Environmental and social sustainability priorities:
Their integration in operations strategies

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Abstract

Purpose: Environmental and social sustainability are becoming key competitive priorities for companies, but the way in which they are integrated in operations strategies remains an open issue. This paper aims to determine whether established operations strategy configuration models (i.e., price-oriented, market-oriented and capability-oriented models) are modified to include environmental and social priorities and whether different operations strategy configuration models are equally successful in the short and long term.

Methodology: Analyses were performed using data from the International Manufacturing Strategy Survey (2009), including companies in the assembly industry in 21 different countries. According to previous studies, cluster analysis of competitive priorities and ANOVA analysis of the business strategy and short- and long-term performance were performed.

Findings: The results show that traditional operations strategy configuration models are slightly modified. Market-oriented and capability-oriented operations strategies are complemented by environmental and social sustainability priorities. These operations strategies are adopted by companies with a differentiation and innovation business strategy. Moreover, capability-oriented companies, which are the most committed to environmental and social sustainability, perform better in both the short and long term.

Practical implications: This research shows to companies that traditional operations strategies focusing on specific competitive priorities (e.g., low price) are being replaced by more holistic strategies that include sustainability priorities. However, environmental and social priorities contribute to competitive advantage when complementing capability-oriented operations strategies.

Originality: This paper extends operations strategy configuration models highlighting how environmental and social sustainability priorities can be deployed together with traditional competitive operations priorities.

Keywords: operations strategy configuration models, environmental and social sustainability, survey methodology

1. Introduction

Sustainability is increasingly an essential element of companies' strategies, given the recognised need to ensure the long-term success in the future of people and the planet (Hay and Stavins, 2005; Kleindorfer et al., 2005). The quest for sustainability is already beginning to transform the competitive landscape, which will force companies to change how they think about products, technologies, processes and business models (Nidumolu et al., 2009; Bonn and Fisher, 2011; Orlitzky et al., 2011).

A recent McKinsey survey suggests that more and more companies are actively integrating sustainability priorities into their business (McKinsey, 2013). Companies are pursuing environmental and social priorities that extend far beyond prior concerns for reputation. Although missions, values and external communications are generally well integrated with sustainability (according to approximately 70 per cent of the respondents), primary processes are still lagging behind in the alignment with the new priorities. Specifically, despite the wide recognition that operations processes are relevant to the achievement of sustainability (according to 58 per cent of the respondents), companies worldwide are struggling to deploy environmental and social sustainability in operations strategies (Porter and Kramer, 2006; BCG&MIT, 2009; Tate et al., 2010; Bonn and Fisher, 2011).

Strategy deployment has been perceived as a complex task since the '80s (Hayes and Wheelwright, 1984; Schroeder et al., 1986). Strategy deployment refers to the process by which business strategy is translated into priorities and programmes for functional strategies. Therefore, functional strategies (i.e., operations strategy) must be coherent with the business strategy and must assure consistent internal actions (Kim and Arnold, 1996). This process is particularly difficult when considering environmental and social sustainability, as these priorities are complex, are interrelated with traditional operations priorities and require a much longer-term perspective (e.g., Wu and Pagell, 2010; Sutcliffe et al., 2009; Roehrich et al., fortcoming).

A useful way to study how to deploy sustainability priorities in business strategies and to integrate them into operations strategies is the configuration model approach. In the operations strategy literature, a number of studies adopt this approach using both theoretical and empirical perspectives and identifying a number of operations strategy configuration models (a review by Sweeney (1991) and subsequently by Bozarth and McDermott (1998) and Luz and Diaz Garrido,

2008). The same approach can be extended to include emerging competitive priorities based on environmental and social sustainability. In this light, a key question that should be addressed concerns the extent to which the traditional configuration models identified in the operations management literature (i.e., price-oriented, market-oriented and capability-oriented models) are challenged and modified to include environmental and social sustainability priorities. Moreover, it might be useful to understand whether configuration models that include environmental and social sustainability priorities are adopted in the presence of specific business strategies (Miller and Roth, 1994; Kotha and Orne, 1989). Similarly, once (new) configuration models are explored, a further step involves understanding whether different configuration models are equally effective in the short and long term, according to equifinality theory (Doty et al., 1993).

The aim of this paper is to address these open questions regarding the integration of environmental and social sustainability priorities in operations strategies, their fit with business strategies and their effectiveness. In this way, we contribute to the operations strategy research field and provide some guidance to operations managers when deploying environmental and social sustainability priorities.

The paper is organised as follows. First, we provide the theoretical basis for our study in presenting the definition of sustainability operations strategy and the configuration model approach. Second, we develop the research propositions. Next, we provide details regarding the methodology used for the research. Finally, we present the analyses and results, and we conclude the paper by discussing outcomes and highlighting theoretical and practical implications.

2. Theoretical background

2.1 Environmental and social priorities in operations strategies

Operations strategy formulation has been a core issue in operations management since the ‘80s when cost, delivery, flexibility and quality were identified as competitive priorities (Hayes and Wheelwright, 1984). Researchers suggest that today’s environmental and social sustainability should be included among these priorities (e.g., Jimenez and Lorente, 2001; Porter and Kramer, 2006; Jabbour et al., 2012). More specifically, environmental sustainability refers to consuming natural resources at a rate below the natural regeneration or to consuming a substitute, generating limited emissions and not being engaged in activities that can degrade the ecosystem (Kleindorfer et al., 2005). Social sustainability refers to actively supporting the preservation and creation of

skills as well as the capabilities of future generations, promoting health and supporting equal and democratic treatments that allow for good quality of life both inside and outside of the company context (McKenzie, 2004).

An increasing number of companies are regarding environmental and social sustainability priorities as an opportunity and a source of competitive advantage (McKinsey, 2013; McWilliams and Siegel, 2011). Given the influence of operations on company profit, the natural environment, workers and the community (e.g., Shrivastava, 1995; Angell and Klassen, 1999), environmental and social sustainability are also emerging as new competitive priorities in the area of operations (Jimenez and Lorente, 2001; Kleindorfer et al., 2005; Gimenez et al., 2012). Although a number of studies explore the role of these new priorities in absolute terms (e.g., Gimenez et al., 2012; Fraj-Andres et al., 2009; Longoni et al., 2014), there is a lack of investigation assuming an holistic perspective of the relative role of these new priorities compared to traditional priorities and of their effects on traditional operations strategies (Jimenez and Lorente, 2001; Jabbour et al., 2012; Roehrich et al., fortcoming). Similarly, companies are struggling to achieve this holistic view. For example, Mirvis (2011) emphasises how Unilever underwent different phases in deploying sustainability strategies in the company's primary processes. To do so, the company needed to confront various challenges and exert efforts to create coherence between business and functional strategies and within functional strategies to deploy holistic strategies.

2.2 Operations strategies and the configuration models approach

The question regarding how to translate competitive priorities in operations strategies has long been a central point in the operations management literature (e.g., Buffa, 1984; Cohen and Lee, 1985; Fine and Hax, 1985; Wheelwright, 1984; Hayes and Wheelwright, 1984; Schroeder et al., 1986; Skinner 1969, 1978; 1985, Roth et al., 1989; Hill, 1989; Stobaugh and Telesio, 1983; Swamidass and Newell, 1987). One common method that is adopted for studying the complexity of the interactions among operations priorities is the configuration model approach. This method was first developed in the organisation theory and strategy research fields with similar purposes (for a review, see, e.g., McGee and Thomas, 1986; Doty and Glick, 1994; Ketchen and Shook, 1996) and was then adopted in the operations management research field (Stobaugh and Telesio, 1983; Miles and Snow, 1978; Miller and Roth, 1994; Kathuria, 2000; Frolich and Dixon, 2001).

