**Hindrances to Sustainability-oriented Differentiation Strategies
in the Brazilian Textile and Apparel Industry**

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ABSTRACT

This paper discusses a possible conversion of Brazilian textile and apparel firms from cost based to sustainability-oriented differentiation strategy. Eco-innovation and social-environmental initiatives of ten firms were analyzed revealing two distinct typologies of strategies among large and small companies. Nevertheless, none of them seem to be near from meeting the needs of emerging global conscious consumers that accept to pay more for sustainable innovations. A case study showed the hindrances to implementing the desired strategy. Recommendations for necessary intra and inter-organizational changes in the value chain are presented.

Keywords: sustainable management; impacts quantitative assessment; textile and apparel industry

1. Introduction

For thirty years the Multi-Fiber Arrangement (MFA) imposed quotas on the amount of textiles and garments developing countries could export to developed countries. Since it expired at the end of 2004, global clothing production has shifted towards strong cost-based competition. A handful of low-cost production sites around the world have seized the opportunity to increase their market share by reducing wages and environmental management costs (Schor, 2005; Gereffi, 2005). This cost-oriented industrial strategy was based on the assumption that only by offering the absolute minimum of working and environmental conditions will organizations survive the globalization of production and trade. Yet even these firms operated on very tight profit margins.

At a time when it is increasingly difficult to compete on costs in the Global Value Chain, firms from historical and traditional local producers look for new business differentiation strategies. Most of T&A industries in developing countries are low-technology intensity industries

(Hatzichronoglou, 1997) characterized by aesthetically centered product innovations instead of high technology ones. Meanwhile, their main information sources to innovate (IBGE, 2013) reveal that their copy-paste strategies make their innovative activities a mere adaptive process of following the internal market tastes and preferences taught by others. Their high dependence on European and American fields and domains of creativity (Csikszentmihalyi, 1999) is fed by the continuing high of imports by big retailers, levering this tendency and making it more difficult to compete against those producers that are supported by export-oriented policies. Economies of scale based upon mass production technologies are another hindrance to innovation, as it is strongly dependent on control and standardization downstream and upstream the value chain. Considering the growth of emerging conscious consumers worldwide, sustainability approach appears as an alternative basis to compete in the Global Value Chain.

The high water and energy consumption in T&A factories and the use and destination of toxic materials, for instance, was soon detected as having a very significant impact on both production costs and environmental degradation (UNIDO, 1979; Hewson, 1999). While many firms have successfully stressed their innovation skills to enhance aesthetically their products or to make them easier to care for, and some others pulverized their innovative design in order to control and accelerate fashion obsoletism, a third group opted for new solutions addressing social and environmental issues. An increasing international interest for sustainable goods has generated specific T&A markets that can be won over by continuously bringing out new products with social and environmental attributes.

This trend towards sustainable products is not restricted, of course, to the T&A industry. Several studies (e.g. Laroche, Bergeron & Barbaro-Forleo, 2001; Borchers, Duke & Parsons, 2007; Bento et

al., 2010; Elfenbein & McManus, 2010) suggest that in many different industries a high proportion of consumers are willing to pay more for eco-friendly products. In their purchase decisions, individuals are starting to consider their sense of responsibility for the environment, bringing short- and long-term considerations together at a single decision point. This heightened consumers' awareness turned passive users into active stakeholders, since the same information and set of values will later influence the production system. The new responsible consumer has driven both product and production technological innovations. Eco-innovation (James, 1997; Rennings, 2000; Hermosilla, Rio & Könnölä, 2010) and cleaner production (Baas et al.,1990; Campbell, 1991) are being seen as potential sources of competitive advantage, especially in globalized, high-competition markets, which is the case of the T&A industry. Striving for competitive differentiation, many firms have adjusted their business strategy, embracing sustainability requirements. A differentiated sustainable performance can be achieved by launching green products that can be retailed at higher prices and bigger margins (Azzone & Noci, 1998; Laroche, Bergeron & Barbaro-Forleo, 2001), or by optimizing production processes, e.g. reducing material and energy consumption, waste generation, etc. (Nieminem et al., 1997; Azzone & Noci, 1998; Jones, 2001). The image of being a sustainability pro-active firm enhances its market value. But market value itself is a changing concept.

As a creative industry, fashion industry plays an important role in dissolving the persistent dichotomy production-consumption of industrial capitalism. In complex markets, consumer choice is not governed by conventional theory of demand. It is leaded by the choice of others in such a way that the decision to buy is the explicit result of a third-party action (Potts et al., 2008; Uricchio, 2004). In this aspect, consumer and citizen roles are brought

together in social networks with sustainability values.

