten (2002); Wagner et al. (2003); Braammer et al. (2005); Brammer et al. (2006); Hill et al. (2007); Lopez et al. (2007); Garcia-Castro et al. (2008); Lee et al. (2009); Garcia-Castro et al. (2010) ; Carden et Sirven (2010)</td>
</tr>
<tr>
<td>( SP = f(FP) )</td>
<td>linear</td>
<td>Neutral Alexander &amp; Buchholz (1978); Abbott &amp; Monsen (1979); Chen &amp; Mccaff (1980); Freedman &amp; Jagg (1986); Mahoney &amp; Shanley (1990); Greening (1995); Kurtz &amp; DiBartolomeo (1996); Guerard (1979); Berman et al. (1999); Graves &amp; Waddock (1999); McWilliams &amp; Siegel (2000); Waddock et al. (2000); D’arcimoles &amp; Trebucq (2003); Seifert et al. (2004); Mill (2006); Murray et al. (2006); Rennaenboog et al. (2008); Kapoor &amp; Sandhoo (2010); Surroca et al. (2010); Garcia-Castro et al. (2010); Choi et al. (2010); Lee et al. (2010)</td>
</tr>
<tr>
<td>( SP = f(FP) )</td>
<td>linear</td>
<td>+ McGuire et al. (1988); Cottrill (1990) ; Dooley &amp; Lerner (1994); Preston &amp; OBannon (1997); Lerner &amp; Fryxell (1988); Cowen et al. (1987); Kraft &amp; Hage (1990); Robert (1992); Waddock &amp; Graves (1997); Stanwick &amp; Stanwick (1998); Verschoor (1998); Adams &amp; Hardwick (1998); Johnson &amp; Greening (1999); Buchholz et al. (1999); Seifert et al. (2004); Elsayed et al. (2006); Bird et al. (2006); Nelling &amp; Webb (2008)</td>
</tr>
<tr>
<td>( SP = f(FP) )</td>
<td>linear</td>
<td>– Lerner &amp; Fryxell (1988); McGuire et al. (1990); Johnson &amp; Greening (1999)</td>
</tr>
<tr>
<td>( SP = f(FP) )</td>
<td>linear</td>
<td>Neutral Cowen et al. (1987); Lerner &amp; Fryxell (1988); McGuire et al. (1990); Patten (1991); Johnson &amp; Greening (1999)</td>
</tr>
<tr>
<td>( SP = f(FP) )</td>
<td>convex</td>
<td>Barnett &amp; Salomon (2006) ; Bouquet &amp; Deutsch (2007); Braimer &amp; Millington (2008); Sun-Young &amp; Lee (2009);</td>
</tr>
<tr>
<td>( SP = f(FP) )</td>
<td>concave</td>
<td>Bowman &amp; Hair (1975) Sturdivant &amp; Ginter (1977); Stanwick &amp; Stanwick (2000); Lankoski (2000); Moore (2001); Schaltegger &amp; Synnestvedt (2001); Wagner (2005); Wang et al. (2008); Elsayed &amp; Paton (2009);</td>
</tr>
</tbody>
</table>

Note. Authors in bold use a measure based on the KLD database. Source: Tebini, 2012
More recently, a second stream aims at assessing the impact of SP on the firm’s risk. The latter is being recognised by analysts as “extra-financial risk”, as it may affect the firm’s reputational capital (Fombrun et al., 2000) or its moral capital and goodwill (Godfrey et al., 2009).

Table 3: Empirical Tests of the Impact of SP on Risk

<table>
<thead>
<tr>
<th>Authors</th>
<th>Context</th>
<th>SP measure</th>
<th>Risk Measure</th>
<th>Results(sign)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lee &amp; Faff (2009)</td>
<td>International</td>
<td>Dow Jones Sustainability Index (DJSI)</td>
<td>Idiosyncratic risk</td>
<td>(−)</td>
</tr>
<tr>
<td>Luo &amp; Bhattacharya (2009)</td>
<td>US</td>
<td>Fortune’s Most Admired Companies</td>
<td>Idiosyncratic risk (systematic risk)</td>
<td>(−)</td>
</tr>
<tr>
<td>Salama, Anderson &amp; Toms (2009)</td>
<td>UK</td>
<td>Community and environment</td>
<td>Systematic risk</td>
<td>(−)</td>
</tr>
<tr>
<td>Goss (2011)</td>
<td>U.S. (all KLD firms)</td>
<td>MSCI ESG STATS (KLD)</td>
<td>Idiosyncratic risk</td>
<td>(−)</td>
</tr>
<tr>
<td>Bouslah et al. (2013)</td>
<td>U.S. (all KLD firms)</td>
<td>All KLD dimensions</td>
<td>Idiosyncratic risk (+total+systematic)</td>
<td>Depends on dimension</td>
</tr>
</tbody>
</table>

Source: Bouslah et al., 2013

In summary, both theoretical and empirical literatures indicate divergent conclusions as to the existence and form of a SP-FP impact. In addition, the empirical literature points to several company characteristics that may affect this relationship.

Some authors have introduced size (Waddock and Graves, 1997; McWilliams and Siegel, 2000; Hillman and Keim, 2001), risk (Pava and Krausz, 1996; Hillman and Keim, 2001; Orlitzky and Benjamin, 2001; Boutin-Dufresne and Savaria, 2004; Luo and Bhattacharya, 2009), R&D and advertising expenditures (Hart and Ahuja, 1996; Konar and Cohen, 2001; Wagner, 2003; Husted and Allen 2007a, b; Porter and Kramer, 2006; Padgett and Galan, 2010), and industrial sector as control variables. However, the effect of these factors may be more complex. Orlitsky et al., (2003) for example maintain that they should also be introduced as moderating variables. Indeed, they state that the high residual variance obtained as a result of their meta-analysis is due to the omission of numerous moderating variables that may indirectly influence the SP-FP relationship. The specification of the relationship must therefore include these interactions, wherein their impact of SP upon FP, via indirect transmission channels, can be increased or decreased. This change of models is a hallmark of recent literature that has empirically demonstrated that company characteristics such as R&D spending (Hull and Rothenberg, 2008; Wang and Choi, 2013), life-cycle (Elsayed and Paton, 2009) and size (Ioannou and Serafeim, 2010) have an effective moderating effect.

Several authors suggest that size affects FP just as much as SP (Ullmann, 1985; Graves and Waddock, 1994; 1999; Russo and Fouts, 1997; Johnson and Greening, 1999; Simpson and Kohers, 2002; Ruf et al., 2001; Wu, 2006; Van Beurden and Gossling, 2008). The studies that examine the SP-FP relationship equally attest to the importance of size as a factor affecting SP (Orlitzky, 2001; Wu, 2006; Amato and Amato, 2007; Van Beurden and Gossling, 2008; Ioannou and Serafeim, 2010). The most common assertion is that size can have a positive effect on SP. Large companies attracting more public attention and facing more pressure from stakeholders have less scope for eluding social responsibilities (Ullmann, 1985; Brammer and Millington, 2006). The size effect is usually captured via control variables (Waddock and Graves, 1997; McWilliams and Siegel, 2000; Hillman and Keim, 2001). The introduction of size as a control variable allows its possible effect on FP to be measured, rather than on the intensity of the relationship. Nevertheless, SP level may be conditioned by size, as has been suggested in recent studies (Van Beurden and Gossling, 2008; Ioannou and Serafeim, 2010). In this case, size would play the role of a moderating factor in the FP-SP relationship (Ioannou and Serafeim, 2010).

Systematic risk is another determining influence on FP. It has been introduced in most previous studies as a control variable. The two proxies used to assess risk are the company’s systematic risk or «beta coefficient» (McGuire et al., 1988; Pava and Krausz, 1996; Hillman and Keim, 2001; McAlister et al., 2007; Luo and Bhattacharya, 2009) and its financial leverage (Waddock and Graves, 1997; Tsoutsoura, 2004; Choi and Wang, 2009; Kapoor and Sandhun, 2010). Other studies have empirically validated the influence of risk upon SP (McGuire et al., 1988; Waddock and Graves, 1997; Orlitzky and Benjamin, 2001). Indeed, according to Orlitzky.
and Benjamin (2001), companies undertaking high-risk operations are incited to act in a responsible manner so as to reduce their level of risk in a pro-active way. Conversely, Zyglidopoulos (1999) has shown that companies faced with an elevated level of risk have fewer resources to devote to innovation and to CSR. SP level could thus be affected by the company’s level of risk.

Other studies suggest that the FP-SP relationship is influenced by certain intangible company investments such as R&D and advertising (Hart and Ahuja, 1996; McWilliams and Siegel, 2000; Konar and Cohen, 2001; King and Lenox, 2002; Wagner, 2003; Husted and Allen 2007a, b; Porter and Kramer, 2006; Paton and Elsayed, 2005; Strike et al., 2006; Brammer and Millington, 2008; Callan and Thomas, 2009; Padgett and Galan, 2010; Surroca et al., 2010; Ioannou and Serafeim, 2010). The studies that examine the financial impact of SP have introduced these variables in order to control the effect of innovation on FP. They support the idea that the intensity level of R&D and advertising reinforces the company’s capacity for innovation and improves the investor’s assessment of the company (Cohen and Levinthal, 1989; Chauvin and Hirschey 1993; Graca and Rego, 2005). Nevertheless, other studies have shown a correlation between these factors and SP (Berrone et al., 2007; Wang et al., 2008). Some papers have considered their moderating effect (Luo and Bhattacharya, 2006; Mackey et al., 2007; Bouquet and Deutsch, 2007; Siegel and Vitaliano, 2007; Hull and Rothenberg, 2008). It could thus be relevant to take into account the influence of investment in R&D or advertising on SP and FP.

It must be noted that many of the studies cited above are limited in scope as to factors being considered. The present research addresses three main issues: (1) what is the type of relationship between SP and FP? (2) How do contingency factors such as risk and R&D expenses moderate this link? (3) Has the nature of the relationship changed over time? These questions are formulated in the next section, wherein our research hypotheses are presented. Section 4 presents data, measures, and samples. Section 5 formulates estimation models, section 6 presents our findings. We then conclude in section 7.

3 RESEARCH HYPOTHESES

The literature offers several perspectives on the formalisation of the SP-FP relationship. Linear specifications – positive or negative – seem inappropriate given the complexity of the link. Tebini et al., (2014), distinguish two main streams in the literature. One, comprising Barnett and Salomon (2006), Bouquet and Deutsch (2008), Lankoski (2008), Brammer and Millington (2008), Elsayed and Paton (2009), underscores the limitations of linear models for representing a SP-FP relationship. The second stream (Moore, 2001; Marom, 2006; Callan and Thomas, 2009) questions the monotonicity hypothesis in this relationship.

This questioning of model specifications has led to the emergence of non-linear models, in particular of concave or convex forms (Lankoski, 2008; Wang et al., 2008; Elsayed and Paton, 2009; Sun-Young and Lee, 2009). Although such models are untenable outside a finite domain, they provide a stepping stone to a more global view, leading to the idea of a non-uniform relationship. A specification by stages, as suggested by Johnson (2003), allows the marginal impact of SP on FP to depend on SP intensity. To this effect, we propose to test the following hypothesis:

H1: The impact of SP on FP depends on SP levels. Under low SP, the marginal SP impact tends to be low (catching up is not much rewarded), whereas under high SP, it tends to be positive (continuous pro-activeness is recognized).

In modeling the FP-SP relationship, size has at times been considered a control variable (Waddock and Graves, 1997; McWilliams and Siegel, 2000; Hillman and Keim, 2001); or, along a suggestion by Orlitzky et al. (2003) treated as a genuine moderating variable (Ioannou and Serafeim, 2010; Van Beurden and Gossling, 2008). In addition to such considerations, other authors (Ullmann, 1985; Adams and Hardwick, 1998; Amato and Amato, 2007; Rojas et al., 2009) assert that an enterprise’s large size in itself makes it more exposed to various stakeholders’ demands and to militant shareholders’ pressures, whereas others remind us that size has a positive effect on FP. In summary, as seen in the literature review, size affects FP, and its effect on the SP-FP relationship is somewhat controversial. Hence:

H2a: Company size has a moderating effect upon the financial impact of SP.

FP is negatively affected by risk. However, SP may also be dependent on risk. Introducing the effect of risk solely as a control variable implies that the effect of SP on FP is constant whatever the level of risk. Once again, conclusions from various studies on this question diverge. Whereas Waddock and Graves (1997) and Orlitzky and Benjamin, (2001) argue that the most risky firms should be more CSR responsive (in order to limit their overall risk), Zyglidopoulos (1999) finds that riskiest firms are unable to fund CSR projects. Therefore risk affects SP, and it becomes relevant to test its moderating effect:

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H2b: Risk has a moderating effect on the financial impact of SP. The negative effect of risk is amplified when it is not compensated by active social involvement. A better SP may lead to a lower perceived risk which may enhance the firm’ relationship with the government, investors and debtors and may reduce the cost of capital.

Some studies conclude that R&D and advertising reinforce the company’s FP (Cohen and Levinthal, 1989; Gruca and Rego, 2005), while others have shown a correlation between these factors and SP (Berrone et al., 2007; Wang et al., 2008) and some other studies have considered their moderating effect (Luo and Bhattacharya, 2006; Hull and Rothenberg, 2008). It could thus be relevant to take into account the influence of investment in R&D or advertising on SP and FP. We therefore propose to test the following hypothesis:

H2c: Company spending on R&D, advertising and technical capital has a moderating effect on the financial impact of SP.

Evolving demands and collective organisation of consumers and responsible investors stakeholder (Rojas et al., 2009; By et al., 201) may explain divergent conclusions noted in several meta-analyses (Orlitzky and Benjamin, 2001). The SP-FP relationship thus depends on continuous developments in the domain of CSR, on the evolution of market preferences and on technological advances. It seems therefore necessary to distinguish between epochs of this relationship.

H3: The SP-FP relationship is not stable over time as it has evolved along historical stages of CSR recognition.

4 DATA AND SAMPLE SET

Two types of data are necessary: social and financial. Social data have been taken from the MSCI ESG STATS (known under the name KLD Research & Analytics Inc.) database. Financial data have come from the database of Research Insight Compustat, which offers a large database for analysis of the American market.

From 1991 to 2000, KLD has rated approximately 650 US firms, 2000 firms in 2002 and more than 3000 in 2003. The rated firms are mainly American companies, among which those present in the S&P500 reference index as well as the Russell3000. KLD is considered a reference in research matters in the domain of socially responsible investment (Margolis et al., 2007). Most studies on the subject of CSR use measurements derived from the KLD database (Waddock and Graves, 1997; Griffin and Mahon, 1997; McWilliams and Siegel, 2000; Hillman and Keim, 2001; Becchetti et al., 2007; Nelling and Webb, 2009; Callan and Thomas, 2009; Choi and Wang, 2009). To date, KLD is considered the largest and most complete source of information regarding CSR (Waddock, 2003; Mattingly and Berman, 2006; Harjoto and Jo, 2011). The KLD system allows American companies to be rated according to 13 SP dimensions. Qualitative issues make up seven dimensions that are related to key stakeholders, namely: (1) employees, (2) community, (3) diversity, (4) environment, (5) governance, (6) products and (7) human rights. Each of these dimensions is evaluated on two criteria, namely strengths and concerns. Strengths and concerns are both rated on binary scales, where “1” signifies “existing” and “0”, “not applicable”. The remaining six dimensions relate to controversial activities and constitute a series of exclusion criteria.

The KLD database effectively omits all criteria of financial evaluation. The KLD data-collection process and information criteria ensure that rated CSR strategies have actually been put in place (Ioannou and Serafeim, 2010).

After merging social data from KLD and financial data from Compustat, our final sample set is a non-balanced panel of 21172 company-year observations over the period 1991-2007.

5. ESTIMATING THE SP-FP RELATIONSHIP

5.1. Dependent variable: Financial Performance

The return on asset (ROA) measured by the ratio «Net income/ total asset» is used as a proxy for FP. This financial indicator is often used in the literature on the SP-FP relationship (McGuire et al., 1988; Waddock and Graves, 1997; Simpson and Kohers, 2002; Nelling and Webb, 2009; Mishra and Suar, 2010; Garcia-Castro et al., 2010) and given preference over measures derived from the stock market (Margolis and Walsh, 2003; Orlitzky et al., 2003).
5.2. Independent variables: Social Performance

There is no consensus to-date about a definite measure of social performance. A majority of references use various proxies based on aggregates of KLD indices or variants thereof (Waddock and Graves, 1997; Hillman and Keim, 2001; Becchetti et al., 2007; Callan and Thomas, 2009; Choi and Wang, 2009).