Organisational configuration models are broadly defined as 'any multidimensional constellation of conceptually distinct characteristics that commonly occur together' (Meyer et al., 1993, p. 1175). Because of their multidimensional nature, Miller (1996) and Bozarth and McDermott (1998) have noted that configuration models are particularly useful when the relationships between variables are too complex to be modelled.

Configuration models are generally classified in two ways: *typologies*, which are conceptually derived categories of ideal types, each of which represents a unique combination of organisational attributes, and *taxonomies*, which are often derived from empirical evidence and classify companies into mutually exclusive and exhaustive groups according to definite rules (Meyer et al., 1993; Doty and Glick, 1994). The operations management literature identifies taxonomies as a good tool to provide effective descriptions of operations strategies, which are useful in discussion, research and pedagogy (e.g., Stobaugh and Telesio, 1983; Miles and Snow, 1978). Taxonomies allow the identification of manufacturers with common profiles that reveal insights into underlying structures of competition as viewed from the perspective of the operations function. Specifically, the operations management research stream on taxonomies (see Table 1) reveals that the rating of competitive priorities is an appropriate grouping criterion that indicates the 'strategic intent' (Hamel and Prahalad, 1989) of operations and that provides a basis for testing whether business strategy and operations strategy choices are consistent with this intent.

As shown in Table 1, the original work of Miller and Roth (1994) is replicated in different periods and contexts. In fact, as suggested by Miller and Roth themselves and subsequently by Kathuria (2000) and Frolich and Dixon (2001), findings related to taxonomies require validation and replication. Overall, results from different studies show a substantial level of stability in operations strategy configuration models. Although some variations of the basic configuration models appear in peculiar settings (countries and/or size categories), most studies identify the following configuration models: a price-oriented configuration model that competes primarily on price, followed by quality and delivery to a lower extent (e.g., Caretakers, Low price, Price-based strategies); a market-oriented configuration model that competes on design flexibility and innovation or after sales (e.g., Marketeers, Servers, Designers); and a capability-oriented configuration model that focuses on enhancing different capabilities while attempting to achieve innovation and excellence (e.g., Innovators, All around).

Table 1: Taxonomies configuration models according to different authors

Article	Sample	Level of analysis	Variables	Analysis performed	Summary and comparison of proposed configuration models
Miller and Roth (1994)	164 American manufacturers	Manufacturing business unit	11 competitive priorities	Clustering, discriminant analysis and ANOVA	3 strategy types: - Price -oriented: *Caretakers*, - Market-oriented: *Marketeers* - Capability-oriented: *Innovators*
Kathuria, (2000)	158 manufacturers	Manufacturing business unit	5 competitive priorities	Clustering and discriminant analysis	- Price-oriented: *Starters, efficient conformers*, - Market-oriented: *speedy conformers* - Capability-oriented: *Do all*
Frolich and Dixon (2001)	212 American manufacturers and 703 international manufacturers	Manufacturing business unit	9 competitive priorities	Clustering	- Price-oriented: *Caretakets*, - Market-oriented: *Designers*, *Idlers*, *Servers* and *Mass customizers* - Capability-oriented: *Innovators*
Christiansen et al. (2003)	46 Danish manufacturer	Manufacturing business unit	9 competitive priorities	Clustering and ANOVA	- Price-oriented: *Low price*, - Market-oriented: *quality delivers, speedy delivers, Aesthetic designers*
Sum et al. (2004)	43 small and medium manufacturers in Singapore	Manufacturing business unit	4 competitive priorities	Clustering and ANOVA	- Price oriented: *efficient innovators*, - Market-oriented: *differentiators* - Capability-oriented: *All around*
Cagliano et al. (2005)	Longitudinal sub-samples: 37 international companies (1992-1996), 62 international companies (1996-2001), 60 international companies (1992-2001)	Manufacturing business unit	5 competitive priorities	Clustering	- Price-oriented: *price-based strategies* - Market-oriented: *Market-based, product-based*, - Capability-oriented: *capability-based*
Zhao et al., 2006	175 Chinese manufacturer	Manufacturing business unit	9 competitive priorities	Clustering and discriminant analysis	- *Low emphasizers*, - Market-oriented: *Quality customizers*, *Mass servers*, *Specialized contractors*
Luz and Diaz Garrido, 2008	265 Spanish manufacturer	Manufacturing business unit	7 competitive priorities	Clustering and discriminant analysis	- Market-oriented: *manufacturers focused on quality and delivery* - Capability-oriented: *Manufacturers pursuing excellence*

2.3 Research aim and propositions

The established operations strategy configuration models are challenged today by the emergence and importance of environmental and social sustainability priorities and the need to integrate them with traditional operations competitive priorities (Porter and Kramer, 2006; McKinsey, 2013; Roehrich et al., fortcoming). The same occurred when quality and service, then flexibility, and finally innovation emerged as competitive priorities (Hall and Nakane, 1990; Cagliano et al., 2005). As suggested by Frolich and Dixon (2001), replicating previous studies with the inclusion of new emerging priorities is needed to understand how traditional configuration models are modified over time.

Sustainability involves adding even more complexity to the problem of defining the operations strategy. First, developing a sustainability strategy is a rather complex task itself (Mohrman and Worley, 2010; Hart, 1995). Sustainability priorities deployment is not well understood and is often studied only at a conceptual level (Linton et al., 2007). In addition, relationships among environmental and social priorities and other operations competitive priorities are not sufficiently studied and discussed (e.g., Wu and Pagell, 2010; Gimenez et al., 2012; Jabbour et al., 2012).

For these reasons, this study attempts to tackle sustainability operations strategies in terms of the dominant integrated set of priorities emerging in companies, i.e., through operations strategy configuration models. In this manner, we can provide cumulative knowledge to operations management and configuration theory by replicating previous studies while simultaneously extending the configuration models to include new competitive priorities. Evidence will be fundamental to define how environmental and social priorities are integrated with traditional competitive priorities and the extent to which they are relevant to foster companies' competitiveness. To pursue this aim, three research propositions are developed based on the literature.

The strategy literature relates sustainability priorities deployment to the traditional cost-leadership, differentiation and innovation business strategies (Orsato, 2006; Porter and van der Linde, 1995; Dangelico and Pujari, 2010; Orlitzky et al., 2011; Crittenden et al., 2011). Specifically, through the efficient use of resources and waste generation prevention, environmental sustainability priorities are suggested to be related to cost-leadership business strategies (Orsato, 2006). Meanwhile, the effective development of green and social products is suggested to have an

essential role in creating successful differentiation business strategies (Dangelico and Pujari, 2010; Crittenden et al., 2011; Klassen and Vereecke, 2012; Prajogo et al., forthcoming). Finally, environmental and social sustainability development is considered a means for enhancing innovation business strategies to rethink the business model, to explore alternatives and to create new practices (Nidumolu et al., 2009; Klassen and Vereecke, 2012). Therefore, the strategic literature suggests that sustainability priorities are integrated into traditional competitive strategies to complement them and is thus not leading to completely new general strategies.

Similarly, we expect that when environmental and social sustainability are introduced as priorities in operations strategies, traditional operations strategy configuration models (i.e., price-oriented, market-oriented and capability-oriented models) can be complemented while maintaining the same primary orientation. The same phenomenon occurred when companies began to compete not only on price, quality and service, but also on flexibility and innovation (Frolich and Dixon, 2001; Hall and Nakane, 1990; Cagliano et al., 2005). Accordingly, the first research proposition is stated:

P1: The pursuit of environmental and social priorities is not leading to new operations strategy configuration models but is rather complementing existing models (i.e., price-oriented, market-oriented, and capability-oriented models).

