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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 & Bertelè, 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, Garcés-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, Garcés-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 (Benijts, 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 (Vanegas, 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; Gerdsri, 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 Aluminum 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 trough 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.

More evidence about the use of roadmapping in connection to sustainability is provided in the field of new product development. In this field, in fact, Petrick and Echols (2004) and Waage (2007) apply the concept of roadmaps for supporting the development of new sustainable products. Petrick and Echols (2004) highlight the need of considering long term expectations and technology evolution in the development of new products and propose an heuristic approach to forecast technologies, markets, and related new product priorities. Waage (2007), expanding on prior research, proposes a four-phase process, structured as a roadmap, for integrating sustainability perspectives into product design process.

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

Literature streams	Topics	Authors
Roadmapping	Roadmap idea	Willyard & McClees (1987); Barker & Smith (1995)
	Adoption and development	Groenveld (1997); Albright & Kappel, (2003); Kajikawa et al. (2008); Gerdsri (2013)
	Industry roadmap	Kostoff and Schaller (2001); Phaal (2002)
	Roadmap classification	Kappel (2001); Phaal et al., *(*2004)
	Link to strategic management	Tschirky *et al*. (2003); Hitoshi *et al*. (2009); McMillan (2003); Propert & Radnor, (2003); Carvalho *et al*. (2013)
Roadmapping & sustainability	Potential use of roadmapping for the development of sustainability strategy	Paramanathan *et al*. (2004)
	Knowledge management	Robison *et al*. (2006)
	Corporate foresight	Will (2008)
	New product development	Petrick and Echols (2004); Waage (2007)

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, purposively 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)

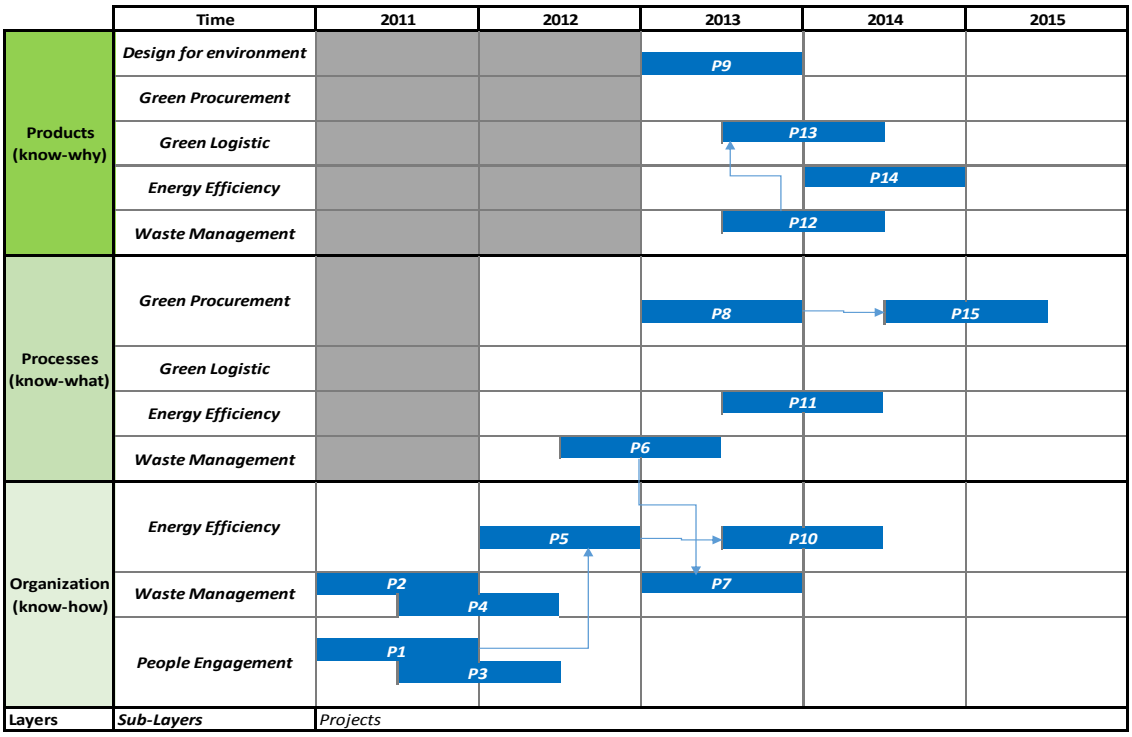
These are the words of the head of the "Green Unit" explaining the decision to adopt a roadmap approach to address the issue. He started from the idea that sustainability is a broad concept that can mean different things to different people. Hence he stated the need to formulate and communicate a "unified 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



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 at 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 stricture 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.

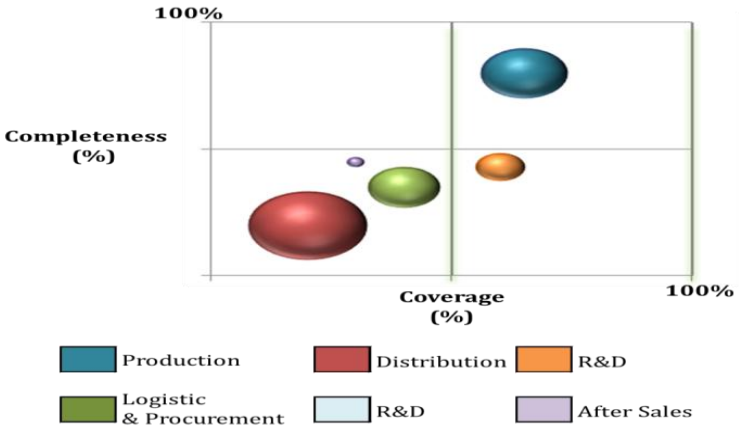
Table 2 Examples of Goal Oriented Indicators for project (proposals) in the "organisation" layer

Dimension of sustainability	Indicators	
People engagement	$\frac{Employee\ inv._T}{Employee_T}$	% number of employees directly involved in project
	$\sum_t^T Portal\ Visits_t$	Total number (t = month, T = year) of visits to the intranet section of the "Green Company" project
	$\frac{\sum_i^N Time\ Session_i}{Portal\ Visits_T}$	Average time (min) of duration of the visit to the intranet section of the "Green Company" project
	$\frac{Km_T - Km_{T-1}}{Km_{T-1}}$	Yearly savings (%) in job trips using automotive or airplane
Waste management	$\frac{\sum_t Waste_{t,i}}{\sum_t employee_t}$	Yearly kilograms of waste generated per employee (t = month, T = year) and typology (i = paper, plastic, …)
	$Waste_T - Waste_{T-1}$	Yearly savings (kilograms) in waste generated
Energy Efficiency	$\frac{\sum_t En\ El_{t,i}}{\sum_t employee_t}$	Yearly kWh of electricity consumed per employee (t = month, T = year) and destination (i = lighting, conditioning, …)
	$En\ El_T - En\ El_{T-1}$	Yearly savings (kWh) in electricity consumed

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.

Figure 2 The Coverage-Completeness Reporting for projects about processes



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

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

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, accordingly 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 can not 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.

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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