The measurement we choose for the exogenous SP variable is based on simple averages of KLD strengths and of KLD concerns. Our choice to assign equal weights to KLD strengths (concerns) is consistent with the theoretical literature on stakeholder management and follows most empirical reference studies (Sharfman, 1996; Johnson and Greening, 1999; Hillman and Keim, 2001; Siegel and Vitaliano, 2007; Callan and Thomas, 2009; Wang and Choi, 2010; Surroca et al., 2010). No preference ordering over these KLD categories is theoretically conceivable (Mitchell et al., 1997).

The sets of strengths and concerns vary across KLD dimensions and across time periods. In order to construct our SP measure, we first compute average scores of strengths and of concerns for each dimension (Harjoto and Jo, 2008); the difference between these averages is a dimension-specific rating. Our SP measure is a simple average of these ratings over all dimensions. Formally:

\[ SP_i = \frac{1}{N} \sum_{n=1}^{N} \left( \frac{1}{T_{pt}^n} \sum_{i=1}^{T_{pt}^n} \text{Strenghts}_i - \frac{1}{T_{qt}^n} \sum_{j=1}^{T_{qt}^n} \text{Concerns}_j \right) \]

where \( N \) is the total number of KLD dimensions, \( T_{pt}^n \) is the total number of strengths for dimension \( n \) in year \( t \), \( T_{qt}^n \) the total number of concerns for dimension \( n \) in year \( t \). As in Hillman and Keim (2001), and Callan and Thomas (2009), our SP measure does not take into account KLD exclusion criteria.

5.3. Control variables

The most commonly-used control variables found in the literature are: size, risk, spending on R&D, and industry (Ullmann, 1985; Aupperle et al., 1985; Waddock and Graves, 1997; Mc Williams and Siegel, 2000; Hillman and Keim, 2001; Andersen and Dejoy, 2011). All are considered in this research.

We measure firm size through the logarithm of the market value of its shares. This logarithmic transformation alleviates the problem of skewness caused by the presence of extreme values.

Two measurements have been considered to control the effect of risk upon the SP-FP relationship: (1) the beta coefficient, and (2) the financial leverage. Systematic risk is measured by the market beta through use of the CAPM. Financial leverage is the ratio of long-term net debt over the market value of shares. Including separately these two risk measures in the analysis of the SP-FP relationship allows us to control for differing risk profiles present in our sample set.

Three proxies have been considered to account for the effects of investment; those of spending on R&D, advertising and fixed assets. The ‘spending on investment’ variable, invoked by the ratio of total spending on R&D, advertising and fixed assets divided by the total of assets, allows us to assess the effect of the different investment forms on FP.

Several studies assess the effect of ‘industry’ on the SP-FP relationship (Aupperle et al., 1985; Waddock and Graves, 1997; Pava and Krausz, 1996; Hillman and Keim, 2001). Economies of scale, intensity of competition seem to account for some variation in FP between different sectors of activity (McWilliams and Siegel, 2000). Following most researchers, we have considered a control variable to assess the affiliation of each company to an activity sector through binary variables representing the 48 industries identified in the Fama and French (1997) classification system.

Table 4 summarizes the variables retained in this study.

<table>
<thead>
<tr>
<th>Table 4: Variables and Measurements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Key variables</strong></td>
</tr>
<tr>
<td>Financial performance</td>
</tr>
<tr>
<td>Social performance</td>
</tr>
<tr>
<td>Size</td>
</tr>
<tr>
<td>Systematic risk</td>
</tr>
<tr>
<td>Financial leverage</td>
</tr>
<tr>
<td>Industry</td>
</tr>
<tr>
<td>Investment</td>
</tr>
</tbody>
</table>
Lastly, in order to identify possible moderating effects (Orlitsky et al., 2003; Lankoski, 2008; Van Beurden and Gossling, 2008), we have introduced interaction terms into our model. The combined effect of certain company-specific factors such as size, risk and investment with SP, is likely to reinforce or temper any impact upon FP. For example, the introduction of the interactive term (SP*size) allows us to assess the combined effect of SP and size on FP. This term serves to evaluate the way in which the impact of SP on FP is influenced by size. In the same way, in order to evaluate the moderating effect of risk on the relationship, we have added the interactive term (SP*beta). Introducing the crossed term (SP*invest) has allowed us to assess a possible variation in SP impact on FP following a change in spending on investment.

5.4. Multivariate analysis

Staring from the highlighted points in the literature and by considering the different variables retained as determiners of FP, several models were examined. In order to appreciate the impact of SP on FP in the setting of a cross-sectional analysis, we consider the following regression model on the pooled data:

\[
ROA_{jt} = \alpha_i + \beta_1 SP_{i,t-1} + \beta_2 size_{i,t-1} + \beta_3 beta_{i,t-1} + \beta_4 levnet_{i,t-1} + \beta_5 invest_{i,t-1} + \sum_{j=1}^{47} \delta_j D_{secj} + \sum_{k=1}^{16} \rho_k Dan_k + \epsilon_{i,t} \tag{1}
\]

where \(i\) and \(t\) are company and year indices, \(D_{sec}\) and \(Dan\) represent dummy variables for the effects of industry and of time respectively and \(\epsilon\) is the error term.

In order to test the effect of moderating variables upon the SP-FP relationship, we propose an extension to model (1) that introduces the interactive terms SP*size, SP*risk and SP*invest. The model becomes:

\[
ROA_{jt} = \alpha_i + \beta_1 SP_{i,t-1} + \beta_2 size_{i,t-1} + \beta_3 beta_{i,t-1} + \beta_4 levnet_{i,t-1} + \beta_5 invest_{i,t-1} + \beta_6 PS_{j-1} \times size_{i,t-1} + \beta_7 SP_{i,t-1} \times beta_{i,t-1} + \beta_8 SP_{i,t-1} \times invest_{i,t-1} + \sum_{j=1}^{47} \delta_j D_{secj} + \sum_{k=1}^{16} \rho_k Dan_k + \epsilon_{i,t} \tag{2}
\]

The new specification (2) has allowed us to detect a possible moderating effect of size, risk and investment. The evaluation of this model allows hypotheses 2a, 2b, and 2c to be tested. In fact, by using model (2) we have identified an indirect effect of SP upon FP, conditioned by company size, its degree of risk and its investment level. The sign and significance of coefficients \(\beta_1, \beta_2, \beta_3\) determine whether the effect of size, investment and risk have a tempering (i.e. significantly negative) or a reinforcing (significantly positive) effect on the impact of SP on FP.

In order to assess the sensitivity of the relationship at different SP levels, and therefore to test hypothesis 1, three formulations have been considered. The first one, proposed in model (3), allows for asymmetry in the relationship to be analysed:

\[
ROA_{jt} = \alpha_i + \beta_{11} SP_{n,t-1} + \beta_{12} SP_{p,t-1} + \beta_2 size_{i,t-1} + \beta_3 beta_{i,t-1} + \beta_4 levnet_{i,t-1} + \beta_5 invest_{i,t-1} + \beta_{61} SP_{n,t-1} \times size_{i,t-1} + \beta_{62} SP_{p,t-1} \times size_{i,t-1} + \beta_{71} SP_{n,t-1} \times beta_{i,t-1} + \beta_{72} SP_{p,t-1} \times beta_{i,t-1} + \beta_{81} SP_{n,t-1} \times invest_{i,t-1} + \beta_{82} SP_{p,t-1} \times invest_{i,t-1} + \sum_{j=1}^{47} \delta_j D_{secj} + \sum_{k=1}^{16} \rho_k Dan_k + \epsilon_{i,t} \tag{3}
\]

where \(SP_{n,t-1} = \Pi_{SP_{i,t-1} = 0} SP_{p,t-1}, \ SP_{p,t-1} = \Pi_{SP_{i,t-1} > 0} SP_{p,t-1} \), and \(\Pi_B = 1\) if statement \(B\) is true, otherwise.

The relationship is asymmetric if equal variations in \(SP_n\) and \(SP_p\) lead to different variations in FP (i.e. if the coefficients \(\beta_{11}\) and \(\beta_{12}\) differ).
The second formulation proposed to test hypothesis 1, namely model (4), allows for a possible effect of SP on FP in stages, as suggested by Johnson (2003). Three stages are considered, according as a company’s SP is low, medium or high:

$$\text{ROA}_{t,j} = \alpha + \beta_1 \text{SP}_{t,j-1} + \beta_2 \text{SP}_m_{t,j-1} + \beta_3 \text{SP}_e_{t,j-1} + \beta_4 \text{SP}_{f,j-1} + \beta_5 \text{size}_{t,j-1} + \beta_6 \text{beta}_{t,j-1}$$

$$+ \beta_7 \text{levnet}_{t,j-1} + \beta_8 \text{invest}_{t,j-1} + \beta_9 \text{SP}_f_{t,j-1} \times \text{size}_{t,j-1} + \beta_{10} \text{SP}_m_{t,j-1} \times \text{size}_{t,j-1}$$

$$+ \beta_{11} \text{SP}_e_{t,j-1} \times \text{size}_{t,j-1} + \beta_{12} \text{SP}_f_{t,j-1} \times \beta_{13} \text{SP}_{e,j-1} + \beta_{14} \text{SP}_{f,t-1} \times \text{beta}_{t,j-1}$$

$$+ \beta_{15} \text{SP}_e_{t,j-1} \times \beta_{16} \text{SP}_{f,j-1} \times \text{beta}_{t,j-1} + \beta_{17} \text{SP}_f_{t,j-1} \times \text{invest}_{t,j-1} + \beta_{18} \text{SP}_m_{t,j-1} \times \text{invest}_{t,j-1}$$

$$+ \beta_{19} \text{SP}_e_{t,j-1} \times \text{invest}_{t,j-1} + \sum_{j=1}^{47} \delta_j D_{sec} + \sum_{k=1}^{16} \rho_k \text{Dan}_k + \varepsilon_{t,j}$$

where $\text{SP}_f_{t,j-1} = \prod_{SP_{t,j-1} \leq 0.25} \text{SP}_{t,j-1}$, $\text{SP}_m_{t,j-1} = \prod_{0.25 < SP_{t,j-1} \leq 0.75} \text{SP}_{t,j-1}$, $\text{SP}_e_{t,j-1} = \prod_{0.75 < SP_{t,j-1} \leq 0.75} \text{SP}_{t,j-1}$ and

$$\text{SP}_4_{t,j-1} = \prod_{PS_{t,j-1} > 0.75} \text{PS}_{t,j-1}.$$
program STATA. A value less than 10 indicates that co-linearity between the variables is tolerable. Overall, co-linearity does not appear to introduce significant biases into our estimation.

6. EMPIRICAL RESULTS

6.1. Descriptive statistics

Table 5 displays descriptive statistics for FP, SP and other explanatory variables. The companies in our sample have a median SP score of −0.017 and standard deviation of 4.3%. On average, they are profitable (i.e. Average ROA = 7.8%). The sample set includes companies of large size with a high risk level. The average size (coefficient of variation) is 7.544 billion dollars (150%) and the average risk level (coefficient of variation) is 1.137 (84.8%). This means that the sample exhibits disparities and heterogeneity as far as risk is concerned.

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROA</td>
<td>21917</td>
<td>.078</td>
<td>.107</td>
<td>−.412</td>
<td>.359</td>
</tr>
<tr>
<td>SP</td>
<td>21917</td>
<td>−.017</td>
<td>.043</td>
<td>−.278</td>
<td>.199</td>
</tr>
<tr>
<td>SPp</td>
<td>21917</td>
<td>.008</td>
<td>.017</td>
<td>.000</td>
<td>.199</td>
</tr>
<tr>
<td>SPn</td>
<td>21917</td>
<td>−.025</td>
<td>.034</td>
<td>−.278</td>
<td>.000</td>
</tr>
<tr>
<td>SPf</td>
<td>21917</td>
<td>−.018</td>
<td>.036</td>
<td>−.278</td>
<td>.000</td>
</tr>
<tr>
<td>SPm</td>
<td>21917</td>
<td>−.006</td>
<td>.011</td>
<td>−.037</td>
<td>.008</td>
</tr>
<tr>
<td>SPe</td>
<td>21917</td>
<td>.007</td>
<td>.017</td>
<td>.000</td>
<td>.199</td>
</tr>
<tr>
<td>SP1</td>
<td>21917</td>
<td>−.018</td>
<td>.036</td>
<td>−.278</td>
<td>0</td>
</tr>
<tr>
<td>SP2</td>
<td>21917</td>
<td>−.006</td>
<td>.010</td>
<td>−.037</td>
<td>0</td>
</tr>
<tr>
<td>SP3</td>
<td>21917</td>
<td>−.000</td>
<td>.002</td>
<td>−.012</td>
<td>.007</td>
</tr>
<tr>
<td>SP4</td>
<td>21917</td>
<td>.007</td>
<td>.016</td>
<td>.000</td>
<td>.199</td>
</tr>
<tr>
<td>size</td>
<td>21870</td>
<td>7.544</td>
<td>1.504</td>
<td>2.204</td>
<td>13.138</td>
</tr>
<tr>
<td>beta</td>
<td>21625</td>
<td>1.137</td>
<td>.848</td>
<td>−.180</td>
<td>4.234</td>
</tr>
<tr>
<td>levnet</td>
<td>21901</td>
<td>.146</td>
<td>.268</td>
<td>−.831</td>
<td>2.592</td>
</tr>
<tr>
<td>Invest</td>
<td>21901</td>
<td>.092</td>
<td>.097</td>
<td>.000</td>
<td>1.500</td>
</tr>
</tbody>
</table>

Notes: Table 5 shows the descriptive statistics of the different variables used for a non-balanced panel of 21172 company-year observations over the period 1991-2007. ROA is the indicator of FP, measured by the rate of return of the asset. SP is the measurement of global SP that combines strengths and concerns. SPp represents a positive SP score. SPn is the score of a negative SP. SPf is the score of the SP belonging to the 25% percentile. SPm is the score of the SP above the 25% percentile and below the 75% percentile, and SPe is the score of the SP belonging to the 75% percentile. SP1 is the SP score from the first quartile. SP2 is the SP score from the second quartile. SP3 is the SP score from the third quartile. SP4 is the SP score from the fourth quartile. Beta is the systematic risk, measured by the market beta derived from CAPM. Size is measured by the market value of shares logarithm. Levnet, financial leverage, is measured by comparison of the long-term net debt on the market value of shares. Invest is the measurement of spending on R&D and advertising, calculated by the ratio of the sum of spending on R&D, advertising and in investment (fixed assets), divided by total assets.

Table 1A in the appendix presents the correlation matrix for variables used in the regression models. It shows that SP correlates positively with ROA and that investment correlates negatively with size and financial leverage. What is particularly interesting is that the sign of the correlation between ROA and SP changes as a function of the level of SP. For companies with a positive or medium SP (SPp, SPm, SP2 or SP3), the correlation with ROA is positive. However, the correlation is negative at low SP levels (SPn or SPf). This result corroborates the central argument of this research, that the relationship is non-linear and varies as a function of SP level. The correlation between SP and risk also varies as a function of SP level. The correlation is negative for high SP levels and positive for low SP levels.
6.2. The impact of SP on FP is not monotonic

Tables 6 and 7 present the estimates obtained from models (1) through (5).