Specifically, an increasing amount of evidence suggests that customers are paying greater attention to companies' offers of sustainable products (Bowen et al., 2001; Goldbach et al., 2003; Rao and Holt, 2005; Nidumolu et al., 2009). The uniqueness, innovativeness and quality of products are not merely related to the brand, technology or other product features but is also granted by the offer of sustainable products affecting operations processes (Orsato, 2006; Nidumolu et al., 2009). Furthermore, manufacturers are increasingly providing a series of sustainable services related to operations processes to support and supplement the sale of the product differentiating after sales and customer service (e.g., closed-loops logistics, recycling services) (Michaelis and Coates, 1994; Wise and Baumgartner, 1999). Therefore, we suggest that environmental and social sustainability priorities complement market-oriented operations strategy models that traditionally compete on design flexibility and innovation or after sales. These operations strategy models can provide valuable differentiation opportunities for products and products as-a-service fitting also with differentiation business strategies.

In addition, we propose that environmental and social sustainability priorities complement capability-oriented operations strategy models. Researchers suggest that companies should develop new capabilities to address environmental and social priorities (Nidumolu et al., 2009; Mohrman and Worley, 2010). By definition, capability-oriented operations strategy models focus on the generation of new resources and capabilities for operational innovations (Miller and Roth, 1994; Cagliano et al., 2005). Therefore, companies that are characterised by capability-oriented operations strategy models can successfully support the deployment of sustainability-related capabilities. Moreover, many studies suggest that sustainability is a source of organisational and technological innovation, enabling companies to create new businesses and practices (Nidumolu et al., 2009; Klassen and and Vereecke, 2012). Therefore, we propose that environmental and social priorities are highly consistent with and complement capability-oriented operations strategy models, traditionally enhancing multiple capabilities and aiming to achieve innovation and excellence, coherently also to innovation business strategies.

However, the effect of environmental and social sustainability deployment on cost in operations is under discussion with controversial results (Gimenez et al., 2012; Wu and Pagell, 2010). The evidence suggests that environmental and social sustainability priorities may sometimes be difficult to include in price-oriented operations strategy models.

In conclusion, we formulate the second research proposition:

P2: Environmental and social sustainability priorities complement

P2a: market-oriented and capability-oriented operations strategy models more than the price-oriented operations strategy model.

P2b: the operations strategies of companies that are more characterised by differentiation and innovation business strategies.

A number of operations management studies show that different strategic configuration models perform equally well in terms of financial performance measures (e.g., Return on Investments (ROI), Return on Sales (ROS), market share) (Zhao et al., 2006; Luz and Diaz-Garrido, 2008). These results are supported by equifinality theory (Doty et al., 1993). Equifinality implies that organisations should be able to adopt various strategy configuration models and still achieve equally high levels of overall performance (Gresov and Drazin, 1997; Van de ven and Drazin, 1985; Galunic and Eisenhardt, 1994; Katz and Kahn, 1978). The theory of equifinality fits

well with the configuration model approach (e.g., Miles and Snow, 1978; Mintzberg, 1980; Porter, 1980).

We expect these results to be confirmed in configuration models complemented by environmental and social sustainability priorities when considering short-term performance. However, we expect different results in the long term. Specifically, all configuration models are expected to perform equally well when examining short-term financial performance. However, with respect to environmental and social sustainability performance, which are by definition long term oriented (Brundtland Commission, 1987), and to internal operational performance, which could be used to predict future results (Stewart, 1991; Sveiby, 1997), we expect that configuration models complemented to a greater extent by environmental and social sustainability priorities tend to perform better. Researchers suggest that companies that are currently treating sustainability as a goal will develop competencies that their rivals will find difficult to match. These competencies will enable a long term competitive advantage (Nidumolu et al., 2009; McWilliams and Siegel, 2011).

In particular, researchers argue that environmental sustainability deployment presents numerous benefits, such as improved image and enhanced loyalty of key stakeholders, which will provide competitive advantages in the long term (Goodman, 2000; Rondinelli and Vastag, 1996; McWilliams and Siegel, 2011; Burgos-Jimenez et al., 2013). Finally, we expect that companies whose operations strategies are complemented by environmental and social sustainability priorities to a greater extent will focus on both present and future social and environmental needs to pursue long-term customer satisfaction and to prevent negative effects on company image in the future (Orsato, 2006; Esty and Winston, 2009). Accordingly, the third proposition is formulated:

P3: Companies adopting different operations strategy configuration models may perform equally well in the short term, whereas companies adopting operations strategy configuration models that are complemented by environmental and social sustainability to a greater extent may perform better in the long term.

3. Methodology

Given the aim to replicate and extend previous studies of operations strategy configuration models, we adopted a survey-based approach to study a worldwide manufacturing sample primarily composed mainly of European and American companies in the assembly industry (ISIC 28-35

classification), consistent with previous studies (e.g., Miller and Roth, 1994; Frolich and Dixon, 2001; Cagliano et al., 2005). Specifically, empirical evidence was drawn from the fifth release of the International Manufacturing Strategy Survey (IMSS) with data collected in 2009. This project, which was originally launched in 1992 by the London Business School and Chalmers University of Technology, studies manufacturing and supply chain strategies within the assembly industry (ISIC 28-35 classification). This sample is also appropriate to study environmental and social sustainability because the literature suggests that manufacturing firms are deploying sustainability-related strategies since longer than service companies (Carter and Easton, 2011; Sampson and Spring, 2011); therefore, we find manufacturing companies to be representative for a study of such a recent phenomenon as environmental and social sustainability priorities deployment in operations. Furthermore, focusing on the assembly industry provides a relatively homogeneous sample in terms of environmental and social needs related to operations processes. Finally, a worldwide sample offers the opportunity to increase the generalizability of the results.

3.1 Questionnaire structure

The basic structure of the IMSS questionnaire used to gather data remained quite similar over time, such that the last editions contain robust core constructs. The first section of the questionnaire is related to the business unit and gathers general information (e.g., size, industry, and production network) on the context in which manufacturing occurs, whereas the other sections refer to the dominant activities of the plant and focus on business and manufacturing strategies, practices and performance. Dominant activities refer to the most widely diffused and relevant method of operation that is believed to be the most representative of the plant itself. The plant is chosen as the unit of analysis to avoid problems related to business units with multiple plants operating in different ways.

Because the questions in these sections remained quite similar over time, the core constructs (e.g., traditional competitive priorities and performance) are rather robust, as they proved to be valid and reliable over time. To ensure alignment with the most recent trends in operations strategies, part of the questionnaire is redesigned in each edition. This update is performed by a design team composed of a pool of international researchers and thus avoids the researchers' country biases (Van de Vijver and Leung, 1997). In particular, in the last edition, some questions

on sustainability were introduced in different sections (strategies, programmes, and performance) to complete the consolidated items on this subject that were present in previous editions.

Consistent with most of the studies of competitive priorities and operations strategy, we used responses from a single manager (e.g., plant, production or operations manager) within each plant under the assumption that such managers have accurate and detailed information regarding operations strategy, decisions, and performance (Szwejczewski et al., 1997). The questionnaire is also designed to minimise common method bias issues that occur in survey-based studies with single respondents and perceptive scales. Common method bias can affect statistical results by inducing correlations or social desirability. Following the suggestions of the literature (Chang et al., 2010; Malhotra et al., 2006; Podsakoff et al., 2003), we guaranteed anonymity and confidentiality to the respondents. Moreover, the questions used are clear and concise. Finally, questions on best practices such as adoption are asked in different sections of the questionnaire, and these practices are separated from competitive priorities and performance.

3.2 Data collection

Data collection was simultaneously administered in different countries through local research groups. In each country, the companies were randomly selected from economic datasets and contacted by partners in different countries. If a respondent showed some interest in participating in the research, then the questionnaire was sent to him/her. After a few weeks, a reminder was sent if no feedback was received. Questionnaires that were sent back were controlled for missing data and were handled on a case-by-case basis, typically by making another attempt to contact the company. Every country was responsible to check reliability, missing data or late respondent bias of gathered data.

Responses were gathered in a unique global database (Lindberg et al., 1998). The sample consisted of 725 firms from 21 countries, with a response rate of 16.3%. For the purposes of this study, 673 companies provided the required information. The distribution of the sample in terms of country, size and industry is shown in Tables 2a and 2b.

Table 2a – Descriptive statistics in terms of (a) country, (b) size

Country	N	%	Country	N	%	Size*	N	%
Belgium	31	5%	Korea	40	6%	Small	343	51%
Brazil	35	5%	Mexico	15	2%	Medium	122	18%
Canada	19	3%	Netherland	48	7%	Large	199	30%
China	51	8%	Portugal	10	1%	Missing	9	1%
Denmark	18	3%	Romania	28	4%	**Total**	**673**	**100%**
Estonia	27	4%	Spain	36	5%			
Germany	35	5%	Switzerland	30	4%			
Hungary	63	9%	Taiwan	31	5%			
Ireland	5	1%	UK	27	4%			
Italy	51	8%	USA	47	7%			
Japan	26	4%						
			Total	**673**	**100.0**			

***Size:** Small: less than 250 employees, Medium: 251-500 employees, Large: over 501 employees

Table 2b – Descriptive statistics in terms of industry

ISIC code	N	%
28	223	33%
29	168	25%
30	12	2%
31	87	13%
32	40	6%
33	40	6%
34	50	7%
35	32	5%
Missing	21	3%
Total	**673**	**100%**

3.3 Measures

The measures of the relevant constructs of the research model were drawn from established measures or published research on similar subjects.

Competitive priority measures

According to previous studies (see Table 1), we used single items measuring competitive priorities to identify operations strategy configuration models. This choice was motivated by the need to replicate previous studies that use such measures. In our survey, competitive priorities are measured on Likert scales with questions regarding the importance of each priority for a company (ranging from 1 for "very low" to 5 for "very high"). The difference between our study and previous studies lies in the introduction of environmental and social sustainability priorities in our study's

survey. These new items were formulated according to published contributions (e.g., Gimenez et al., 2012; Longoni et al., 2014). Table 3 shows a comparison of the variables used with previous studies.

Table 3: Competitive priorities

	Miller and Roth (1994)	Frolich and Dixon (2001)	This study
Lower price	X	X	X
Quality conformance	X	X	X
Quality performance	X	X	X
Delivery speed	X	X	X
Delivery dependability	X	X	X
Design flexibility	X	X	X[a]
Broad product line	X	X	X
Volume flexibility	X	X	X
After sales service	X	X	X
Broad distribution	X	Not asked	Not asked
Advertising	X	Not asked	Not asked
Environmental products and processes	Not asked	Not asked	X
Committed social responsibility	Not asked	Not asked	X

[a] Two items were used to measure this capability: (1) ability to make rapid changes and (2) ability to introduce new products (see also Zhao et al., 2006; Cagliano et al., 2005).

Performance measures

In this study, performance was explored through measures assessing short-term performance by means of financial performance and through measures assessing long-term performance, such as social and environmental sustainability performance and internal operational performance. Environmental and social sustainability performance are long term by definition, measuring resource preservation and regeneration (Brundtland Commission, 1987); operational performance is considered a proxy of long-term performance indicating the actual level of operational resources that will bring to future economical results (Stewart, 1991; Sveiby, 1997).

Specifically, financial performance was measured in terms of ROI, ROS and market share, in accordance with studies such as Ward et al. (1994), Vickery et al. (1997), Papke-Shields and Malhotra (2001), Narasimhan and Jayaram (1998), Curkovic et al. (2000) and Zhao et al. (2006); Petkova and Dam, forthcoming). Each type of performance was measured in a comparison with each company's main competitors on Likert scales ranging from 1 for "much worse" to 5 for "much better".

Operational performance was measured using an exploratory factor analysis of single performance items on the following dimensions: cost, quality, delivery, flexibility and customer service. These variables were measured on a Likert scale (ranging from 1 for "much worse" to 5 for "much better") in terms of performance improvements over the last three years. We chose to measure the level of improvement because it is believed to better represent the capability developed by a company to assure long-term results. Table 4 provides the results of the exploratory factor analysis performed on the single performance items and the value of the scale reliability measured through Cronbach's alpha for factors with more than two items and measured through the Spearman Brown formula for the inter-item correlation of factors composed of two items.

Table 4: Exploratory Factor Analysis for operational performance

	Cost	Customer service	Flexibility	Quality	Delivery	Cronbach's Alpha	Spearman Brown correlation
Manufacturing conformance				0.825			
Product quality and reliability				0.806			0.805
Product innovativeness		0.772					
Customer service and support		0.712					
Product customization ability		0.710				0.755	
Volume flexibility			0.809				
Mix flexibility			0.796				0.806
Delivery speed					0.778		
Delivery reliability					0.769		0.800
Unit Manufacturing cost	0.687						
Labor productivity	0.670						
Inventory turnover	0.722						
Capacity utilization	0.691					0.772	

Finally, sustainability performance was measured in terms of environmental and social performance. *Environmental Sustainability Performance* was measured as a single-item construct measuring pollution and consumption performance improvement in the last three years on a Likert scale ranging from 1 for "much worse" to 5 for "much better" (e.g., Labuschagne et al., 2005). Even if multiple items could have been used to measure these aspects, the team of researchers responsible for designing the IMSS questionnaire decided to measure environmental performance using a single item (Gimenez et al., 2012) as previously used in the literature (e.g., Pullman et al., 2009), and multiple sources supported the validity and reliability of this item (e.g., Crowe and Brennan, 2007). Consistent with the relevant literature on the subject, we measured social sustainability performance on two dimensions: communities and workforce (e.g., McKenzie, 2004; Epstein, 2008; Longoni et al., 2014). Thus, the *Social Sustainability Performance* construct includes two items: social reputation, which measures the external (community) dimension of social sustainability, and employee satisfaction, which measures the internal (workforce) social sustainability dimension. Performance items were measured as improvements in the last three years on a Likert scale ranging from 1 for "much worse" to 5 for "much better". Their reliability was tested by means of the Spearman-Brown reliability measure (0.774).

Contingent variable measures

Previous authors have proposed a contingency model of operations strategies dependent on business strategy (e.g., Hayes and Wheelwright, 1984). Therefore, a key issue in the development of operations strategy is the fit of operations strategy with business strategy (Hayes and Wheelwright, 1984; Venkatraman, 1989). To study the fit of operations strategy configuration models with business strategy, we used the variables that are most widely adopted in the operations strategy literature and that are more consistent with the aim of studying sustainability development.Specifically, the literature suggests that environmental and social sustainability could lead to greater business differentiation and innovation (Sharistava, 1995; Dangelico and Pujari, 2010; Crittenden et al., 2011). Therefore, in this study, *Business Strategy* was operationalized using 5-point Likert scales to measure the market span (1 for "few segments" to 5 for "many segments"), product focus (1 for "physical attributes" to 5 for "service emphasis") and geographical focus (1 for "national" to 5 for "international") (Mintzberg, 1979).