### Table 6: Pooled Regression of Models (1) and (2) over the Period 1991-2007

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Model 1</th>
<th>Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP</td>
<td>.216*** (.027)</td>
<td>-0.017 (.145)</td>
</tr>
<tr>
<td>Beta</td>
<td>-0.028*** (.001)</td>
<td>-0.031*** (.001)</td>
</tr>
<tr>
<td>Size</td>
<td>.019*** (.001)</td>
<td>.020*** (.001)</td>
</tr>
<tr>
<td>Levnet</td>
<td>-0.047*** (.006)</td>
<td>-0.048*** (.006)</td>
</tr>
<tr>
<td>Invest</td>
<td>-0.205*** (.024)</td>
<td>-0.197*** (.025)</td>
</tr>
<tr>
<td>SP*size</td>
<td>.038** (.016)</td>
<td></td>
</tr>
<tr>
<td>SP*invest</td>
<td>.631 (.472)</td>
<td></td>
</tr>
<tr>
<td>SP*beta</td>
<td>-1.140*** (.033)</td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>.038 (.024)</td>
<td>.035 (.023)</td>
</tr>
<tr>
<td>Industry dummies</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Year dummies</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Observations</td>
<td>21172</td>
<td>21172</td>
</tr>
<tr>
<td>R²</td>
<td>.299</td>
<td>.302</td>
</tr>
</tbody>
</table>

**Note.*** significant at the 1% level (p<0.01); ** significant at 5% (p<0.05); * significant at 10% (p<0.1)

### Table 7: Analysis of the Pooled Regression of Models (3), (4) and (5) over the Period 1991-2007

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Model (3)</th>
<th>Model (4)</th>
<th>Model (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPn</td>
<td>-.336* (.184)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPp</td>
<td>.807*** (.376)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPf</td>
<td>-.348* (.183)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPm</td>
<td>-.497 (.504)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPe</td>
<td>.829*** (.383)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP1</td>
<td>-.353* (.184)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP2</td>
<td>-.461 (.503)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP3</td>
<td>-.1.874 (.780)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP4</td>
<td>.838** (.385)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beta</td>
<td>-.031*** (.002)</td>
<td>-.033*** (.002)</td>
<td>-.033*** (.002)</td>
</tr>
<tr>
<td>Size</td>
<td>.024*** (.001)</td>
<td>.024*** (.001)</td>
<td>.024*** (.001)</td>
</tr>
<tr>
<td>Levnet</td>
<td>-.047*** (.006)</td>
<td>-.047*** (.006)</td>
<td>-.047*** (.006)</td>
</tr>
<tr>
<td>Invest</td>
<td>-.268*** (.031)</td>
<td>-.262*** (.033)</td>
<td>-.265*** (.034)</td>
</tr>
<tr>
<td>SPn*size</td>
<td>102*** (.020)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPp*size</td>
<td>-.150*** (.042)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPn*invest</td>
<td>-.1.473*** (.666)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPp*invest</td>
<td>5.753*** (.987)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPn*beta</td>
<td>-.133*** (.040)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPp*beta</td>
<td>-.076 (.100)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPn*size</td>
<td>104*** (.020)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPp*size</td>
<td>153*** (.062)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPp*beta</td>
<td>-.012 (.101)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP1*invest</td>
<td>-.105*** (.020)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP2*invest</td>
<td>-.1.488*** (.062)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP3*invest</td>
<td>-.379*** (.217)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPF*invest</td>
<td>-.1.110 (.140)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP1*beta</td>
<td>-.012 (.101)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note.*** significant at the 1% level (p<0.01); ** significant at 5% (p<0.05); * significant at 10% (p<0.1)
Model (1), without interactions, displays a strong SP-FP association. In model (2), this direct association is replaced by strong interactions of SP with size and with risk. Models (3) to (5) display locally strong associations, depending on SP ranges. However, the most novel observation is a confirmation of the asymmetry in the SP-FP relation. It appears indeed that the marginal impact of SP on FP depends on the SP range, with similar sign reversals across all three models. There is thus a strong presumption in favour of Hypothesis 1. We now discuss each model in more detail.

The results of model (3) indicate that the effect of SP on FP varies according to whether SP is positive or negative. The financial impact is significantly positive for companies with a positive SP, significantly negative for companies with a negative SP. Thus companies enjoying a positive SP may profit from a positive effect of their social actions. Conversely, the effect of socially responsible actions is negative for companies with inferior social performance. This result agrees with that of Moon (2007) who showed that positive social actions and negative social actions affect FP in an asymmetric manner.

The estimation of model (4), which examines the effect of three SP levels, is along the same lines. The effect of SP is negative for companies with a low SP score, more or less neutral for companies with medium levels of social engagement, and positive for companies with a high SP. This result corroborates those of Bouquet and Deutsch (2008), who propose that companies with an intermediate level of SP and which display a minimal conformity to regulations and to stakeholder pressure do not benefit from a positive financial impact. And that actually achieving the financial benefits of SP requires a genuinely proactive approach that goes above and beyond mere conformity to regulations.

The dependence of the SP-FP relationship as a function of the level of social engagement is also supported by the results of model (5). Companies with a low (1st quartile) SP rating undergo a negative SP-FP relationship, whereas those with a high (4th quartile) SP rating experience a positive one. The relationship is indeterminate over intermediate SP ranges. In the same vein, Johnson (2003) asserts that being socially responsible does not necessarily offer financial benefits to companies who simply adhere to regulations, or to those who engage in CSR in a fragmented way. Conversely, FP can be improved for companies who opt to implement CSR strategically.

6.3. Significance of control and moderating variables

Table 8 indicates a significant direct impact of most control variables. Company size (resp. risk, spending on R&D and advertising) is positively (negatively) related to ROA, implying that large companies (the least risky, least innovative) appear to generate more FP that small (riskier, more innovative) companies. These effects are consistent across all models. It must however be noted that industry never appears as a significant factor.

Company size, beta and spending on R&D and advertising are also used as moderators in models (2)-(5). Table 8 summarises significant interaction terms.

Table 8: Significant interactions with SP

<table>
<thead>
<tr>
<th>Model (2)</th>
<th>Model (3)</th>
<th>Model (4)</th>
<th>Model (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>+ for low SP</td>
<td>+ for low SP</td>
<td>+ for low SP</td>
</tr>
<tr>
<td></td>
<td>– for high SP</td>
<td>– for high SP</td>
<td>– for high SP</td>
</tr>
<tr>
<td>Invest</td>
<td>– for low SP</td>
<td>– for low SP</td>
<td>– for low SP</td>
</tr>
<tr>
<td></td>
<td>+ for intermediate SP</td>
<td>+ for high SP</td>
<td>+ for high SP</td>
</tr>
<tr>
<td>Beta</td>
<td>– for low SP</td>
<td>– for low and</td>
<td>– for low and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>intermediate SP</td>
<td>intermediate SP</td>
</tr>
</tbody>
</table>

Notes: +/−: sign of interaction coefficient. Reported effects are significant at a 5% level or better.

The direct SP-FP impact seen in model (1) loses its significance when interactions are introduced in model (2). The interaction of SP with size and risk is significant and suggests that these factors play a moderating role on the SP-FP relationship. The significant positive coefficient of the cross term (SP×size) shows an amplifying effect of size. That is, large companies benefit more (financially) from their social engagement than small companies. This conclusion concurs with Ioannou and Serafeim (2010), who demonstrated the occurrence of a
The coefficient of the interaction term (SP*beta) in model (2) is significantly negative. This shows a dampening effect of risk. High-risk companies benefit less from the financial advantages of their social engagements than those with lower risk. The interaction term (SP*invest) is not significant: spending on R&D and advertising R&D and advertising does not have a moderating effect, thus confirming Wang and Choi (2013).

In summary for model (2), while SP does not seem to directly affect FP, it is in fact the indirect effect of SP, via size and risk level, that affects FP. It is important to note that this is a pure moderating effect because the SP-FP relationship is not significant. The variable size (risk) has thus a pure positive (negative) moderating effect upon the financial impact of SP. This means that the greater the company size (risk level), the stronger (weaker) the SP-FP relationship. Our explanation for the neutrality of the direct SP-FP relationship furthers the analysis of Surroca et al. (2010), for whom the positive impact of SP upon FP is deceptive.

In order to test the moderating effect of size, risk level and spending on R&D and advertising while taking into account a possible non-linear SP-FP relationship, models (3), (4) and (5) have been used. The results obtained from these alternative models support our conclusions as to the importance of introducing size, risk level and spending on R&D and advertising as moderating factors.

The results of model (3) show that the factor of size has a reductive effect, whereas risk level and spending on R&D and advertising exert an amplifying effect on the relationship. The significant negative coefficient of the interaction term (SPp*size) means that the marginal positive effect of SPp on FP decreases with size. Thus size attenuates the positive impact of SP upon FP for companies with a positive SP. For companies with negative SP, the coefficient of the cross-term (SPn*size) is significant and positive), which suggests also that size attenuates the marginal negative effect of SPn on FP.

The results from model (3) also indicate that the effect of risk depends upon the level of SP. The moderating effect of risk is significant and negative for sampled companies with negative SP. This result implies that risk amplifies the negative effect of SP on FP for companies with a negative social side. In effect, companies with a negative social rating and a high level of risk are more financially penalised than companies with a low risk level. The moderating effect of risk is however not significant for companies with a positive SP rating.

The significant positive coefficient of the interaction term (SPp*invest) supports a amplifying effect of spending on R&D and advertising for companies with positive SP. For such companies, the positive financial effect of SP is stronger for the most innovative companies. The significant positive interaction term (SPn*invest) shows that spending on R&D and advertising also amplifies the negative effect of SPn on FP. This result suggests that the negative financial impact of SP for companies with a negative social rating is all the greater for the most innovative companies.

In summary, model (3) highlights two opposing effects: risk, which plays an attenuating role, and size and spending on R&D and advertising that exert an amplifying effect. The existence of these indirect effects of SP on FP, by the bias of the factors of size, risk level and spending on R&D and advertising, demonstrates the contingent character of the relationship, but it also takes into account the non-linear dynamic of this link.

Models (4) and (5) highlight the attenuating effect of size, regardless of SP level. They also indicate that the effect of risk depends on the SP level. The level of risk amplifies the negative financial impact of social actions for companies of low or medium SP level. For companies of high SP, the level of risk has no bearing whatsoever on the SP-FP relationship.

Models (4) and (5) also indicate an amplifying effect of spending on R&D and advertising at low or high SP levels. The negative financial impact of SP for irresponsible companies is all the greater when these companies are innovative.

The following general conclusions can be reached regarding moderating effects: (i) Our results are broadly consistent across models. (ii) They indicate significant moderating effects of risk, size and spending on R&D and advertising, thus adding credibility to hypotheses 2a, 2b and 2c. (iii) They indicate that these effects also depend significantly on the level of SP. This accentuates the picture of a complex set of associations between variables.

### 6.4. The impact of SP on FP varies with time

In order to test hypothesis 3, which states that the impact of SP on FP is stable over time, we shall use the results of models (2), (3) and (4) applied to the entire period of study (1991-2007) as a basis for comparison. We then apply the same models on two time divisions: division 1 consists in the two sub-periods 1991-2000 and 2001-2007. Division 2 consists in 4 sub-periods: 1991-1994, 1995-1999, 2000-2002 and 2003-2007. The latter division enables us to isolate the effect of the period 2000-2002, corresponding to the burst of the Internet bubble, and to distinguish the period of growth experienced in the 90’s (1991-1999) from the period of economic slowdown 2001-2007.

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**Hajar Tebini, Pascal Lang, Bouchra M’Zali and Blanca Perez-Gladish**
The results summarised in tables 9, 10 and 11 show that the impact of SP on FP varied over time, regardless of the model. In early years, the SP-FP relationship was not significant in general. In more recent times, the impact of SP on FP increased. The results from model (2) (table 9) suggest that the impact of SP on FP is only significant and negative at the 10% threshold over the period 2003-2007. When we distinguish the negative impacts from the positive impacts of SP on FP (model (3)), the variation in behaviour of the relationship becomes clearer. The impacts of SPn and of SPp on FP over the total sample set are negative at the 5% threshold and positive at the 10% threshold respectively. They become non-significant over the sub-period 1991-2000, and significant at the 1% threshold over 2001-2007. These results are confirmed by the second time division, in which the relationship is only significant on the sub-period 2003-2007.

Table 9: Analysis of the Pooled Regression of Model (2) over Time

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Table 10: Analysis of the Pooled Regression of Model (3) over Time

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This result is also supported by model (4), according to which the coefficients of SPf, SPm and SpE are not significant over the period 1990-2000, in contrast to the period 2001-2007.

Table 11: Analysis of the Pooled Regression of Model (4) over Time

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In summary, the examination of the impact of SP on FP over different sub-periods confirms the hypothesis that the relationship is not stable over time. This result agrees with the conclusion of certain recent studies that suggest the relationship varies over time (Lankoski, 2008; Paton and Elsayed, 2005; Barnett, 2007; Bird et al., 2007; Brammer and Millington, 2008; Ioannou and Serafeim, 2010). Our results demonstrate that the impact of
SP on FP has been more significant during recent periods than during previous periods. On fact, during recent periods, the market seems to have been sensitive to different SP levels. Only those companies who are proactive in terms of their CSR practises benefit from a positive financial return. Companies with a medium or low level of SP are penalised by the market. For previous periods, the direct impact of SP on FP was non-significant. However, the effect of SP combined with other financial variables such as size, level of risk and spending on R&D and advertising does affect FP. It must also be noted that the significance of these moderating factors changes over time. For example, in the period 1991-2000, size, risk and R&D and advertising factors, which play no role in the SP-FP relationship, were significant over the most recent period 2001-2007.

These results demonstrate the evolution of the CSR concept, which has grown in credibility and legitimacy in recent years and in which social engagement is seen as being positive by the market. The institutionalisation of CSR, the evolution of stakeholders’ perceptions and of social standards as well as the accessibility of social and environmental information are all factors explaining the evolution of the relationship dynamic. Our explanation of these results furthers the work of Lankoski (2008), for whom the exogenous factors that determine the SP-FP relationship are not necessarily stable. The author thus opts for a relationship of retarded effect that de... the SP-FP relationship dynamic... the SP-FP relationship are not necessarily stable. The author thus opts for a relationship of retarded effect that de...

7. CONCLUSION

Several social, environmental and governance crises have fostered concerns about corporate social responsibility. CSR is nowadays an established expectation of stakeholders, and its neglect is considered a source of extra-financial risk. However, the nature of the impact of SP on FP remains subject to debates both in academic and managerial circles.

The present study rests on a sample of 21172 observations with coherent SP and FP measures over the entire 17 years horizon. The recent literature suggests that the linear SP-FP relations are inappropriate and that some firm characteristics (size, risk, particular SP components) cannot be treated as control variables. In the spirit of suggestions by Orlitsky et al. (2003), we consider a non-linear dependency between SP and FP and introduce size (Ioannou and Serafeim, 2010), risk (Orlitzky and Benjamin, 2001; Zyglidopoulos, 1999), and R&D (Luo and Bhattacharya, 2006; Hull and Rothenberg, 2008) as moderating variables.

Our conclusions are several. First, the relation between SP has a non-monotonic form, as SP’s impact depends on its level: i.e., the marginal effect of SP on FP is negative at low levels of SP, positive at higher levels. Second, in agreement with aforementioned studies, some contextual factors have a moderating effect. Thus, size (risk, R&D) has a positive (negative) effect on FP, and tends to attenuate (reinforce) the SP-FP relation. Third, a SP-FP relation exists throughout the horizon of reference, even though it seems to have evolved with the perceived importance of CSR by stakeholders and financial analysts.

This study has several limitations. One stems from the composition of our sample. Our present sample includes American firms embedded in similar markets, this not include small businesses. Given that industrial sectors are variously affected by specific CSR components (Shalchian et al., 2006), it would be interesting to focus on individual industries, such as mining, "dirty" or "sin" industries, distribution, textile. As these sectors have been subject to consumer and investor campaigns, they may provide better clues as to the evolution of the CSR concept. Another limitation is about econometrics. We used a pooled panel. Alternative approaches could have been GMM regressions with fixed effects, or an inter-temporal model.

This study nonetheless points to some significant managerial implications. It seems less and less tenable for a firm to ignore the CSR context, particularly under conditions of high intrinsic risk, small size, and reduced R&D investment. It is in the firm’s interest to identify specific CSR components relevant to its strategic positioning. Furthermore, the evolving character of CSR issues makes it imperative for the firm to maintain an active watch on its environment, to anticipate future stockholder demands and regulatory practices, so as to proactively guide its long term strategic orientations.