3. Data analysis

To study the propositions formulated in the literature review, we conducted our research following multiple steps. Two preliminary steps were needed to check the alignment of our sample with previous results and the significance of our propositions. First (Step 0.a), we replicated previous studies (see Table 1) to verify whether traditional configuration models were still valid in our sample. In particular, configuration models were defined through a cluster analysis of traditional competitive priorities and were compared to previous results in the literature. Because of the large number of companies analysed and the instability of hierarchical clustering algorithms, a two-step clustering procedure was used. This procedure is also aligned with that used in previous studies (e.g., Frolich and Dixon, 2001; Cagliano et al., 2005). An initial hierarchical clustering was performed on random subsamples to determine the number of clusters. Subsequently, non-hierarchical clustering was performed using the K-means cluster algorithm. The K-means cluster analysis was conducted to generate the four clusters. To ensure stability of the results, we iterated the analysis by employing the K-mean algorithm to generate three and five clusters. The results indicated that the four clusters were acceptable. To test whether these clusters match those of the most widely acknowledged studies (i.e., Miller and Roth (1994) and Frohlich and Dixon (2001)), we adopted the approach of Zhao et al. (2006) in computing Spearman's rank-order correlation coefficients (rs) to compare the relative rankings of our clusters with those of the established works. In Step 0.b, an ANOVA was conducted to test for differences in environmental and social priorities among clusters. This step was needed to explore whether environmental and social priorities were relevant and significantly different among the configuration models to justify the subsequent steps of the research.

Next, Step 1 aimed to identify the extent to which adding environmental and social sustainability to the traditional competitive priorities changes traditional configuration models (i.e., testing P1). Therefore, we adopted the same clustering procedure described above, but we added environmental and social sustainability to the competitive priorities. In this case, four clusters were also identified. We iterated the K-means cluster analysis to generate three and five clusters, and the four clusters were acceptable.

In Step 2, an ANOVA was conducted to test for differences in the competitive priorities, especially environmental and social sustainability, in these new configuration models (i.e., testing P2a). Furthermore, to test the fit of these new configuration models, with a contingent approach,

we analysed the *Business strategy* by performing an ANOVA (i.e., testing P2b).

Finally, to determine whether the new configuration models identified achieve short- and long-term performance to different extents (i.e., testing P3), Step 3 involved performing an ANOVA of the performance achieved.

All of the research and analysis steps are summarised in Table 5.

Table 5: Research methodology steps

Research step	**Analysis performed**
Step0.a Replication of traditional operations strategy configuration model studies	1. Two-step cluster analysis (hierarchical and K-means) on traditional operations priorities 2. Spearman's rank order correlation
Step 0.b Check differences in sustainability priorities in traditional operations strategy configuration models	1. ANOVA on environmental and social sustainability priorities
Step 1. Identification of the new operations strategy configuration models including environmental and social priorities (testing P1)	1. Two-step cluster analysis (hierarchical and K-means) on traditional operations priorities and environmental and social sustainability priorities
Step 2a. Identification of the new operations strategy configuration models complemented by environmental and social priorities to a greater extent (testing P2a)	1. ANOVA on competitive priorities
Step 2b. Identification of the fit between the new operations strategy configuration models and business strategies (testing P2b)	1. ANOVA on business strategy characteristics
Step 3. Identification of the effects of the new operations strategies configuration models on short- and long-term performance (testing P3)	1. ANOVA on short- and long-term performance

4. Results

4.1 Replication of traditional operations strategy configuration model studies (Step 0)

Table 6 presents the results of the cluster analysis based on only traditional competitive priorities (Step 0.a). The results show that the sample is grouped into four main clusters. Based on the rankings and significantly different average values given to competitive priorities (based on Scheffé's post-hoc test with significance < 0.05) in the different clusters, the four clusters are interpreted as follows: a price-oriented configuration, a capability-oriented configuration and two market-oriented configuration models (i.e., product-oriented and service-oriented models) (Table 6).

As shown in Table 7, these four clusters are significantly correlated with the clusters previously established in the operations management literature (i.e., Miller and Roth (1994) and Frolich and Dixon (2001)). The priority rankings of the identified price-oriented configuration and capability-oriented configuration models are highly correlated with those found by Miller and Roth (1994) (correlation significant at < 0.05) and Frolich and Dixon (2001) (correlation significant at < 0.01). The two market-oriented configuration models (i.e., product-focused and service-focused configurations) are correlated with Miller and Roth's (1994) market-oriented configuration (at < 0.05 and < 0.01, respectively). Instead only the service-focused configuration model is correlated with Frolich and Dixon's (2001) market-oriented configuration models (correlation significant at < 0.01). The product-focused configuration model is not correlated with Frolich and Dixon's (2001) market-oriented configurations. To explain these results related to the Frolich and Dixon's configurations, we note that our study explores innovation priorities in greater detail than in Frolich and Dixon's (2001) study, which could have influenced the relative ranking of priorities.

The results of Step 0.b of the analysis are presented in Table 8. An ANOVA analysis of environmental and social priorities means show that despite the average environmental and social priorities being relatively low (ranging from 2.17 to 3.86), the configuration models show significantly different levels of environmental and social priorities (with significance < 0.05) (see Table 8).

Table 6: Clusters (with traditional competitive priorities) average values and ANOVA

		N	*Lower selling prices*	*Superior product design and quality*	*Superior conformance*	*More dependable deliveries*	*Faster deliveries*	*Superior customer service*	*Wider product range*	*Offer new products more frequently*	*More innovative products*	*Greater order size flexibility*
Market-oriented configurations	***Product focused***		3.88	4.27	*3.76*	*3.04*	*2.64*	3.36	2.95	2.67	3.66	*2.12*
			3	***3, 4***	***2, 4***	***2, 3, 4***	***2, 3, 4***	***2, 3, 4***	***2, 3, 4***	***2, 3, 4***	***2, 3, 4***	***2, 3, 4***
		121	2	1	3	6	9	5	7	8	4	10
	Service-focused		*3.61*	4.10	4.14	4.18	4.00	3.87	3.31	2.96	3.24	3.41
			3	***3, 4***	***1, 4***	***1, 4***	***1, 3, 4***	***1, 3, 4***	***1, 3, 4***	***1, 3, 4***	***1, 3, 4***	***1, 3, 4***
		238	6	3	2	1	4	5	8	10	9	7
Price-oriented configuration			**4.28**	*3.60*	3.92	4.05	3.69	*2.84*	*2.14*	*1.56*	*1.88*	2.78
			1, 2, 4	***1, 2, 4***	***4.00***	***1, 4***	***1, 2, 4***	***1, 2, 4***	***1, 2, 4***	***1, 2, 4***	***1, 2, 4***	***1, 2, 4***
		108	1	5	3	2	4	6	8	10	9	7
Capability-oriented configuration			3.84	**4.64**	**4.64**	**4.51**	**4.46**	**4.58**	**4.13**	**4.14**	**4.41**	**4.14**
			3	***1, 2, 3***	***1, 2, 3***	***1, 2, 3***	***1, 2, 3***	***1, 2, 3***	***1, 2, 3***	***1, 2, 3***	***1, 2, 3***	***1, 2, 3***
		206	10	1	1	4	5	3	9	7	6	7

Note*:* The bold and italic values in the first rows represent highest and lowest score, respectively, for each variable.

Cluster differences have been assessed by means of a Scheffé post-hoc test with significance < 0.05 and indicated in the second row ***(Group 1: market-oriented (product focused), Group 2: market-oriented (service focused), Group 3: price-oriented, Group 4: capability-oriented).***

The Overall ranking of competitive priorities is indicated in the third row.

Table 7: Comparison of traditional operations priorities clusters and established literature

		Price-oriented	***Market-oriented (Product)***	***Market-oriented (Service)***	***Capability-oriented***
Price-oriented	**Caretakers_MR[a]**	.703*	0.167	0.301	-0.186
Market-oriented	**Marketeers_MR**	.767*	.667*	.833**	0.529
Capability-oriented	**Innovators_MR**	0.35	.667*	0.633	.773*
Price-oriented	**Caretakers_Nord America_FD**	**.983****	0.55	.717*	0.328
Market-oriented	**Idlers_FD[b]**	-0.253	0	-0.228	0.038
	Servers_FD	0.383	0.633	.667*	.790*
	Mass_customizers_FD	-0.298	-0.213	-.672*	-.674*
	Designers_Nord America_FD	0.185	0.546	0.664	.814**
	Designers_South America_FD	0.494	0.46	.762*	.781*
	Designers_West Europe_FD	0.217	0.383	.767*	.882**
	Designers_Asia_FD	0.2	0.55	.667*	.849**
Capability-oriented	**Innovators_Nord America_FD**	0.117	0.467	.683*	**.933****

[a]MR: Miller and Roth (1994): Miller and Roth's rank orders are derived from Table 2, page 291 of Miller and Roth (1994)

[b]FD: Frolich and Dixon (2001): Frolich and Dixon's Designers rank orders are derived from Table 12, page 550; Idlers, Servers and Mass customizers rank orders from Table 14, page 551; Caretakers rank order from Table 4 (IMSS 1998) page 546; Innovators rank order from Table 6 (IMSS 1998) page 547; of Frolich and Dixon (2001)

* Correlation is significant at 0.05 level.

** Correlation is significant at 0.01 level.

Table 8: ANOVA results for environmental and social priorities in traditional configuration models

		Environmental products and processes	*Committed social responsibility*
Market-oriented configurations	***Market-oriented (Product –focus)***	*2.55*	*2.17*
		2, 4	***2, 4***
	Market-oriented Service-focused	3.18	2.92
		1, 3, 4	***1, 3, 4***
Price-oriented configuration		2.57	2.37
		2, 4	***2, 4***
Capability-oriented configuration		**3.86**	**3.79**
		1, 2, 3	***1, 2, 3***

Note*:* The bold and italic values in the first rows represent highest and lowest score, respectively, for each variable. and indicated in the second row ***(Group 1: market-oriented (product focused), Group 2: market-oriented (service focused), Group 3: price-oriented, Group 4: capability-oriented).***

4.2 Identification of the new operations strategy configuration models including environmental and social priorities (Step 1)

Table 9 shows that when environmental and social sustainability priorities are included as clustering variables, four clusters are identified. Based on the rankings and significantly different average values given to competitive priorities (based on Scheffé's post-hoc test with significance < 0.05) in the different clusters, the four clusters are interpreted as follows: a price-oriented configuration named *New Caretakers*, a capability-oriented configuration named *New Innovators* and two market-oriented configurations (i.e., one product-focused configuration named *New Designers* and a service-focused configuration named *New Servers*) (see Table 9). No distinct strategic configuration models that focused only on environmental or social priorities appeared; instead, the traditional configuration models were slightly changed to integrate the new priorities. Therefore, P1 is confirmed.

Table 9: Clusters (with traditional competitive priorities and sustainability) average values and ANOVA

		N	*Lower selling prices*	*Superior product design and quality*	*Superior conformance*	*More dependable deliveries*	*Faster deliveries*	*Superior customer service*	*Wider product range*	*Offer new products more frequently*	*More innovative products*	*Greater order size flexibility*	*Environmental products and processes*	*Committed social responsibility*
Market-oriented configurations			3.73	4.35	3.99	3.58	3.44	3.68	3.55	3.33	3.92	2.83	2.24	1.85
	New Designers		***3***	***2, 3, 4***	***4***	***2, 4***	***2, 4***	***3, 4***	***2, 3, 4***	***2, 3, 4***	***2, 3, 4***	***2, 3, 4***	***2, 3, 4***	***2, 4***
		147	4	1	2	6	8	5	7	9	3	10	11	12
	New Servers		3.76	4.03	4.16	4.12	3.86	3.73	3.00	2.57	3.02	3.32	3.49	3.36
			3	***1, 3, 4***	***3, 4***	***1, 3, 4***	***1, 3, 4***	***3, 4***	***1, 3, 4***	***1, 3, 4***	***1, 3, 4***	***1, 3, 4***	***1, 3, 4***	***1, 3, 4***
		205	5	3	1	2	4	6	10	12	11	9	7	8
Price-oriented configuration			**4.14**	*3.65*	*3.74*	3.68	3.22	2.89	*2.18*	*1.70*	*2.11*	*2.32*	*2.11*	*1.76*
	New Caretakers		***1, 2***	***1, 2, 4***	***2, 4***	***2, 4***	***2, 4***	***1, 2, 4***	***1, 2, 4***	***1, 2, 4***	***1, 2, 4***	***1, 2, 4***	***1, 2, 4***	***2, 4***
		114	1	3	2	2	4	5	7	11	9	6	8	10
Capability-oriented configuration			3.82	**4.62**	**4.60**	**4.54**	**4.46**	**4.56**	**4.07**	**4.05**	**4.30**	**4.15**	**4.12**	**4.01**
	New Innovators		***-***	***1, 2, 3***	***1, 2, 3***	***1, 2, 3***	***1, 2, 4***	***1, 2, 3***	***1, 2, 3***	***1, 2, 3***	***1, 2, 3***	***1, 2, 3***	***1, 2, 3***	***1, 2, 3***
		207	12	1	1	3	3	1	7	7	10	6	7	11

Note*:* The bold and italic values in the first rows represent highest and lowest score, respectively, for each variable.

Cluster differences have been assessed by means of a Scheffé post-hoc test with significance < 0.05 and indicated in the second row ***(Group 1: New Designers, Group 2: New Servers, Group 3: New Caretakers, Group 4: New Innovators).***

The Overall ranking of competitive priorities is indicated in the third row.

4.3 Identification of the new operations strategy configuration models complemented by environmental and social priorities to a greater extent and the fit with business strategies (Step 2)

Comparing the average values for environmental and social sustainability priorities in the different clusters through ANOVA and Scheffé's post-hoc test with significance < 0.05 (see Table 9), we highlight the significant differences. Specifically, *New Caretakers* give the lowest value to environmental and social sustainability priorities. The value for the environmental sustainability priority is significantly different from all other configuration models, whereas the value for social sustainability is significantly different from *New Innovators* and *New Servers*. Compared with all of the other configurations, *New Innovators* give significantly higher value to both environmental and social sustainability priorities. *New Designers* and *New Servers* are between *New Caretakers* and *New Innovators,* but among them, *New Servers* give significantly higher values to environmental and social sustainability priorities than *New Designers*.