REFERENCES


**APPENDIX**

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Strategic change: a journey towards new meaning? Semantic analysis of corporate communication

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Abstract

Strategic change, infused with new data, perspectives and concepts may change the inherent meaning of the central tenets in an existing strategy. It taps into the cognitive aspects of a journey where language, in verbal and written form, aids in the process of communicating, understanding and creating new meaning. Hence, it comes as no surprise that communication is argued to be an important means of forming and executing strategy, particularly if that strategy involves change. Thus far corporate communication has been the objective of extensive and predominately qualitative analysis of written content, with a focus on identifying and demonstrating strategic intent or reorientation. The objective here is to take a different route, not yet explored in the field of strategic management and change. Leaning on a previously conducted, longitudinal and qualitative case study of strategic change the aim is twofold: Firstly, to propose a method for quantitative analysis of semantic content of texts and statistically test the semantic development over time in the same case. Secondly, to evaluate and discuss the results of a quantitative semantic analysis in relation to previous and qualitative findings. By applying latent semantic analysis (LSA), we quantified the semantic content of annual reports and press releases between 2001 and 2010, derived from a case study of one company in the paper packaging industry. Using this method, we statistically analysed significant changes in semantic content across the ten-year time period studied. The results indicate interesting avenues for continued and wider use of quantitative semantic analysis in contributing to the understanding of semantic development and strategic change.

Keywords: strategic change, communication, cognition, latent semantic analysis, paper packaging industry

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1 INTRODUCTION

Strategic change is a challenging endeavour requiring everything from a new organisational structure to underlying culture (Mintzberg & Quinn, 1992; Markides, 1997). Communication is one suggested lever, argued to be important in the formulation and implementation of strategy and strategic change (Simons, 1995; Porter, 1996; Quinn, 1996; Higgins & McAllaster, 2004). Communication plays a role both in terms of manipulation and control, and for creating new meaning and practice (Brown, Collins, & Newman, 1989; Hartelius & Browning, 2008; Rogers, Gunasekera, & Yang, 2011). The use of a common, and preferably unpretentious language is, for example, argued to facilitate in closing the strategy-to-performance gap, and to enhance learning, change and strategic innovation (Pfeffer & Sutton, 1999; Marshak, 2002; Jacobs & Heracleous, 2005; Mankins & Steele, 2005). Communication and dialogue are likewise argued to be integral parts of strategic control through interactive control systems, and for discussions on performance, risk, and business ethics (Simons, 1995; Quinn, 1996; Melnyk, Hanson, & Calantone, 2010).

The value and use of rhetoric, dialogue, narratives and metaphors in verbal and written communication in this context are well explored from multiple perspectives. Language, being one of our most important means for communication, influences and is influenced by situations, negotiations and activities within an organisation and its surrounding environment (Brown et al., 1989; Györi, 2002). Reflective dialogue is considered to be a prerequisite for changing mental models, and an enabler of strategic change and innovation (Markides, 1997; Jacobs & Heracleous, 2005). A necessary first step for critically reviewing mental models is to render them visible through the use of language and metaphors: “During such inquiry, a collective language is likely to emerge. It is through this common language that emergent, new mental models can take shape” (Jacobs & Heracleous, 2005, p. 347).

At the other end of the communication spectrum are written artefacts such as employee magazines, corporate brochures, press releases, annual reports and more. These are in turn important tools for forming an organisation’s identity and managing perceptions and expectations in relation to internal and external stakeholders (Fiol, 1995; David, 2001; Prasad & Mir, 2002). An organisation’s language, made up of its choice of words expressed in verbal or written forms, is an important cultural artefact in itself. Homburg and Pfessler (2000) found that an organisation aspiring to be market oriented will not exhibit behaviours to this end without a market-oriented language.

Given that language is an important marker of cognitive and cultural change, how can it be studied and measured in relation to strategic change? Thus far, the growing interest in communication and rhetoric in the management literature is often dealt with in relation to manipulation and control: “Specifically, rhetorical studies and management are concerned with power as it relates to language” (Hartelius & Browning, 2008, p.14). Previous studies in the area and in relation to strategy are predominately qualitative, applying content analysis and word frequency counts to interview transcripts and public documents. For example, Landrum (2008) shows how strategic intent and posture are revealed in letters to shareholders using a qualitative narrative analysis. Rutherford (2005) examines rhetorical plays and Pollyanna effects by studying narratives in corporate annual reports using word frequencies as a tool of analysis and a linguistic based approach.

The aim here is to take a different route, which to the authors’ knowledge has not yet been explored in the field of strategic management and change. Seeing the importance of language as a tool for communicating strategy or a new strategic direction, and a potential marker of certain behaviours, we address the question of how language, and more specifically the semantic content in an organisation’s written communication, can shed light on the understanding of a strategic change process. We applied a quantitative analysis method for measuring semantic content, which is the underlying meaning of words and narratives. We did this based on findings from a longitudinal case study of strategic change, and the notions put forth in the literature that an organisation’s language is a tool as well as a result of a cognitive processes (such as strategic change).

The aim was twofold: Firstly, to propose a method for quantitative analysis of semantic content of texts and statistically test the semantic development over time in one organisation. Secondly, to evaluate and discuss the results of a quantitative semantic analysis in relation to qualitative findings of the same organisation.

We start with a theoretical discussion on strategic change, the role of communication and how different methods are used for studies thereof. Then we briefly present previous findings from a qualitative case study, followed by a description of the methods used here. The results from the quantitative semantic analysis are presented and discussed in relation to previous qualitative findings. This is followed by conclusions, implications for theory and practice and suggestions for the continued use of similar methods in contributing to the understanding of semantic development and strategic change.
2 STRATEGIC CHANGE, COMMUNICATION AND RESEARCH APPROACHES

Normann (2001) argues that “The core process of a company in the long term is to form new ‘dominating ideas’” (ibid., p. 149). Describing the evolution of strategic paradigms, Normann (2001) shows how the competitive dominance or edge has moved from the industrial economy where resource transformation, standardisation and production were at the heart of business logic and management, to an economy where the crucial competence is to organise value creation where the customer is not only an important source of business but regarded as a co-producer. Simons (1995) similarly describes the differences between ‘old’ and ‘new’ strategic paradigms from ‘top-down strategy’, ‘standardisation’ and ‘according to plan’ to ‘customer/market-driven strategy’, ‘customisation’ and ‘continuous innovation’ Simon goes on to argue that a shift or co-existence between the old and the new reflects a deeper tension between basic philosophies of management and control. For industries that originate from the industrial economy, this may imply a dramatic conceptual and real change in how customers are viewed and how value is created.

According to Mintzberg and Quinn (1992) the most difficult challenge in managing strategic change is the move from a familiar domain to one that is less well-defined. It can take place through continuous and incremental improvement, or through a more radical renewal of the business (Quinn, 1978; Normann, 2001). This is a process that in turn can be reactive or proactive, temporal (different phases of stability and change) and spatial (separated from the rest of the organisation) (Baden-Fuller & Volberda, 1997; Normann, 2001). The process of forming new ‘dominating ideas’, or changing mental models underlying the strategy paradigm of an organisation is foremost a cognitive challenge (Markides, 1997; Normann, 2001; Jacobs & Heracleous, 2005). For an organisation going through strategic change, new perspectives, competencies, tools and models may come in the form of new concepts with new meaning that has to be addressed. For example, an organisation aiming for a competitive advantage through a strategy of ‘differentiation’, coming from one of ‘cost’ (Porter, 1985; Porter, 1996), or heading for a ‘Blue Ocean’ (Kim & Mauborgne, 2005), will instil new meaning (and practice if successful) in relation to terms like ‘value’, ‘customer orientation’, and ‘innovation’.

Johnson (1992) argues that “…a change in emphasis from control of costs to an emphasis on monitoring effective customer service, is not simply a means for monitoring the progress of a changing strategy, it is also a major signal of a change in corporate culture” (Johnson, 1992, p. 35). Corporate culture where language systems and metaphors are central ingredients in forming an organisation’s value systems and norms, are in turn important levers in strategic change. As put by Higgins and McAllaster (2004): “If strategy and cultural artifacts are not aligned, then employees are uncertain which messages are real – the old familiar, comfortable ones supported by lots of well-known cultural artifacts, or the new messages about a new strategy that are in conflict with the old, still in place cultural artifacts”. Hombrug and Pflesser (2000) show that a market-oriented language, being a cultural artefact, is a prerequisite for market-oriented behaviour.

Seeing that language plays an important role in conveying and creating new meaning and behaviour, it is not surprising that communication is argued to be an important ingredient in leadership and strategic management in general and for change and innovation in particular (Porter, 1996; Markides, 1997; Mankins & Steele, 2005; Jacobs & Heracleous, 2005; Groysberg & Slind, 2012).

Thus far research has provided important insight into the relationship between corporate communication, language and control as well as rhetorical choices for communicating strategic intent and posture (Landrum, 2008). Bryman (1989) points to the increasing interest in studying language in the organisational context and how communication is used and the consequences thereof. In a recent qualitative study by Rogers et al. (2011), they examined textual components in strategic statements over time, showing how managers may use language to articulate shifts in strategy. However, according to Rogers et al. (2011) there is limited research on the linguistic development within an organisation over time. There is equally, to our knowledge, no quantitative research on the semantic content of an organisation’s communication, over time, contributing to this field.

Public documents like annual reports and executive statements are important media by which companies communicate with their shareholders, the stock market and society at large (Fiol, 1995; Prasad & Mir, 2002). Prasad and Mir (2002) argue that “…the texts of annual reports and letters to shareholders contain important symbolic meanings that need to be unveiled through interpretation” (ibid., p. 110). Even though these may be written in a way to convey a certain intentional message, Fiol (1995) argues that future research comparing different forms of communication is important.

Applying a quantitative semantic analysis in an organisational context offers another potential route. By addressing the need for increased understanding of how shifts in strategy are reflected in language, we wanted to measure if and how the semantic content of an organisation’s written communication changes over time by applying latent semantic analysis (LSA). LSA is a mathematical method for computer modelling and simulation of the meaning of words and passages by the analysis of representative corpora of natural text. It is also a method for analysing the underlying semantic content. It has primarily been used so far in cognitive science and educational research (Landauer & Dumais, 1997). A few recent organisation and management studies have used LSA to examine verbal communication in design teams, showing how semantic coherence within teams creates shared understanding, and how this computational tool can be used to detect how teams function (Dong, 2005;
Yang & Helander, 2007). Wallemacq and Jacques (2009), albeit not using LSA, introduce the software Evoq to visualise the semantic meaning of words drawn from qualitative texts.

As a strategic change process progresses, one could assume that a new language is used and developed not only in lexical terms (i.e. new vocabulary) but also in semantic terms (i.e. the inherent meaning of words and narratives) hence leading to less semantic coherence over time measured in quantitative terms. Given the inherent meaning of, and link between, strategy, market orientation and innovation (Frambach, Prabhu, & Verhallen, 2003; Dobni, 2010) and the cognitive and cultural aspects of strategic change (Homburg & Pflesser, 2000; Normann, 2001; Dufour & Steane, 2006) – it could be assumed that an organisation pursuing strategic change towards increased market orientation and innovation will develop a new and measurable semantic content expressed through language.

Hence, our research is based on the notion that strategic change; such as moving from an old’ towards a ‘new’ strategic paradigm, requires cognitive change where communication (use of language) is vital. We raise the question how language and more specifically the semantic content in an organisation’s corporate communication can shed light on the understanding of a strategic change process over time. Given the role of communication and language in strategy and strategic change, and the successful application of quantitative semantic analysis in other areas, we hypothesised that: an organisation going through strategic change will display a change in language and more specifically a significant change in the semantic content – the underlying meaning of words or narratives – over time.

3 STRATEGIC CHANGE IN PRACTICE – FINDINGS FROM A QUALITATIVE CASE STUDY

The study presented here is linked to a longitudinal qualitative case study (Olander-Roese & Olsson, 2007; Olander-Roese, 2008; Olander Roese & Olsson, 2012). A brief introduction of the study and prior findings is in place.

One company in the Swedish forest and paper packaging industry was studied between 2004 and 2010 with the overarching purpose to explore and contribute to the understanding of strategic change, and the link between strategy, customer orientation and innovation. The research, based on a qualitative and interpretive approach (Alvesson & Sköldberg, 1994; Gummesson, 2000; Patton, 2002), focused on challenges and enablers of strategic change, the process in itself and the related managerial actions, decisions and organisational reactions. The data collection consisted primarily of in-depth interviews, observations and participation as well as studies of the company’s written material.

The company, a manufacturer of paper packaging material named Billerud (now BillerudKorsnäs), was formed in 2001 through a merger of three existing Swedish paper mills and introduced on the Stockholm Stock Exchange. The Swedish forest industry, of which the paper packaging industry is central, is one of Sweden’s most important primary industries and makes up 12% of the nation’s GDP. It is characterised by capital intensive processes and products with high knowledge content. Efficient production processes, volume output and cost focus have been at the core of the forest industry paradigm. After the formation in 2001, Billerud spent the first three years streamlining the activities of the founding mills and developing a strategy. In 2004 Billerud revised their strategy and the next step was to be taken. An increased market orientation and new product development were central themes of the strategy. In 2005, the founding CEO was replaced, followed by a review and change in the company’s objectives, financial targets and strategy. This time around an increased focus was placed on the direction set out in 2004, combining world class process efficiency and customer focused development. Processes for innovation and market learning were developed, the organisation restructured, new ventures launched, and the ‘offering’ extended beyond the physical product (Olander Roese & Olsson, 2012). In summary, the journey of strategic change studied between 2004 and 2010 can be described as a move from a production oriented, cost-focused business towards a more market and customer oriented one. The new financial targets set in 2006 were reached in 2010.

In Table 1, the introductory words of CEO statements as communicated in annual reports further depict the strategic journey from 2001 to 2010 along with turnover and margin statistics. One could conclude, when comparing the fluctuating financial developments over the years with the qualitative findings thus far, that the financial results are limited. However, given the importance of communication and language in strategy and strategic change suggests measures for other outcomes beyond profit maximisation, such as semantic development (See e.g. Whittington, 1997; Dufour & Steane, 2006). This inspired the present study.
Table 1. CEO statements, turnover and margin between 2001 and 2010 (Billerud, 2011).

<table>
<thead>
<tr>
<th>YEAR</th>
<th>CEO STATEMENT IN ANNUAL REPORTS 2001-2010</th>
<th>TURNOVER Net sales, Msek</th>
<th>MARGIN</th>
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<tr>
<td>2001</td>
<td>“The new Billerud – The past year was dominated for Billerud by the merger of the three mills at Gruvön, Karlsborg and Skärblacka. Extensive work was required to co-ordinate production and find models for co-operation between the mills. During the year we have also formed functions for the head office and established a sales organisation with offices in seven European countries”.</td>
<td>6910</td>
<td>19%</td>
</tr>
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<td>2002</td>
<td>“The past year was Billerud’s first full year as a listed company. While work in 2001 was dominated by efforts aimed at creating an efficient business, our focus in 2002 was on realising the plans made when we formed the company. As we have worked to establish ourselves on the market we have seen confirmation of the fact that the Billerud brand, thanks partly to its long tradition, is a strong name in the forest industry. Together with our strategy of focusing on niches where we are already strong, the name has undoubtedly contributed to the large interest shown in Billerud both by the market and by investors”.</td>
<td>7067</td>
<td>17%</td>
</tr>
<tr>
<td>2003</td>
<td>“At the formation of Billerud we produced a plan for the first three years where the focus was on establishing the company and consolidating our business. During this first phase our work has focused on creating procedures for our working methods and on realising the opportunities for organic growth and increased efficiency that were created through the co-ordination of three mills within a single company. Now that this phase is over I can state that Billerud is well established on the market and as a listed company. We have created a strong base, both financially and as an organisation, for the next phase of Billerud’s development”.</td>
<td>6992</td>
<td>16%</td>
</tr>
<tr>
<td>2004</td>
<td>“During its first years since formation Billerud has co-ordinated the activities of its three Swedish mills and thereby created a niche business and established listed company focus on packaging paper. Synergies have led to increased production capacity, which has meant a significant rise in deliveries. Following the successful start it is now time to move to the second phase, in which the focus will be on increased market orientation. This will enable Billerud to meet new demands from customers and end-users. Increasing efficiency within the business will be equally important, and this will be done by cutting costs”.</td>
<td>7159</td>
<td>11%</td>
</tr>
<tr>
<td>2005</td>
<td>“A renewal has begun. Billerud’s results were disappointing. Continued weak economic conditions and the dramatic rise in costs for energy, raw materials and chemicals affected us negatively. We have now implemented strong measures to transform our results and build a more modern, more efficient company”’.</td>
<td>6823</td>
<td>-3%</td>
</tr>
<tr>
<td>2006</td>
<td>“Billerud undergoing change. After several years of faltering profitability, Billerud’s earnings trend was turned around in 2006. Prices could be raised slightly higher than costs increased. Combined with greater efficiency this meant a strong improvement in profits”.</td>
<td>7369</td>
<td>7%</td>
</tr>
<tr>
<td>2007</td>
<td>“The hard work continues. In 2007 we worked very hard and successfully to develop markets, customer relationships and products, to reduce costs and improve efficiency. Over the past 12 months we have raised prices and reduced our energy costs. However, increases in wood costs and currency changes impacted negatively on earnings. We will continue working intensively on our chosen course to make improvements”.</td>
<td>7758</td>
<td>8%</td>
</tr>
<tr>
<td>2008</td>
<td>“A changed reality. Billerud’s positive development continued at the start of 2008. We were successful on the market and our customers appreciated our new business concepts and products. In the middle of the year a weakening in the industrial business cycle became more obvious, and by the end of the year the financial crisis had struck and the downturn was a fact. We were forced to face up to further challenges”.</td>
<td>7792</td>
<td>4%</td>
</tr>
<tr>
<td>2009</td>
<td>“The resurgence. Describing 2009 in brief is almost impossible. We were plunged into a financial crisis and an economic slump with falling demand, plummeting prices and a financial market that practically stopped working all together. However, we handled the situation and bounced back very strongly at the end of the year. I think that in 2009 we really showed Billerud’s inherent strength”.</td>
<td>7760</td>
<td>4%</td>
</tr>
<tr>
<td>2010</td>
<td>“Strong position for Billerud. I am pleased, happy and impressed with the progress that we made in 2010. Demand for our products rose very strongly over the year, resulting in an operating margin of 12%. I interpret that as proof of how strong our customer offering is”.</td>
<td>8828</td>
<td>12%</td>
</tr>
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4 METHOD

The data analysed for this paper was retrieved from the Billerud company and consist of the written content of annual reports and press releases from the period 2001 to 2010. The semantic content was assessed quantitatively by applying latent semantic analysis (LSA). LSA generates a high dimensional semantic representation (semantic space) from a large corpus of natural language using information of co-occurrence words. The texts are then inserted into this space, so that the statistical tests can be applied to the semantic representation that is associated with the texts. The method is described below. The analyses were conducted using SemanticExcel, a web-based software for scientific and statistical analysing of semantic representation (www.semanticexcel.com).

4.1 Creating a semantic space

Semantic spaces are generated by applying computational methods to large text corpora. This space is a representative frame of reference for the meaning of different words (Landauer & Dumais, 1997). For this paper, an English semantic space was created. The texts generated by the subjects (i.e. the annual reports and press releases) were not sufficiently large to construct a high quality representation. Instead we collected a corpus based on 1.6 GB of English news articles from 2007. The latent semantic analysis was generated by the Infomap software (http://infomap-nlp.sourceforge.net/), using the following parameters settings: the number of words in the space (15k), the number of context columns (20k), the context size (±15 words), the number of SVD iterations (500), and the number of dimensions in the semantic representation (100). The result of this analysis was a semantic quantification of the 120k most frequent words in the corpus, where each word is described by a 100 dimensional vector. Words that are semantically similar (synonyms) have similar representation in this semantic space.

4.2 Empirical data – texts to be analysed

The empirical data consisted of written expressions in the form of annual reports and press releases from the years 2001 to 2010, in total ten annual reports and 194 press releases in English. The particular organisation was selected based on a previous qualitative and longitudinal case study of strategic change (Olander Roese, 2008; Olander Roese & Olsson, 2012). With the limited reference to similar studies and applications of LSA, it was important to choose an object of study where we could relate to data and findings beyond the ones in focus here in order to evaluate and discuss the results of LSA. The material for analysis – annual reports and press releases – was selected based on public access and to ensure representation of comparable texts for all years. The annual reports cover (excluding financial statements): statements from the CEO/president, a summary of the year’s major events and descriptions of business concepts, vision, strategy, targets, markets and trends, production, product and business areas, human resources, environmental issues, production and investments, risk analysis, etc. The press releases include communications of financial reports and market outlook, product launches and changes in production or number of employees, etc. As already noted, the annual reports and other public documents are an important means for corporate communication. One limitation put forward by Fiol (1995) in addition to the potential of formulations aimed at conveying a certain and particular positive image of the events, is that annual reports are often produced by external consultants. Nevertheless, the information and language employed should, to our knowledge and personal experience, adhere not only to legal requirements but also the voice of the organisation and the people interviewed for content.

4.3 Data preparation and procedure of analysis

Annual reports (10) and press releases (194) from the years 2001 to 2010 were downloaded from the website of the case company or sent as PDFs from the company. All documents were transferred to unique text files (txt.), 204 files in total, and prepared for analysis by removing financial statement tables, figures, images and data such as contact information, telephone numbers and links to other documents. Each file was named with the corresponding date.

The analysis encompassed three steps: First, each document (i.e. text file) was transformed to a semantic representation. This was done by adding the semantic representation of the words that were presented in each document, and by normalising the length of the resulting vector to one. This generated one semantic representation for each document, with the same number of dimensions as the original semantic space.

Second, we created a semantic scale spanning two sets of documents. This semantic scale measures how semantically similar one document is to two sets of documents. The scale spans from -1 (maximally similar to set 1) to +1 (maximally similar to set 2), and where a value of zero indicates that it is equally similar to both sets. We summarised each set of documents by aggregating all semantic representations in the set, and normalised the resulting vector to one. Then we created a “difference” vector, where the vector representing the second set was subtracted from the vector representing the first set, and where the resulting vector was normalised to one. Finally, we measured the semantic similarity between the difference vector and the vector representing a document that we wanted to measure on the semantic scale. The semantic similarity between the
vectors is measured as the cosine of the angle of the vectors. Since the lengths of the vectors were normalised to one, the cosine of the angle was calculated as the sum of the pairwise multiplication of each semantic dimension. Hence, if the vectors were identical the value was +1 and if exactly opposite the value was -1, and if unrelated, zero. Thus, 1 signifies extremely high similarity/relatedness, and 0 signifies no relatedness. However, while calculating the difference vectors, we removed the document that we wanted to measure on the semantic scale. This was necessary to avoid bias that otherwise would occur when the document to be measured was included in the difference vector. Thus, the difference vector was slightly different for each document that was measured. The semantic scale of each document was simply the semantic similarity between this document and the difference vector, where a positive value indicate a resemblance to set one, and a negative value a resemblance to set two.

Third, we calculated the appropriate statistic on the semantic scale. To measure whether the two sets of documents differed in the semantic scale we used a two tailed t-test, where p < 0.05 indicated a significant result. To measure the size of the difference we calculated z-values (z), by subtracting the mean value of the second set from the mean value of the first set and dividing the resulting value by the pooled standard deviation.

5 RESULTS AND DISCUSSION

The following results are presented and discussed: first, the semantic similarity between annual reports and annual summaries of press releases respectively, comparing all pairwise years and the consecutive development; second, the identification and measurement of significant keywords of pairwise years.

5.1 Semantic similarity of annual reports

In analysing the annual reports we used words rather than documents as the underlying unit of analysis simply because statistics could not be based on a single data point as only one report is related to each year. For example, if year 2005 consisted of 10,000 words then a set of data (e.g. set 1) consisted of the 10,000 semantic vectors representing these words. The results are presented by all pairwise combinations of years (Figure 1) and by changes across consecutive years (Figure 2).

First, the results show that the semantic similarity scores (s) diminish gradually over time between the annual reports (AR) from 2001 to 2010, indicating a change in the semantic content (i.e. inherent meaning of words and narratives) across time. Figure 1 illustrates the semantic similarity score of each year in relation to the preceding and following years as well as in relation to itself (s=1.0). The semantic content of annual report 2001 (AR 2001) is identical to itself (s=1.0), highest in similarity to AR 2002 (s=0.9999), and lowest in similarity compared to AR 2010 (s=0.9958). The results show high significance. The similarity score between 2001 and 2010 rendered a p-value of 0.000 and z-value of 86.697. The analysis further shows that the semantic similarity between directly preceding or following years is the highest: AR 2004 is most similar to AR 2003 (s=0.9993) and 2009 to 2010 (s=0.9991). The semantic content in annual reports between 2001 and 2004 have the lowest similarity to AR 2010, and the annual reports between 2005 and 2010 have the lowest similarity with AR 2001 (i.e. the semantic distance becomes greater relative to the first year and progressively closer to the last year).

Figure 1: Semantic similarity scores (s) of annual reports (AR) 2001-2010
Second, Figure 2 shows that changes in semantic content across consecutive years differ. The semantic similarity scores between years can be seen as a measure of semantic change, sometimes called “coherency” (Foltz, Kintsch, & Landauer, 1998). Figure 2 illustrates the semantic similarity of consecutive years, where each year is related to the following year. Hence, the semantic similarity score between 2001 and 2002 is \( s = 0.9990 \), between 2002 and 2003 is \( s = 0.9995 \), etc. The results show a higher semantic similarity between 2002-2003 (\( s = 0.9995 \)) and 2007-2008 (\( s = 0.9989 \)), and lower similarity between 2004-2005 (\( s = 0.9989 \)) and 2006-2007 (\( s = 0.9989 \)). The lowest similarity score is between 2008 and 2009 (\( s = 0.9985 \)), which shows a significant value (\( p = 0.000 \); \( z = 38.5 \)).

**Figure 2: Semantic similarity scores (s) of consecutive years, annual reports (AR) 2001-2010**

In summary the semantic development in annual reports yielded a gradual variation of the semantic content ranging from \( s = 0.9958 \) to 1.000. If we compare the results of the quantitative latent semantic analysis (LSA) with the findings from interviews and documentation in the qualitative study (see brief summary, section 3) the low semantic similarity between 2001 and 2010 (as shown in Figure 1) and gradual shift (Figure 2) may not be surprising. The semantic distance does become greater relative to the first year and progressively closer to the last year. Seeing the company’s semantic development over the years, also considering the financial results, this could be interpreted as a continuous or incremental strategic change.

An examination of the actual content of the annual reports reveals that there is a notable difference in terms of themes, expressions and highlights that are in line with the results of the consecutive development (Figure 2). The three lowest points of semantic similarity between the years shown in Figure 2 are of interest (see 2005, 2007 and 2009). Firstly, in 2004 in line with the revised strategy, ‘market orientation’ was emphasised for the first time with a separate chapter in the annual report on ‘Customer focus’. In the following year, 2005, a new CEO arrived and the company experienced a decrease in turnover and negative margins. This indicates that the lower similarity can be explained by the difference in semantic content between the years (and the ‘dip’ in 2005). It could also be interpreted as the focus on ‘market orientation’ becoming secondary in times of organisational changes and financial turbulence. 2006 (similar to 2004) was characterised by the introduction and communication of a new strategy with an increased emphasis on customer-focused development. The following year’s annual report, 2007, communicated the efforts to implement the new strategy, with an increased focus on environmental and sustainable development issues and new business initiatives. The low similarity with 2006 was therefore surprising; however, a closer look revealed the equally continued concentration on production efficiency and cost reductions, which are prerequisites, but not drivers for market orientation per se in terms of customer focused language. Finally, 2009 is the year after the 2008 financial crisis, and the time when the company communicated their vision and sustainability targets for the first time, as well as launching a new product, which was much communicated.

### 5.2 Semantic similarity of press releases

We measured the semantic scale between all pairwise combinations of press releases aggregated over a year (i.e. 2001-2010), where the press releases were the unit of analysis. The results are presented in Figures 3 and 4. The preferred level of analysis for conducting the statistical analysis was on the level of press releases because it answers the question whether the results can be generalised across units of press releases. In the annual report analysis described above, it was not possible to use annual reports as the underlying units of analysis because there is only one annual report available each year, so that the pooled variance in the t-test could not be calculated.
First we illustrate the semantic similarity score between the years based on the press releases for each year in relation to the preceding and following years as well as in relation to itself (Figure 3). Hence, the results show the semantic content of press releases 2001 (PR 2001) is identical to itself ($s=1.0$), highest in similarity to PR 2002 ($s=0.9024$), with the lowest similarity to PR 2009 ($s=0.1627$). The similarity score between 2001 and 2009 rendered a $p$-value of 0.000 and $z$-value of 9.099. In summary, the years 2001 and 2002 appear to be exceptions in semantic content compared to the other years. PR 2003 through PR 2010 all show the lowest similarity score in comparison with 2001 with appropriate levels of significance. Where the annual reports showed a gradual and limited change of semantic content over the years, the differences indicated through the press releases were more dramatic, considering also the greater variance of actual similarity scores ranging from $s=0.1627$ to 1.000 (compared to $s=0.9958$ to 1.000 for annual reports).

Figure 3: Semantic similarity scores ($s$) of press releases (PR) 2001-2010

The semantic similarity between consecutive years based on press releases yields an equally more varied picture (Figure 4) than the corresponding development in annual reports (Figure 2). As shown in Figure 4, there is a significant change in semantic similarity between 2002 and 2003 ($s=0.69$, $z=2.52$); however no other consecutive years show statistically significant differences. 2002 and 2003 were also statistically different from all subsequent years (2004-10). Finally, 2003 differed from 2007, 2009, and 2010, and 2004 differed from 2009 and 2010.

Figure 4: Semantic similarity scores ($s$) of consecutive years, press releases 2001-2010

In summary the semantic changes in press releases across years shows a significant change between 2002 and 2003, and there were no differences between other subsequent years (Figures 3 and 4). These results could not be directly compared with the results from the annual report, because the statistics in the annual reports were based on words as the underlying unit of observation.
However, studying the actual content of the press releases yielded a difference in themes and highlights, in line with the results of the consecutive development (Figure 4). The significant dip in 2003 with a low semantic similarity compared to 2002 can be understood through the sole focus on financial communication in the two preceding years. While financial communication is aimed for the (financial) market, the language is restricted in the sense that it has to adhere to the format for financial communication of a listed company. In 2003, an acquisition and product launch contributed to differentiating the semantic content. Interestingly, there is no dip in the consecutive semantic development in annual reports (Figure 2). A potential explanation for this is the differences in content and purpose of annual reports and press releases. Press releases are predominately financial statements, interim reports or related messages (128 out of 194 in the study) and limited in text aimed at relevant stakeholders, particularly on the financial market. The annual reports on the other hand allows for more elaborate descriptions and an opportunity to, in retrospect, prioritise areas to highlight with the exception of fulfilling legal requirements for the financial reporting. It is aimed at a broader audience. Furthermore, press releases are bound to show greater variance given that they are more event driven whereas annual reports provide summaries. The dip in 2007 (i.e. low semantic similarity with 2006), even if not significant, corresponds with that of the annual report. The consecutive similarities between the years (2007 to 2010) are notable in that they show an increased number of press releases communicating product and service launches, alliances, cooperation projects with customers and product awards and personal statements compared to previous years.

5.3 Significant keywords across the years
A further analysis of the semantic content in annual reports was made by identifying significant keywords of pairwise years. This was done by first making a frequency count of the words in the annual reports and then comparing these frequencies to words in the corpus used for generating the semantic representation (i.e. constituting a norm of word frequencies). We selected the 100 most overrepresented words in the annual reports, by making a chi-square test for each unique word, and where all the selected words were significantly overrepresented following Bonferroni corrections for multiple comparisons. These 100 keywords were selected as a set of words to compare text related to one year in relation to another year (see Table 2). This analysis was carried out using the chi-square test with the Bonferroni correction method just described. Hence, the analysis was limited to the 100 most overrepresented words, rather than all words in the reports. Table 2 (to be read horizontally) shows all significant words for 2001 compared to 2010, 2005 compared to 2001 and 2010, and finally 2010 compared to 2001 and 2005.

Comparing the significant keywords across the years provides a further indication of the semantic development. From significant keywords of ‘turnover’, ‘investments’, ‘segments’, ‘tonnes’, ‘production’ in 2001, to ‘customer’ entering in 2005, albeit still communicating cost-reduction measures and investments in production processes through ‘electricity’, ‘wood’, etc. The keywords for 2010, in relation to previous years, are primarily related to the company’s offering, the market and sustainability positioning, which can be seen as a result of the strategic change initiated in 2004 and in 2006.