Overall, the price-oriented configuration model (i.e., *New Caretakers*) is less inclined to be complemented by environmental and social sustainability priorities. The market-oriented (i.e., *New Designers* and *New Servers*) and innovation-oriented (i.e., *New Innovators*) configuration models are complemented by environmental and social sustainability priorities to a greater extent even with some nuances. Therefore, P2a is partially confirmed.

Furthermore, an ANOVA analysis of *Business strategy* shows that environmental and social sustainability priorities are consistent with differentiation and innovation strategies related to market-oriented (i.e., *New Designers* and *New Servers*) and innovation-oriented (i.e., *New Innovators*) operations strategies, as suggested in P2b. Table 10 shows that *New Caretakers* has a significantly (with significance < 0.05) lower market span and higher product focus than *New Designers*, *New Servers* and *New Innovators*. Instead there is no significant difference in relation to the geographic focus.

Table 10: ANOVA results for business strategy characteristics

	Market-oriented configurations				*Price-oriented configuration*		*Capability-oriented configuration*	
	New Designers		***New Servers***		***New Caretakers***		***New Innovators***	
Market span	3.16	***3***	3.16	***3***	*2.59*	***1, 2, 4***	**3.34**	***3***
Product focus	2.69	***4***	2.91	***3***	*2.46*	***2, 4***	**3.14**	***1, 3***
Geographical focus	**3.90**	**-**	*3.65*	**-**	3.88	-	3.68	-

Note*:* The bold and italic values in the first columns represent highest and lowest score, respectively, for each variable. ***Cluster differences*** have been assessed by means of a Scheffé post-hoc test with significance < 0.05 and indicated in the second row ***(Group 1: market-oriented (product focused), Group 2: market-oriented (service focused), Group 3: price-oriented, Group 4: capability-oriented).***

4.4 Identification of the effects of the new operations strategies configuration models on performance (Step 3)

Tables 11 and 12 report the results of the ANOVA analysis of short- and long-term performance in the different clusters. The tables show the average level of performance of the clusters, together with an indication of the clusters that are significantly different from the one considered. The results suggest that the equifinality of configuration models is not supported in the short term except in the case of ROS. In fact, *New Innovators* has a significantly (with significance < 0.05) higher level of market share than *New Servers* and *New Caretakers* and a significantly higher ROI than *New Designers* and *New Caretakers*. However, concerning long-term performance *New Innovators* performs significantly better than all other configuration models. Therefore, P3 is partially confirmed: the new configuration models identified are not performing at the same level in the short term and among sustainability-oriented configuration models; only *New Innovators* are performing better than all the others in terms of long-term performance.

Table 11: ANOVA results for short term performance

		Market share	*Return on sales*	*ROI*
Market-oriented configurations	***New Designers***	3.25	3.12	3.08
		-	**-**	***4***
	New Servers	3.23	3.21	3.19
		4	**-**	**-**
Price-oriented configuration	***New Caretakers***	*3.13*	*3.05*	*3.04*
		4	**-**	***4***
Capability-oriented configuration	***New Innovators***	**3.52**	**3.36**	**3.37**
		1, 3	**-**	***2, 3***

Note*:* The bold and italic values in the first rows represent highest and lowest score, respectively, for each variable. ***Cluster differences*** have been assessed by means of a Scheffé post-hoc test with significance < 0.05 and indicated in the second row ***(Group 1: market-oriented (product focused), Group 2: market-oriented (service focused), Group 3: price-oriented, Group 4: capability-oriented).***

Table 12: ANOVA results for long term performance

		Cost	*Quality*	*Flexibility*	*Customer service*	*Delivery*	*Social sustainability*	*Environmental sustainability*
Market-oriented configurations	***New Designers***	2.79	3.06	3.35	2.92	3.00	2.57	2.76
		4	***4***	***3***	***3, 4***	***4***	***4***	***4***
	New Servers	2.89	3.10	3.24	2.92	3.26	2.77	2.95
		4	***4***	***3, 4***	***3, 4***	***3, 4***	***4***	***4***
Price-oriented configuration	***New Caretakers***	*2.72*	*2.97*	*2.93*	2.65	*2.84*	*2.56*	*2.72*
		4	***4***	***1, 2, 3***	***1, 2, 4***	***1, 4***	***4***	***4***
Capability-oriented configuration	***New Innovators***	**3.18**	**3.41**	**3.58**	**3.39**	**3.50**	**3.17**	**3.40**
		1, 2, 3	***1, 2, 3***	***1, 3***	***1, 2, 3***	***1, 2, 3***	***1, 2, 3***	***1, 2, 3***

Note*:* The bold and italic values in the first rows represent highest and lowest score, respectively, for each variable. ***Cluster differences*** have been assessed by means of a Scheffé post-hoc test with significance < 0.05 and indicated in the second row ***(Group 1: market-oriented (product focused), Group 2: market-oriented (service focused), Group 3: price-oriented, Group 4: capability-oriented).***

5. Discussion

Our analysis allows for discussion of the three research propositions.

Operations strategy configuration models

A preliminary result of our study is that considering only traditional priorities, four configuration models are identified and can be traced back to the established models in the operations management literature (i.e., a price-oriented strategy, a capability-oriented strategy and

two market-oriented strategies) (Miller and Roth, 1994; Frolich and Dixon, 2001) (see Table 6). When also including environmental and social sustainability priorities, similar configuration models emerge, although no specific configuration models characterised primarily by environmental and social priorities appeared (Table 9). The configuration models that are more similar to traditional configuration models are *New Caretakers* and *New Innovators*. The *New Caretakers* configuration model is similar to Miller and Roth's (1994) and Frolich and Dixon's (2001) price-oriented configurations. As in the traditional configuration models, the *New Caretakers* compete primarily on price, followed by quality conformance, design performance and delivery speed and dependability, even if to a lower extent. The priorities given by the *New Caretakers* to sustainability, especially environmental sustainability, is limited but still higher than that for flexibility and innovation priorities. However, the results show that the *New Caretakers* configuration model is the less numerous cluster in our sample, perhaps because most companies are no longer considering low price to be the only competitive weapon and are thus moving towards a more complete set of competences (Cagliano et al., 2005; Porter and Kramer, 2006).Moreover, the configuration model of *New Innovators* is similar to Miller and Roth (1994) and Frolich and Dixon's (2001) capability-oriented configuration models. As in the traditional configuration models, companies in this cluster seek to differentiate themselves by offering high product quality, superior customer ser*vice and high* flexi*bility and produ*ct v*ariety, and th*ey do not show high price consciousness. On the sustainability side, these companies are those showing the highest commitment to environmental and social sustainability p*riorities. Fur*thermore, considering priority rankings, the environmental sustainability priority is among the most important after quality, customer service and flexibility.

The two market-*oriented confi*guration models (i.e., *New Designers* and *New Servers*) are similar to Frolich and Dixon's (2001) market-oriented models (i.e., Designers and Servers) and can be traced back to Mi*ller and Roth'*s (1994) Marketeers. As in previous research, *New Servers* base their competition on the balance between delivery, after sales and quality, together with the ability to fulfil customer needs in terms of product availability and on-time delivery. *New Designers* emphasise product innovativeness and design quality and are also oriented towards offering broader product lines and the frequent introduction of new products. Both *New Servers* and *New Designers* show a certain level of price consciousness. In both configuration models, the values attributed to environmental and social sustainability priorities are higher than in *New Caretakers*.

However, considering priorities ranking, environmental and social sustainability priorities are less important in *New Designers* than in *New Servers.* In fact, in *New Servers* environmental and social sustainability priorities are ranked higher than innovation and flexibility.