Table 2. Significant keywords of pairwise year and their chi-square test scores with Bonferroni correction

<table>
<thead>
<tr>
<th></th>
<th>AR 2001</th>
<th>AR 2005</th>
<th>AR 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>turnover</td>
<td>n/a</td>
<td></td>
<td>22.2</td>
</tr>
<tr>
<td>investments</td>
<td>19.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>segments</td>
<td>15.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>tonnes</td>
<td>15.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>production</td>
<td>13.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>currencies</td>
<td>11.8</td>
<td></td>
<td></td>
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<tr>
<td>stora</td>
<td>11.8</td>
<td></td>
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<tr>
<td>enso</td>
<td>10.5</td>
<td></td>
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<td>kraft</td>
<td>9.1</td>
<td></td>
<td></td>
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<tr>
<td>costs</td>
<td>32.0</td>
<td>43.7</td>
<td></td>
</tr>
<tr>
<td>electricity</td>
<td>24.1</td>
<td>20.0</td>
<td></td>
</tr>
<tr>
<td>wood</td>
<td>23.0</td>
<td>19.1</td>
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</tr>
<tr>
<td>sacks</td>
<td>12.9</td>
<td>15.5</td>
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<tr>
<td>boilers</td>
<td>10.2</td>
<td>14.8</td>
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</tr>
<tr>
<td>customer</td>
<td>9.8</td>
<td>10.9</td>
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<tr>
<td>coated</td>
<td></td>
<td>10.9</td>
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</tr>
<tr>
<td>demand</td>
<td></td>
<td></td>
<td>17.9</td>
</tr>
<tr>
<td>packaging</td>
<td></td>
<td></td>
<td>13.1</td>
</tr>
<tr>
<td>solutions</td>
<td></td>
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<td>10.6</td>
</tr>
<tr>
<td>fossil</td>
<td></td>
<td></td>
<td>sek</td>
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<tr>
<td>sustainable</td>
<td>11.8</td>
<td></td>
<td>9.8</td>
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<tr>
<td>sustainability</td>
<td>11.8</td>
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<td></td>
</tr>
<tr>
<td>renewable</td>
<td>10.8</td>
<td></td>
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</tr>
</tbody>
</table>
Summarizing the presentation of results and discussion thereof, the results provided some surprises in relation to the qualitative findings. One example is the difference between the years 2006 and 2007 (Figure 2). Where the qualitative study (based on document analysis and interviews) concluded that the revised strategy in 2006 was followed by similar expressions and development of product and service launches and new business initiatives in 2007, the LSA pointed to an equal emphasis on a continued focus on process efficiency and cost reductions hence showing less semantic similarity than was first concluded. Moreover, the overall trend of the semantic development – where the semantic distance becomes greater relative to the first year and progressively closer to the last year – is equally interesting from the perspective of strategic change indicating a gradual and continuous change, or logical incrementalism (Quinn, 1978). This development is further enhanced given the resulting significant keywords, based not only on frequency but also on the semantic representation of these words. At the same time, given the inherent meaning of these words (Table 2) equally raises the question of a more revolutionary change (Hamel, 1996) given the particular industrial setting and strategic change at hand.

Applying LSA to annual reports and press releases, which yielded somewhat different results that required different levels of analysis (i.e. words and document level), draws the attention to the different nature and purpose of corporate communication. Comparing the evolving semantic content between the two sources (Figures 2 and 4) begs the question whether these artefacts of corporate communication, and their semantic content, communicate change (i.e. are an effect of a strategic change) or if they influence change explicitly (aimed communication) or implicitly (through communication that might be required legally). Where the semantic content in annual reports in this particular case could be seen as an effect of strategic change, and a gradually developing one, the press releases may qualify as a representative of both. As noted in the literature, both are tools for corporate communication, written in adherence with legal and stock exchange requirements and/or with the aim to communicate a predetermined message to relevant stakeholders (Fiol, 1995; David, 2001). However, annual reports allow for more elaborate descriptions of important events, prioritised focus areas and more. Press releases are shorter in form, often event driven for reasons of legal of financial reporting requirements and/or with the objective to communicate a new product launch or collaboration.

6 CONCLUSIONS, EXTENDED DISCUSSION AND SUGGESTIONS FOR FUTURE RESEARCH

Summarising the presentation and discussion of results, a number of issues are of particular interest in relation to the aims of the study. Firstly, by quantifying the semantic content of the annual reports and press releases we have examined and statistically evaluated the semantic development, with several significant results. Secondly, having used LSA for the first time in this particular setting and study of strategic change we have demonstrated that it can be a helpful method in further analysing and contrasting qualitative findings in case study research. It can also serve as a starting point for a longitudinal qualitative study of strategic change, providing indications of variations to consider on both an aggregated level and in relation to significant keywords and/or particular time periods.

We conclude that in this particular case the semantic content changed significantly over the time period covered, expressed through texts, and that an LSA as a quantitative method can be a complementary guide in a longitudinal qualitative study of strategic change. However, given the limited variation in semantic similarity scores over the years in annual reports (Figures 1 and 2), albeit statistically significant, indicate that strategic change may be limited expressed through the semantic content of corporate communication. Further and comparative research between actors and cases are important for future references.

Discussing the findings one step further, the theoretical implications of this study are related to the field of strategic management (i.e. strategic change) and case research. Firstly LSA opens up new ways of measuring strategic change. For example, testing and measuring an organisation’s relative emphasis on market and non-market oriented cultural artefacts, such as customer-focused language and employee narratives as suggested by Homburg and Pflesser (2000) could yield novel answers to how strategic change is managed over time. This is of particular relevance given the traditional ways of measuring strategic change. While the rational and classical approaches to strategy and strategic change build on efficiency and achievement of objectives of (financial) profit maximisation, the processual or political approach (see e.g. Dufour & Steane, 2006; Whittington, 1997) acknowledge pluralistic outcomes (i.e. other than profit max). Through these perspectives, other ways of measuring strategic change towards for example increased market orientation and innovation can be argued for. Homburg and Pflesser (2000) argue the importance of cultural artefacts (e.g. customer focused language) as an important prerequisite for translating new norms for market orientation to actual market oriented behaviours. Hence, applying LSA in studies of strategic management and change provides new possibilities for identifying new findings and for operationalising and testing previous qualitative findings as well as provide opportunities for triangulation and validation in otherwise qualitative case study research. From the perspective of cognition and learning (Argyris, 1989; Brown et al., 1989), a measure of the semantic development over time may be an indicator of whether an organisation learns and adopts a new intended strategy and it’s market oriented (or other) language, or just “learns about it”.

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For practice and management, the findings indicate that the use of LSA can serve as a complementary quantitative measure to for example financial results to measure the cognitive change (expressed through language), argued necessary in strategic change. The application of LSA could thus provide a benchmark to financial reports which does not capture and on-going cognitive change in an organisation. Furthermore, LSA could serve as a tool to measure the degree of coherence and/or non-coherence between individuals in management groups and other teams in relation to strategy implementation and innovation through operationalising the findings by Kellermans et al. (2011) and adding to the findings by Dong (2005) and Yang Helander (2007).

It should be noted that the study was limited to one case and the type and amount of data found in annual reports and press releases. This is why continued research using LSA in the areas of strategy and change is recommended. We welcome similar applications of LSA as the one performed here, as well as studies encompassing larger amounts of data. Even though our results were largely significant, statistical methods benefit from more data.

Hence, beyond corporate communication, other written material, interview transcripts and media clips may be used. The number of actors can naturally also be extended, opening for comparative case studies within and between industries as well as studies at group and individual levels. One example would be to apply LSA to management teams similar to studies performed by Dong (2005) and Yang and Helander (2007). A possible avenue could be to further develop the notions suggested by other authors, such as Kellermans et al. (2011), who argue that a high degree of strategic consensus in management groups improves strategy implementation in stable environments, with the likelihood of opposite effects in dynamic business environments. In applying LSA one could measure the semantic similarity between verbal expressions of individual actors (management team members) in relation to the strategic intent and with regard to the external environment.

Seeing that strategic change taps into the assumption and need for cognitive change, continued use of LSA would be most interesting to increase the understanding of how, if, why and when change occurs measured through semantic content of verbal and written, internal and public communication and documentation.

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Using Delphi technique to build consensus in practice

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Abstract

This paper focuses on the use of Delphi technique in building consensus in practice. More specifically, it reviews some fuzzy issues regarding the expert’s panel selection and the questionnaire design, while it provides two case examples for the consensus measurement. Hence, examining some controversies, it makes obvious that the purpose of the study and the homogeneity of the sample are crucial factors when designing the Delphi procedure. However, what still remains unclear is the approach in measuring consensus, which varies from study to study. In this case, the present paper recommends a complementary use of three measures to assess consensus, since each one separately could not be thought of as a good proxy of it. These measures are: (i) the interquartile range, (ii) the standard deviation and (iii) the 51% percentage of respondents lying in the ‘highly important’ or ‘strongly agreeing’ category.

Keywords: Delphi method, methodological problems, consensus building, application, research guidelines
1 INTRODUCTION

Delphi technique was firstly introduced by Rand Corporation in 1950 and evolved as a ‘consensus’ tool in 1970. It was based on the assumption that ‘group judgments’ are more reliable than individual’s and has applications on various sectors, such as public health, public transportation, education etc. (Dalkey, 1969; Kittell-Limerick, 2005: 55). This technique is preferred as a problem solving or policy making tool when the knowledge about a problem or a phenomenon is incomplete and is used with the aim of obtaining the most reliable group opinion (Adler & Ziglio, 1996; Kittell-Limerick, 2005: 53; Kreitner & Kinecki, 1992). Thus, Delphi is used in forecasting tasks when there is no appropriate or available information and is based on the assumption that “N+1 heads are better than one” (Hill, 1982; Nerantzidis, 2012; Rowe & Wright, 2001).

Delphi has been criticized for ‘apparent consensus’ (Rowe & Wright, 1999: 363). However, it is supported that consensus is not forced but elicited (Shields, Silcock, Donegan, & Bell, 1987), with the results being conducted and recorded through a focused conversation, without the disadvantages of the interpersonal conflict (Agwe & Sharif, 2007; Dalkey & Helmer, 1963; Landeta, 2006).

Even if this method measures the consensus, there is no common practice regarding the statistical analysis of the results, with this approach varying from study to study (Landeta, 2006). In addition, critics about its lack of accuracy and reliability check are also existent (see Landeta, 2006). Undoubtedly, the aim of this paper is to provide practical assistance to management or business researchers in designing and applying the Delphi technique. For this reason, the purpose of the case examples presented is to clarify the way of reaching consensus among experts. Hereafter, the main characteristics of Delphi technique along with the questionnaire design, the expert’s panel selection and the consensus measurement are described, whilst 32 prior empirical studies in the field of management and business are presented in order to record a trend on these issues. Finally, two case examples are provided for an in depth understanding.

2 DELPHI PROCEDURE

2.1 Background

Delphi technique is considerably desirable to reach consensus on a field where a lack of agreement or incomplete knowledge is evident. Its application is primarily based on anonymity, giving the opportunity to participants to express their opinions freely, eliminating any possible personal conflict (Christie & Barela, 2005; Dalkey, 1969; Linstone & Turoff, 1975; Skulmoski, Hartman, & Krahn, 2007). Respectively, it is characterized for (i) iteration, which allows participants to reconsider and refine their opinion, (ii) controlled feedback, which provides them with information about the group’s perspectives in order to clarify or change their views and (iii) statistical response, to represent the group’s views quantitatively (Dalkey, 1969; Landeta, 2006; Rowe & Wright, 1999; Shields et al., 1987; Skulmoski et al., 2007).

However, two of the most fundamental issues in Delphi application are related with the questionnaire design and the expert’s panel selection. The former is referred to the Likert scale choice and the number of rounds, while the latter to the panel size, its main characteristics and the response rate.

2.2 Questionnaire design

Of the first priorities when conducting such a research, is to decide upon the questionnaire structure and the appropriate rounds. On the one hand, the Likert scale choice depends on the study’s purpose. This means that when the researcher wants to identify between three situations, a 3-Likert scale is used, while when he/she attempts to assess the degree of agreement, he/she usually chooses a 10-point one (Christie & Barela, 2005). On the other hand, the Delphi rounds are not an easy task as they are usually related with the group size. This means that, although Delphi is a repeated process of ‘feedback’ until consensus is reached, in most cases – when the sample is small – no more than one round may be needed (Mullen, 2003). However, a minimum of two rounds is required in order to allow feedback and ‘revision of responses’ (Butterworth & Bishop, 1995; Christie & Barela, 2005; Gallagher, Branshaw, & Nattress, 1996; Mullen, 2003). Respectively, there are also cases where three rounds are usually recommended (for large samples, >30) (Christie & Barela, 2005; Dalkey, Rourke, Lewis, & Snyder, 1972; Helmer, 1967; Linstone & Turoff, 1975). Nevertheless, the scope of the study, for example when the goal is to understand the ‘nuances’, and the sample homogeneity may accept a smaller number; i.e. less than 3 rounds (Skulmoski et al., 2007). Undoubtedly, it is up to the researcher
to choose his/her study rounds, while, according to Landeta (2006: 479), he/she may prefer to sacrifice rounds in order to “guarantee panel participation and continuity”.

2.3 Experts’ panel

When constructing the experts’ panel it is important to consider that their experience (‘expertise’) or knowledge (‘knowledgeability’) determines the reliability and validity of the results (Adler & Ziglio, 1996; Kittell-Limerick, 2005: 53; Rowe & Wright, 1999). Hence, the experts should satisfy four requirements: (i) to acquire knowledge and experience through investigation, (ii) to be willing to participate, (iii) to have sufficient time (to participate) and (iv) to possess effective communication skills (Adler & Ziglio, 1996; Skulmoski et al., 2007). In any case, ‘knowledgeable persons’ could be identified either through literature search or recommendations from institutions and other experts, demanding techniques of purposive and snowball sampling (for more information, see Bryman & Bell, 2011: 192-193; Saunders, Lewis, & Thorhill, 2009: 237-240).

In addition, two more important factors, when conducting Delphi technique, are the panel size and the response rate. In both cases, there are not strict rules. It is referred that the group size is highly related to the purpose of the investigation (Cantrill, Sibbald, & Buetow, 1996; Mullen, 2003) and the response rate may be ranging between the different disciplines, according to the participants’ research interest (Mason & Almandari, 2007). However, it is evident that the group error reduces and the decision quality is reinforced as the sample increases (Skulmoski et al., 2007); Although the sample ranges from 7 to 30 (Armstrong, 1985; Cavalli-Sforza & Ortolano, 1984; Dalkey, 2003; Mullen, 2003; Phillips, 2000; Turoff, 1970), the ‘drop-out’ rate is higher in large groups (Reid, 1988). In any case, it is believed that a sample size of 20 tending to retain the members (Mullen, 2003). Undoubtedly, what determines the panel’s size selection is the homogeneity, since in this case a sample of between 10 to 15 people can yield sufficient results (Skulmoski et al., 2007) and assure validity (Listone & Turoff, 1975).

3 MEASURING CONSENSUS

Although the principal aim of Delphi technique is to reach consensus among the participants, still a common practice to measure it does not exist. Hence, there are studies that measure agreement through frequency distributions and others using the standard deviation or the interquartile range. In the first case, the percentage of responding to any given category is defined, according to the participants’ research interest (Mason & Almandari, 2007). However, it is evident that the central tendency (Binning, Cochran, & Donatelli, 1972; Kittell-Limerick, 2005), as well as the coefficient of variation (i.e. the division of the standard deviation with the mean), denoting the observations’ homogeneity, and the mode, representing the most frequently occurred value (Gupta & Waymire, 2008: 104; Saunders et al., 2009: 444-448).

4 PRIOR EMPIRICAL STUDIES USING DELPHI TECHNIQUE

In this part, a number of studies, using Delphi technique, between years 1975 to 2013 in the scientific fields of management and business were chosen. These studies are summarized in table 1 focusing on the way they used Delphi and providing implications for the most controversial issues of the panel size, the Likert scale, the measure of consensus and the Delphi rounds.

More specifically, in the first two columns the authors (in chronological order) and the country of research are referred. From the total 32 studies analyzed here, 11 were conducted in Europe. 9 in USA, 4 in Canada, 3 in Asia, 2 in Africa and 1 in Australia; while 2 were cross-national.

The third column depicts the participants in every study, showing that the majority uses a number up to 30 experts, namely 18 out of 32 studies. In these 18 studies of Delphi 10 used the opinion of less than 20 experts. However, there are studies using more than 30 experts, with the number ranging between 30 and 50 participants in 5 studies and between 50 and 100 in 4 more. Also, there are 5 studies which used an even greater number of participants, i.e. >100.

Focusing on the Likert point scale (fourth column of table 1), it is obvious that 10-point and 5-point scales are the most common, since these are used by the 29 out of 32 studies (14 studies using a
10-point scale and 15 studies a 5-point one). Nevertheless, the most important in the Likert point scale selection is the aim of the study. What can be extracted by the use of the Likert point scale, is that a 10-point one is used when the level of importance is investigated, since from the 14 studies which used the 10-point scale, 11 measured the importance while from the 15 studies that used the 5-point scale, only 3 did so. On the other hand, when the level of agreement is investigated, or in case of increase/decrease measurement, a 5-point scale is most common. This could be inferred by the fact that 5 out 15 studies used a 5-point scale to investigate the level of agreement and 3 the level of decrease/increase, while only 1 out of 14 studies which used a 10-point scale measured the level of agreement.

The fifth column shows the measure of consensus with the majority of studies (12 out of 32) using the standard deviation. An also common measure of consensus is the interquartile range which in many cases is used supplementarily with standard deviation, or with median, or with a specific percentage of the participant responding to a given category, as for example the percentage of experts responding to the 'strongly agreeing' category, or the percentage of experts responding to the 'highest priority' category etc. However, there are also cases using only the percentage of the participant responding to a given category as an exclusive measure of consensus, others using the coefficient variation and others implementing the Kendall’s coefficient W. Also, there are studies combining the standard deviation with the coefficient variation, or the standard deviation with the mean, or even more the interquartile range with the standard deviation and the median, or the interquartile range with the median and the percentage of the participant responding to a given category.

Finally, focusing on the number of rounds implemented for reaching consensus, the last column shows that the majority needed 2 or 3 rounds. From the 32 studies presented in table 1, 17 reached consensus after two rounds, 11 after three rounds, 2 after four rounds, 1 after five rounds and an additional one used a combination of two panels, reaching consensus in the 2\textsuperscript{nd} and the 4\textsuperscript{th} round respectively.
<table>
<thead>
<tr>
<th>No</th>
<th>Authors</th>
<th>Research scope</th>
<th>Country</th>
<th>Participants</th>
<th>Likert-scale</th>
<th>Measure of consensus</th>
<th>Delphi Rounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lamb (1975)</td>
<td>This study appraises 12 research projects in the field of electricity utilization by using Delphi combined with benefit/cost rankings</td>
<td>Canada</td>
<td>160</td>
<td>10-point</td>
<td>IR</td>
<td>2 rounds</td>
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<tr>
<td>2</td>
<td>Ley &amp; Anderson (1975)</td>
<td>The Delphi technique was used to forecast the urban development of Nanaimo, British Columbia along a range of physical, social and political dimensions.</td>
<td>Canada</td>
<td>52</td>
<td>5-point</td>
<td>IR</td>
<td>2 rounds</td>
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<td>3</td>
<td>Kaynak &amp; Macaulay (1983)</td>
<td>Gather data concerning the factors that will influence the future growth of tourism</td>
<td>Europe (Scotia)</td>
<td>1st round: 111/150, 2nd round: 44/60</td>
<td>5-point (significant decrease to significant increase)</td>
<td>SD²</td>
<td>2 rounds</td>
</tr>
<tr>
<td>4</td>
<td>Nelms &amp; Porter (1985)</td>
<td>This study estimates the maximum possible impact that technology could have on clerical productivity as well as the actual expected impact.</td>
<td>USA (Atlanta, Georgia)</td>
<td>10</td>
<td>n/d3</td>
<td>SD, IR, median</td>
<td>2 rounds</td>
</tr>
<tr>
<td>5</td>
<td>Fish &amp; Piercy (1987)</td>
<td>This study used Delphi to examine the similarities and differences in the theory and practice of structural and strategic family therapy</td>
<td>USA</td>
<td>32</td>
<td>7-point for agreement</td>
<td>IR, median</td>
<td>3 rounds</td>
</tr>
<tr>
<td>6</td>
<td>Green, Hunter &amp; Moore (1990)</td>
<td>Assessment of the environmental impacts stemming from tourist projects.</td>
<td>Europe (UK)</td>
<td>Preliminary stage: 40, 1st Round: 31, 2nd Round: 21</td>
<td>n/d</td>
<td>SD and CV⁴</td>
<td>2 rounds &amp; a preliminary stage</td>
</tr>
<tr>
<td>7</td>
<td>Niederman, Branchseau &amp; Wetherbe (1991)</td>
<td>The study uses Delphi to determine the most critical issues in Information Systems (IS) management. For this reason the importance of 25 issues was investigated.</td>
<td>USA</td>
<td>1st round: 114/241, 2nd round: 126/241, 3rd round: 104/175</td>
<td>10-point (least important to most important)</td>
<td>SD</td>
<td>3 rounds</td>
</tr>
<tr>
<td>8</td>
<td>Kaynak, Bloom &amp; Leibold (1994)</td>
<td>This study uses Delphi to analyze the future of tourism in South Africa by investigating factors which will influence the future growth of the tourism industry</td>
<td>South Africa</td>
<td>1st round: 50/100, 2nd round: 37/50</td>
<td>5-point (significant increase to significant decrease) and 10-point (non important to critically important)</td>
<td>SD</td>
<td>2 rounds</td>
</tr>
<tr>
<td>#</td>
<td>Author(s)</td>
<td>Description</td>
<td>Country</td>
<td>N</td>
<td>Scale</td>
<td>% of Experts Responding to Categories</td>
<td>Rounds</td>
</tr>
<tr>
<td>----</td>
<td>---------------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>---------</td>
<td>-----</td>
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</tr>
<tr>
<td>10</td>
<td>Greninger et al. (2000)</td>
<td>Delphi was used to determine retirement planning guidelines: to ascertain retirement planning considerations and guidelines, to determine if a consensus of opinion existed or could be established and to determine what differences in opinions might exist.</td>
<td>USA</td>
<td>188</td>
<td>5-point (definitely do not agree to strongly agree)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Hayne &amp; Pollard (2000)</td>
<td>Assessing the importance of 23 issues in Information Systems (IS) management.</td>
<td>Canada</td>
<td>157</td>
<td>10-point (least important to most important)</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Miller (2001)</td>
<td>The study used Delphi technique in order to develop indicators to measure the movement of the tourism product at a company/resort level towards a position of greater or lesser sustainability. More specifically, the author ascertained the opinion of experts on indicators presented to measure movement towards sustainable tourism.</td>
<td>Europe</td>
<td>2 rounds</td>
<td>5-point (strongly disagree to strongly agree)</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Keil, Tiwana &amp; Bush (2002)</td>
<td>The study explores the issue of IT project risk from the user perspective and compares it with risk perceptions of project managers.</td>
<td>USA</td>
<td>15</td>
<td>10-point of importance</td>
<td>Kendall’s coefficient of concordance (W)</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Hackett, Masson &amp; Phillips (2006)</td>
<td>The study explores levels of consensus among practitioners about good practice in relation to youth who are sexually abusive.</td>
<td>Europe (UK &amp; Ireland)</td>
<td>78</td>
<td>10-point (strongly disagree to strongly agree)</td>
<td>IR, median, % of strongly agreeing statement (8-10 and 4-5)</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Kaynak &amp; Marandu (2006)</td>
<td>The study explores the most probable scenario for the tourism industry in Botswana by the year 2020. For this experts commended on the extent of changes in societal values and ranked the expected impact these changes would have on the industry.</td>
<td>Africa (Botswana)</td>
<td>2 rounds</td>
<td>5-point (significant decrease to significant increase) and 10-point (no impact at all to very high impact)</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Ku Fan &amp; Cheng (2006)</td>
<td>The study uses Delphi technique in order to identify the needs for continuing professional development for life insurance sales representatives and to examine the competencies needed by those sales representatives.</td>
<td>Asia (Taiwan)</td>
<td>10</td>
<td>5-point (strongly disagree to strongly agree)</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Saizarbitoria (2006)</td>
<td>The scope of this study was to analyze the influence on companies’ performance of the two most important models for Quality Management practice, using Delphi technique.</td>
<td>Europe (Spain)</td>
<td>27</td>
<td>11-point</td>
<td>IR, median</td>
<td></td>
</tr>
</tbody>
</table>

70
<table>
<thead>
<tr>
<th>Study Reference</th>
<th>Authors</th>
<th>Title</th>
<th>Methodology</th>
<th>Region(s)</th>
<th>Rounds</th>
<th>Consensus Criteria</th>
<th>Agreement Threshold</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 Mason &amp; Alamdari (2007)</td>
<td>Lefkothea Giannarou and Efthimios Zervas</td>
<td>The paper used Delphi to forecast the structure of air transport in EU in 2015 in respect of network carriers, low cost airlines and passenger behavior. For this reason the experts were required to agree or disagree with 27 statements.</td>
<td>EU</td>
<td>26/61</td>
<td>5-point</td>
<td>A 75% of agreement as a “broad consensus” threshold.</td>
<td>2 rounds</td>
<td></td>
</tr>
<tr>
<td>19 Chang et al. (2008)</td>
<td>Delphi was used to assess the importance of ERP life cycle activities</td>
<td>Asia (Taiwan)</td>
<td>1st round: 27/40 2nd round: 24</td>
<td>10-point for importance</td>
<td>SD</td>
<td>2 rounds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 Czinkota &amp; Ronkainen (2008)</td>
<td>The scope of the study was to identify international business dimensions subject to change in the next 10 years and highlight the corporate and policy responses to these changes</td>
<td>Africa Asia Europe America</td>
<td>34</td>
<td>10-point (very low impact to very high impact)</td>
<td>n.d.</td>
<td>3 rounds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21 Nakatsu &amp; Iacovou (2009)</td>
<td>They investigated the importance of 25 risk factors of outsourced software development from a client perspective in domestic and offshore settings</td>
<td>USA</td>
<td>1st round: 29/32 2nd round: 26/32 3rd round: 27/32</td>
<td>10-point (unimportant to very important)</td>
<td>SD</td>
<td>3 rounds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22 Lee &amp; King (2009)</td>
<td>The study proposes a guiding framework for the future development of hot springs tourism in Taiwan, drawing upon factors influencing the competitiveness of the sector.</td>
<td>Asia (Taiwan)</td>
<td>1st round: 31/36 2nd round: 28/31 3rd round: 26/28</td>
<td>5-point for importance</td>
<td>IR&lt;1 &amp; 80% responded to categories “highest priority” (mean score above 4.5) and “important elements” (mean score between 4 and 4.49)</td>
<td>3 rounds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23 Asonitis &amp; Kostagiolas (2010)</td>
<td>Delphi technique was employed to highlight the most important library services for the central Greek public libraries.</td>
<td>Europe (Greece)</td>
<td>1st round: 11/12 2nd round: 9/12</td>
<td>10-point for importance</td>
<td>CV</td>
<td>2 rounds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24 Geist (2010)</td>
<td>Evaluating the importance of organizational goals and a follow-up survey asking questions about the ease of use, the merit or value and enjoyment</td>
<td>USA</td>
<td>Paper-pencil delphi: Round 0: 14/30 Round 1: 16/30 Round 2: 12/30 Round 3: 13/30 Real-time Delphi: Round 0: 10/30 Round 1: 11/30</td>
<td>7-point (not important to very important 5-point (strongly disagree to strongly agree)</td>
<td>SD, IR</td>
<td>4 rounds &amp; 2 rounds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference</td>
<td>Authors</td>
<td>Country</td>
<td>Round 1</td>
<td>Round 2</td>
<td>Round 3</td>
<td>Round 4</td>
<td>Round 5</td>
<td>Methodology</td>
</tr>
<tr>
<td>-----------</td>
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<td>---------</td>
<td>---------</td>
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<td>-------------</td>
</tr>
<tr>
<td>Hussein (2010)</td>
<td>The study examines Corporate Social Responsibility (CSR) theorists’ criteria from the corporate executive’s perspective. For this reason it uses Delphi technique in order to identify specific criteria recognized and used by organizational executives vital to evaluating CSR.</td>
<td>USA</td>
<td>26/35</td>
<td>27/35</td>
<td>25/35</td>
<td>5-point for importance</td>
<td>IR &lt; 1.2</td>
<td>3 rounds</td>
</tr>
<tr>
<td>Culley (2011)</td>
<td>This study uses Delphi to evaluate the efficacy of using online computer, Internet and e-mail applications.</td>
<td>USA</td>
<td>18</td>
<td></td>
<td></td>
<td>7-point (not useful to very useful)</td>
<td>IR ≥ 70% agreement</td>
<td>2 rounds</td>
</tr>
<tr>
<td>Giannarakis, Litaras &amp; Theotokas (2011)</td>
<td>The paper identifies both general and sector-specific indicators in order to measure the Corporate Social Responsibility (CSR) performance in Telecommunication sector.</td>
<td>Europe (Greece)</td>
<td>8/17</td>
<td>n/d</td>
<td></td>
<td>Mean (divided into two categories: over 4 and under 3) SD</td>
<td>3 rounds</td>
<td></td>
</tr>
<tr>
<td>Post, Rannikmäe &amp; Holbrook (2011)</td>
<td>The study aims to create a theoretical tool for determining competencies and knowledge in science education (which a school leaver should have in order to be successful in the workforce and/or as a citizen in society).</td>
<td>Europe (Estonia)</td>
<td>1st round: 38</td>
<td>2nd round: 85</td>
<td></td>
<td>5-point (non important to very important)</td>
<td>2 rounds</td>
<td></td>
</tr>
<tr>
<td>Hadaya, Cassivi &amp; Chalabi (2012)</td>
<td>The purpose of the study is to identify the most important IT project management resources and capabilities.</td>
<td>Canada</td>
<td>1st round: 30/34</td>
<td>2nd round: 30/30</td>
<td>3rd round: 28/30</td>
<td>4th round: 24/28</td>
<td>5th round: 19/24</td>
<td>10-point for importance</td>
</tr>
<tr>
<td>Hefferan &amp; Wardner (2012)</td>
<td>It uses Delphi to demonstrate how demand drivers and accommodation priorities for emerging knowledge-intensive firms are understood and how corporate property and asset managers can respond to them.</td>
<td>Australia</td>
<td>11</td>
<td></td>
<td></td>
<td>5-point (low priority to very high priority)</td>
<td>n/d</td>
<td>4 rounds</td>
</tr>
<tr>
<td>Goula (2013)</td>
<td>This study uses Delphi technique to explore ways of public transition from bureaucracy to a participation-culture model of human resources.</td>
<td>Europe (Greece)</td>
<td>10/12</td>
<td></td>
<td></td>
<td>5-point (strongly disagree to strongly agree)</td>
<td>IR, SD</td>
<td>2 rounds</td>
</tr>
<tr>
<td>Jones, Day &amp; Quadri-Felitti (2013)</td>
<td>This study uses Delphi to determine what defines “boutique” and “lifestyle” hotels.</td>
<td>Europe USA Asia</td>
<td>1st round: 20</td>
<td>2nd round: 24</td>
<td>3rd round: 25</td>
<td></td>
<td></td>
<td>10-point (least important to most important)</td>
</tr>
</tbody>
</table>

1. IR: interquartile range
2. SD: standard deviation
3. n/d: not defined
4. CV: coefficient variation
5 CASE EXAMPLES

5.1 Design
The presented case examples focus on one of the most controversial issues in Delphi technique application, namely the consensus measurement. This issue triggered our effort to provide complete guidelines to conduct Delphi as a means of eliciting experts’ opinion. Based on our experience, the way of reaching consensus, is presented, using two case examples to illustrate how the various measures of consensus could be applied in practice. These examples are used to indicate our basic conclusions on consensus measurement in a practical way.

In the following two case examples, the way of eliciting the experts’ opinion is demonstrated, regarding the importance of 10 variables and their agreement upon 8 statements respectively; which are two of the most common uses of Delphi (see for example Geist, 2010; Hadaya, Cassivi, & Chalabi, 2012; Hayne & Pollard, 2000; Ku Fan & Cheng, 2006; Miller, 2001; Nakatsu & Iacovou, 2009). For this reason, a well-structured questionnaire is formulated (see appendix 1); using a 10-Likert scale for assessing the importance of a variable (1st case) and a 5-Likert one for the measurement of agreement (2nd case). The data that are used to illustrate these case examples are taken in part from one of the authors PhD thesis. However, since the aim of this study is to provide guidance to any researcher in any scientific field, the names of the variables and the statements are not referred. Nevertheless, the selected data are used to describe the problems that may arise in the consensus measurement and are described thereafter.