Overall, the results suggest that established operations strategy configuration models are only partially modified when environmental and social sustainability priorities are introduced. This evidence supports our first research proposition:

P1. The pursuit of environmental and social priorities is not leading to new operations strategy configuration models but rather complements existing models (i.e., price-oriented, market-oriented, and capability-oriented models).

The configuration models that are complemented by environmental and social priorities to a greater extent are the capability-oriented (i.e., *New Innovators*) and market-oriented (i.e., *New Designers* and *New Servers*) configuration models (see Table 9), thus supporting P2a. Interestingly, among the latter models, the configuration model with greater emphasis on environmental and social sustainability priorities is the *New Servers*. Although the literature suggests that increasing attention is devoted to sustainable product design and development (Orsato, 2006; Porter and van der Linde, 1995; Crittenden et al., 2011; Dangelico and Pujari, 2010), the importance given to environmental and social sustainability priorities by *New Designers* is relatively low, although still higher than *New Caretakers*. This result may be observed because attention to sustainable product design and development is quite widespread. Therefore, it is not a competitive weapon but rather a qualifier for companies competing on product quality and innovativeness. Thus, environmental and social sustainability priorities are not the main competitive priorities of *New Designers*. Instead, environmental and social sustainability priorities are much more important for *New Servers,* given that sustainability deployment in product-related services has been more recently developed, and it is still providing differentiation advantages to those companies competing through after sales and customer service-related operations strategies.

Furthermore, as expected, the configuration models with greater emphasis on sustainability are consistent with differentiation and innovation business strategies, thus confirming P2b. In fact, considering the business strategy, *New Servers*, *New Designers* and *New Innovators* are operating in many market segments and with broad product ranges, whereas *New Caretakers* have a more focused business (see Table 10).

In summary, our results support that the configuration models that are complemented by environmental and social sustainability priorities to a greater extent are capability-oriented strategy (i.e., *New Innovators*) and market-oriented strategy models (in particular *New Servers*), thus partially confirming P2a:

P2a: Environmental and social sustainability priorities complement market-oriented and capability-oriented operations strategy models more than the price-oriented operations strategy model.

Furthermore, configuration models that are complemented by environmental and social sustainability priorities to a greater extent are consistent with differentiation and innovation business strategies, thus confirming P2b:

P2b: Environmental and social sustainability priorities complement the operations strategies of companies that are more characterised by differentiation and innovation business strategies.

Performance achievement

Considering the level of performance achieved by different configuration models in the short term, equifinality theory is only partially supported by our results. Equifinality theory implies that configuration models differ only in terms of strategic orientation but achieve the same level of financial performance (Doty et al., 1993). Our analyses of short-term performance (see Table 11) show that there is no significant difference between the level of ROS achieved by different configuration models identified, providing support to equifinality theory. However, analyses performed on ROI and market share show differences among the configuration models, indicating that *New Innovators* perform better than the other models (see Table 11).

Furthermore, when considering the proxies of long-term performance (i.e., operational and sustainability performance) (see Table 12), *New Innovators* are performing significantly better than other configuration models, especially in terms of environmental and social sustainability performance, perhaps because these companies have developed strong organisational capabilities on which they build environmental and social sustainability and long-term economic results. Such companies are able to face complex, long-term issues and overcome the inherent trade-offs.

We suggest that the greater performance of *New Innovators* also in terms of ROI and market

share could result from the earlier development and more mature approach to environmental and social sustainability that led these companies to excel on all performance dimensions. In fact, commitment to environmental and social sustainability is becoming a key success factor in the market (Porter and Kramer, 2006). However, this interpretation cannot be supported by our findings, as we do not have longitudinal data to prove this relationship.

Finally, even if *New Servers* are also committed to environmental and social priorities, they have a more focused set of capabilities that does not allow them to exploit the sustainability competitive advantage to the same extent. As a consequence, the level of operational performance improvement of *New Servers* is lower than that of *New Innovators*, even if it is higher than other configuration models identified.

Overall, the third research proposition is only partially verified:

P3: Companies adopting different operations strategy configuration models may perform equally well in the short term, whereas companies adopting different operations strategy configuration models that are complemented by environmental and social sustainability to a greater extent may perform better in the long term.

In fact, the results suggest that complementing operations with environmental and social sustainability to a greater extent might lead to better performance in both the short and long term if complementing capability-oriented operations strategies.

6. Conclusion and implications

The paper contributes to the operations management literature by validating previous established configuration models and extending the problem considering the emerging topic of environmental and social sustainability. In this way, we contribute to a further development and update of the long-time stream of operations strategy configuration models (e.g., Miller and Roth, 1994; De Meyer, 1990) and provide insights for academics and practitioners on how environmental and social priorities are integrated into holistic operations strategies.

5.1 Theoretical implications

Our study shows that when environmental and social sustainability priorities are introduced, companies integrate them into traditional operations strategies rather than developing new approaches to competition. This result provides evidence that environmental and social

sustainability are not isolated business priorities but are instead incorporated to enrich and expand traditional operations strategies. Moreover, our results show that sustainability does not place constraints on organisations but is, on the contrary, a source of inspiration contributing to higher operational and sustainability performance and could also be a source of enhanced financial performance leading to competitive advantage. In fact, *New Innovators,* while placing the same importance on environmental and social sustainability as on the traditional priorities of quality, delivery and innovation, are performing better in terms of both short-term financial performance and long-term operational and sustainability performance. Similarly, *New Servers* are most committed to environmental and social sustainability among the market-oriented configuration models, illustrating how sustainability is becoming a priority in companies competing on after sales and customer service.

The traditional price-oriented configuration model is less affected by the emergence of environmental and social sustainability priorities. In fact, *New Caretakers* are less committed to environmental and social sustainability priorities and maintain the primary focus on price and quality priorities. However, *New Caretakers* is the less numerous cluster of companies, showing how focused strategies that do not integrate environmental and social sustainability priorities are concentrated and perhaps even disappearing.

6.2 Practical implications

This research provides a number of managerial implications with suggestions for companies aiming to pursue environmental and social priorities regarding how they can approach this objective in a manner that is consistent with traditional operations competitive priorities. Moreover, the study suggests to managers how environmental and social priorities can be a source of competitive advantage in the short and long term when integrated into innovative strategies that enhance different operational and sustainability capabilities. Finally, we suggest that these types of strategies might characterise the new competitive scenario, given that such operations strategies are often adopted by companies pursuing differentiation and innovation business strategies increasingly common in competitive markets.

6.3 Limitations and directions for future research

An important limitation of this work stems from the cross-sectional data that do not allow for tracing the movements of companies from one operations strategy configuration model to another. Such an analysis could provide more insight on when, how and why companies move to other configuration models or simply enlarge or modify their existing strategies with emerging priorities. Moreover, it is difficult to distinguish between short- and long-term results and to imply casual relations. To fill this gap, qualitative research and longitudinal data may be helpful to develop and test more specific propositions.

Similarly, the inclusion of environmental and social priorities appears to be more effective in companies adopting capability-oriented strategies, likely because sustainability is a complex issue that requires a mature approach and the availability of resources and capabilities that not all companies have. Therefore, another possible future development of the research may concern the study of possible sequences through which companies build cumulative capabilities to achieve competitive advantages, e.g., revisiting the sandcone model (Ferdows and De Meyer, 1990) by adding environmental and social sustainability capabilities.

Finally, future research could test the results of this study to determine whether growing levels of company consciousness in terms of sustainability in the future will further change the operations strategy configuration models and will lead, e.g., to the emergence of specific operations strategies focused primarily on sustainability.

7. References

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