5.2. 1st Case
In the first case, the consensus measurement when the scope of a Delphi study is to assess the importance of a variable is demonstrated. Such examples are the Hayne and Pollard’s (2000) study, where the importance of 23 issues in Information Systems (IS) management was evaluated, or the Nakatsu and Iacovou’s (2009) one where the importance of 25 risk factors of outsourced software development from a client perspective in domestic and offshore settings was investigated.

To illustrate this case, in a Likert scale of 0-10 (respectively for non- and high-importance) (Asonitis & Kostagiolas, 2010; Ishikawa et al., 1993; Mullen, 2003; Nerantzidis, 2013), the opinion of 12 experts is shown in table 2.

To assess consensus, three measures are used combinatory:

(i) The 51% responding to the category ‘highly important’, which is between values 8 and 10 on a 10-Likert scale (Hackett, Masson & Phillips, 2006),
(ii) the interquartile range below 2.5 (Kittel-Limerick, 2005) and
(iii) the standard deviation below 1.5 (Christie & Barela, 2005).

Each of the above three measures has been separately proposed for consensus measurement. However, there are cases where the interquartile range may be lower than 2.5 and/or the standard deviation lower than 1.5, but only a low percentage of experts (less than 51%) evaluate the variable as ‘highly important’ (between values 8 and 10). Respectively, it is also possible that although at least 51% of the experts evaluate a variable as ‘highly important’, its interquartile range may be higher than 2.5 or/and its standard deviation higher than 1.5. These cases are presented in table 2 in variables 4, 7 and 8.
Table 2: Delphi results regarding the importance of the variables

<table>
<thead>
<tr>
<th>1st Delphi round</th>
<th>2nd Delphi round</th>
<th>median</th>
<th>Q1</th>
<th>Q3</th>
<th>Q-Q3-Q1</th>
<th>mode</th>
<th>average</th>
<th>8-10%</th>
<th>standard deviation</th>
<th>CV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable 1</td>
<td>10 9 7 10 9 10 8 7 9 9 9 8 9</td>
<td>9 8 9.3</td>
<td>1.25</td>
<td>9 8.75</td>
<td>83.33</td>
<td>1.06</td>
<td>0.12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable 2</td>
<td>9 9 9 9 9 9 9 8 9 9 9 9 8 9</td>
<td>9 8.8 9</td>
<td>0.25</td>
<td>9 8.75</td>
<td>100.0</td>
<td>0.45</td>
<td>0.05</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable 3</td>
<td>9 9 10 9 8 8 10 9 9 8 8 7</td>
<td>9 8 9</td>
<td>1.00</td>
<td>9 8.67</td>
<td>91.67</td>
<td>0.89</td>
<td>0.10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable 4</td>
<td>5 7 9 9 8 8 9 8 8 5 8 4 9</td>
<td>8 6.5 9</td>
<td>2.50</td>
<td>9 7.42</td>
<td>66.67</td>
<td>1.78</td>
<td>0.24</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable 5</td>
<td>10 10 10 8 9 6 10 10 8 9 10 10</td>
<td>10 8.8 10</td>
<td>1.25</td>
<td>10 9.17</td>
<td>91.67</td>
<td>1.27</td>
<td>0.14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable 6</td>
<td>10 9 4 9 6 3 5 6 9 8 6 6</td>
<td>6 5.8 9</td>
<td>3.25</td>
<td>6 6.75</td>
<td>41.67</td>
<td>2.22</td>
<td>0.33</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable 7</td>
<td>8 9 7 8 6 5 8 9 6 8 5 7</td>
<td>7.5 6 8</td>
<td>2.00</td>
<td>8 7.17</td>
<td>50.00</td>
<td>1.40</td>
<td>0.20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable 8</td>
<td>6 7 9 8 6 8 5 8 4 8 5 7</td>
<td>7 5.8 8</td>
<td>2.25</td>
<td>8 6.75</td>
<td>41.67</td>
<td>1.54</td>
<td>0.23</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable 9</td>
<td>10 9 4 8 7 10 9 9 10 8 10 8</td>
<td>9 8 10</td>
<td>2.00</td>
<td>10 8.50</td>
<td>83.33</td>
<td>1.73</td>
<td>0.20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable 10</td>
<td>7 10 6 8 8 6 8 9 3 6 6 8</td>
<td>7.5 6 8</td>
<td>2.00</td>
<td>6 7.08</td>
<td>50.00</td>
<td>1.83</td>
<td>0.26</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **1st Delphi round**
- **2nd Delphi round**
- **median**
- **Q1**
- **Q3**
- **Q-Q3-Q1**
- **mode**
- **average**
- **8-10%**
- **standard deviation**
- **CV**
More specifically, although the 66.67% of respondents evaluate the ‘variable 4’ as ‘highly important’ (i.e. value this variable between 8 and 10 in the Likert scale), its interquartile range is 2.5 and its standard deviation over 1.5. Thus, how can we infer that this variable reaches consensus? Respectively, ‘variable 7’ has an interquartile range 2 and standard deviation 1.40, but only a 50% of respondents consider the variable as ‘highly important’ (its average value is 7.17). Similarly, ‘variable 8’ also has an unsatisfactory average value of 6.75 and an even lower percentage of respondents evaluate it as ‘highly important’ (41.67%), although its interquartile range is 2.25.

All things considered, in this example, only 4 variables could be thought of as reaching consensus (variables 1, 2, 3, 5) from the 1st Delphi round and a 2nd round of feedback is considered necessary in order to conclude for the most important variables.

For this reason, a questionnaire of a controlled feedback of the group’s perspective should be designed, for the second Delphi round, so that the respondents can clarify or change their views. For this reason, the interquartile range of each variable should be identified (the shadow area in appendix 2) and the respondents should change or state their answer when this is out of this range.

In case where fewer respondents than in the first round participate, the response rate must be calculated. In this case example, we consider the answers of 10 out of 12 experts participating in the second round; a response rate of 83.33%.

As it is apparent, the second round has improved the agreement among the experts. This means that, apart from variables 1, 2, 3 and 5, consensus is also reached for the importance of variables 4, 7, 9 and 10 (see table 3). More specifically, all these variables satisfy the criteria of an interquartile range below 2.5, a standard deviation below 1.5 and a percentage of experts over 51% evaluating them as ‘highly important’ (between values 8-10). Hence, in this example, where the importance of 10 variables was investigated and diverse views existed (lack or agreement), the Delphi technique provided us with a reliable way to conclude to the most significant ones; namely these where agreement was reached among the experts.

### Table 3: Variables’ consensus

<table>
<thead>
<tr>
<th>Variable</th>
<th>% 8-10</th>
<th>IR</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1st Round</td>
<td>2nd Round</td>
<td>1st Round</td>
</tr>
<tr>
<td>Variable 1</td>
<td>83.33</td>
<td>100.00</td>
<td>1.25</td>
</tr>
<tr>
<td>Variable 2</td>
<td>100.00</td>
<td>100.00</td>
<td>0.25</td>
</tr>
<tr>
<td>Variable 3</td>
<td>91.67</td>
<td>100.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Variable 4</td>
<td>66.67</td>
<td>60.00</td>
<td>2.50</td>
</tr>
<tr>
<td>Variable 5</td>
<td>91.67</td>
<td>100.00</td>
<td>1.25</td>
</tr>
<tr>
<td>Variable 6</td>
<td>41.67</td>
<td>30.00</td>
<td>3.25</td>
</tr>
<tr>
<td>Variable 7</td>
<td>50.00</td>
<td>60.00</td>
<td>2.00</td>
</tr>
<tr>
<td>Variable 8</td>
<td>41.67</td>
<td>30.00</td>
<td>2.25</td>
</tr>
<tr>
<td>Variable 9</td>
<td>83.33</td>
<td>90.00</td>
<td>2.00</td>
</tr>
<tr>
<td>Variable 10</td>
<td>50.00</td>
<td>60.00</td>
<td>2.00</td>
</tr>
</tbody>
</table>

### 5.3 2nd Case

In this second case, an example of eliciting consensus upon the agreement of experts in 8 statements is provided, using a 5-Likert scale, with value 1 denoting strongly disagreeing and value 5 strongly agreeing (Hackett et al., 2006; Verhagen et al., 1998). This use of Delphi is presented, for instance, in Miller’s (2001) study to ascertain the opinion of experts on indicators considered to measure the movement towards sustainable tourism. For this reason, he asked the experts whether they agree or not that an indicator is understandable or is measured on an ongoing basis etc. In these statements, experts were asked to provide their opinion choosing a value from 1 (strongly disagree) to 5 (strongly agree).

In such a case, the consensus is proposed to be assessed using three measures combinatorily:

(i) The 51% of experts responding to the category ‘strongly agreeing’ (which according to Hackett et al., 2006, is between values 4 and 5 on a 5-Likert scale),
(ii) the interquartile range below 1 (Raskin, 1994; Rayens & Hahn, 2000: 311) and
(iii) the standard deviation below 1.5 (Christie & Barela, 2005)
Table 4: Delphi results regarding the agreement of the statements

<table>
<thead>
<tr>
<th>Statement</th>
<th>1st Round</th>
<th>2nd Round</th>
<th>3rd Round</th>
<th>4th Round</th>
<th>5th Round</th>
<th>6th Round</th>
<th>7th Round</th>
<th>8th Round</th>
<th>9th Round</th>
<th>10th Round</th>
<th>11th Round</th>
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</tr>
</thead>
<tbody>
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<td>5 4</td>
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<td>91.67</td>
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<td>4</td>
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<td>3 2.8</td>
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<td>1.25</td>
<td>4</td>
<td>3.17</td>
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<td>4 3</td>
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</table>

| Statement 1 | 5 5 5 4 5 4 5 5 5 - - 4 5 | 5 4.3 | 5 | 0.75 | 5 | 4.70 | 100.00 | 0.48 | 0.10 |
| Statement 2 | 5 5 5 - 5 4 4 5 5 5 - 4 4 | 5 4 | 5 | 1.00 | 5 | 4.60 | 100.00 | 0.52 | 0.11 |
| Statement 3 | 3 4 - 5 4 4 5 4 4 - 3 5 | 4 4 | 4.8 | 0.75 | 4 | 4.10 | 80.00 | 0.74 | 0.18 |
| Statement 4 | 5 5 - 5 5 4 5 5 5 - - 5 5 | 5 5 | 5 | 0.00 | 5 | 4.90 | 100.00 | 0.32 | 0.06 |
| Statement 5 | 5 5 - 5 3 2 4 2 5 - 2 2 | 3.5 | 2 | 5 | 3.00 | 5 | 3.50 | 50.00 | 1.43 | 0.41 |
| Statement 6 | 4 5 - 5 4 3 4 5 5 - - 5 5 | 5 4 | 5 | 1.00 | 5 | 4.50 | 90.00 | 0.71 | 0.16 |
| Statement 7 | 3 4 - 4 3 4 3 4 - 3 4 | 3.5 | 3 | 4 | 1.00 | 3 | 3.50 | 50.00 | 0.53 | 0.15 |
| Statement 8 | 4 5 - 5 4 3 4 5 4 - 3 4 | 4 4 | 4.8 | 0.75 | 4 | 4.10 | 80.00 | 0.74 | 0.18 |
To prove the need of this combinatory use, the answers of 12 experts for the 1st Delphi round and 10 experts for the 2nd one are provided (table 4).

As it is obvious, in the first Delphi round, there may be statements with standard deviation below 1.5 and/or a 51% or experts responding to the category ‘strongly agreeing’ (i.e. between values 4 and 5), while their interquartile range may be above 1 (statements 3 and 6). Respectively, there may be a case where the percentage of experts’ responses lying into the ‘strongly agreeing’ category is below 51%, even if the standard deviation and/or the interquartile range are below 1.5 and 1 respectively (statement 7).

The question of how can one assure that these statements are reaching consensus among the experts still exists. Thus, combining the above three measures, in our example, only 4 statements could be thought of as overall consensus and a second round of enhancing agreement is required (see appendix 2).

In the second round of changing or stating the opinion (using the interquartile range as guidance), the level of agreement of two more statements was improved. That’s was because the combination of the three measures of consensus, namely the 51% of experts responding to the ‘strongly agreeing’ category, the interquartile range below 1.5 and the standard deviation below 1, were denoting overall consensus among six statements. Obviously, consensus was reached in addition to statements 3 and 6, where their interquartile range value was improved to 0.75 and 1 respectively.

Finally, table 5 denotes the difference between these measures from round to round for each statement. Undoubtedly, the combinatory use of these three measures ensured, once more, the way of reaching consensus in Delphi technique and provided a reliable manner to conclude on the expert’s overall agreement upon the eight statements assumed.

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<td>90.00</td>
<td>1.25</td>
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<tr>
<td>Statement 8</td>
<td>58.33</td>
<td>80.00</td>
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6 CONCLUSION

The Delphi technique is a qualitative tool, which is used to elicit expert’s opinion, without the cost of ‘face-to-face’ interaction, when information about the existing problem is restricted. Although time consuming, it is quite simple in application and allows interaction. However, its implementation on different sectors has also yielded issues of fuzziness regarding the expert’s panel selection (size and characteristics), the consensus measurement and the number of rounds, as well as the response rate and the questionnaire design.

This paper clarifies the above issues both theoretically and practically, to assist any researcher in management or business field to conduct Delphi technique. In particular, through literature review this study shows that the purpose of each study defines the questionnaire design, and more specifically the Likert scale choice, while the homogeneity of the sample determines the panel size and therefore the Delphi rounds; demanding, in any case, a response rate above 70%. However, since there is a great variation among the studies using Delphi, regarding the Likert scale, the number of participants, the number of rounds and the measures of consensus, 32 prior empirical studies are analyzed to show the major trends.

On the other hand, using two examples, the way of reaching consensus was demonstrated in practice, leading to the need of using more than one statistical measures in order to assess the consensus. Hence, this study shows that there are cases where the interquartile range or/and the standard deviation may be within the accepted limit but the average value may be low and hence the experts may do not assess the importance of a variable as high (between values 8-10 in a 10-Likert scale) or may not ‘strongly agree’ with a statement (between values 4-5 in a 5-Likert scale). For this reason, these three measures should be considered at the same time, so that consensus can be ensured.

All things considered, Delphi is a quite useful tool in decision making process in the scientific field of management or business, when a lack of agreement or incomplete knowledge is evident. It is useful in case study analyses, because of its limitation of non generalizability of the results, and provides a great advantage for
the researcher who does not need a representative sample to implement this method. Its diffusion and contribution in any scientific field could be the aim of a longitudinal study. This means that, selecting the applications of Delphi from the very first years, such a study could highlight the scientific field with the greatest contribution and practical implementation. Undoubtedly, this is not the only implication for future studies, since an open case is the great time that this method demands in order to reach consensus. This issue may also be central in the near future, where technology could provide a clear assistance on its implementation. Hence, what was an obstacle in 1970s, could now be confronted through on-line applications, providing friendlier environment and quicker responses with real time interactions between the experts.

REFERENCES


APPENDIX 1

1st Delphi round: Questionnaire sample

Clarifications
In the following questionnaire your may state your opinion regarding the level of each variable’s importance, compared to the others, by choosing a value among 0 to 10. More specifically, you may choose the zero (0) value when the variable is considered unimportant and, while value ten (10), when it is considered as highly important. Respectively, you should express your opinion on 8 statements by choosing a value among 1 to 5. You may choose value one (1) when you highly disagree, while value five (5) when you highly agree.

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Additional information – observations:

APPENDIX 2

2nd Delphi round: Questionnaire sample

Clarifications
In the following questionnaire you are to restate your opinion regarding the contribution level of each of the 10 variables, compared to the others, by choosing a value between 0 and 10 and your disagreement or agreement upon the 8 statements, by choosing a value between 1 and 5. In addition, the shadowed cells depict the range of the 50% of the first Delphi round responses as follows: the lower values imply lower importance for this specific variable or low levels of agreement, while the higher values, higher importance or higher levels of agreement.

In the two next tables, you are to restate your opinion, either by maintaining or changing your previous choice (your answer in 1st Delphi round). In the case where the chosen value is outside the shadowed range, you should justify your choice providing a short explaining text.
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