Nevertheless, sustainable goods usually generate very dynamic markets. In order to achieve competitive advantage in such situations, an increasing attention to organizational learning has been argued by different scholars (e.g. Hung et al., 2010; Wu, 2010; Zhou, 2010). Developing worker knowledge and skills through training may help to balance external pressures with the internal capabilities (Sarkis, Gonzales-Torre & Adenso-Diaz, 2010) because it can enhance the three factors identified by Wang and Ahmed (2007) as the basic sources of competitiveness: (a) the ability to take in external knowledge, (b) the ability to link the innovativeness to products and markets and (c) the ability to adapt and align resources and capabilities. Other frequent sources of organizational learning are acquiring external knowledge and or referring to consulting services. But when it comes to sustainability, this paper argues that organizational learning, whatever its form, should lean strongly on the creation of quantitative sustainability assessment in the entire value chain.

In order to participate in the Global Value Chain, Brazilian T&A industry must confront with these challenges and contradictions. Being socially and environmentally committed is not merely a marketing issue, but a question of developing sustainability capabilities that transcend brand image strategies and eco-friendly discourses. The aim of this paper is to explore obstacles to sustainability-oriented differentiation strategies in Brazilian T&A industry, describing and analysing chosen relevant firms initiatives and presenting the hindrances found in the case study of a lead fashion retailer´s supply chain measurement of environmental and social impacts. The results suggest that while the small firms selected are keener to more radical product innovations, the large ones strive to reduce their environmental and social impacts in order to comply with

legislation, but none of these initiatives seem to be on the pace of adoption of the new methods and technologies that can push then onto leadership in sustainability-oriented differentiation strategies. We conclude that the implementation of life cycle quantitative assessment all along the lead firm value chain may lead to a better understanding of products and processes, enhancing organizational learning, trust and eco-innovation capabilities.

The paper is organized as follows. The next section discusses a possible conversion of Brazilian T&A firms to sustainability-oriented differentiation strategies. Section 3 synthesizes sustainability initiatives implemented by selected Brazilian T&A firms, designed to bear out, or not, this conversion. The results are analysed on Section 4. Section 5 describes a case study that was set up in order to deepen the previous results and section 6 discusses the new results. Section 7 presents our recommendations for the development of sustainability-oriented differentiation strategies in the Brazilian T&A value-chain. The final section draws our conclusions.

2. Sustainability-oriented differentiation strategies: an alternative to Brazilian T&A industry?

When the MFA came to an end, Brazilian T&A industry underwent a forced reorganization in response to increased competition from Asian producers. The governance of the supply-chains underwent major changes. In a bid to attain scope and scale economies, the largest firms launched a sequence of mergers and acquisitions. Leadership of the value chains began to be taken over by large retailers, following the global patterns of governance. At the same time, new, unprecedented interest started to be shown in Brazilian brands and firms sporting genuine Brazilian design, both inside the country and abroad. Some firms, many of which are small and medium-sized, have developed strategies to win over new markets on the back of their cultural appeal

and ecological values (Garcia et al., 2005; AUTHOR, 2007). In general, they are still taking their first steps. However, their future is not yet assured, as it depends on their capacity to withstand the high levels of competition in their business environment.

It is particularly these new businesses that demonstrate most clearly the difficulty experienced by Brazil's T&A industry in its haste to exchange cost-based strategies for business differentiation strategies. During the 1980s and 1990s, the main focus was on total quality management, but now these tools are clearly unable to yield the results required for achieving either price-based or differentiation-based competition. Managers then moved towards new methods, taking account of principles of human resources management, but these were also unsuccessful in obtaining either cost- or differentiation-based competitive advantages. Although some firms have started to make a transition towards business differentiation based on eco-innovation or cleaner production, the sector as a whole still seems locked into traditional production methods. This can be seen clearly by a broad-based survey of Brazilian firms involved in some form of innovation held one year after the MFA ended (IBGE, 2005). The analysis of the T&A firms included in the survey showed that innovative impacts rarely were focused on social and environmental issues. The very small group that invested in these aspects were almost entirely limited to improving their production processes to reduce water and energy consumption. Almost none of them showed any sign of employing systematic methods to develop new products. In line with this lack of interest in eco-innovation, it was also found that just a smaller group had any kind of collaboration with universities or other science and technology institutions, and just very few of them had sought to

bring their practices into line with international sustainability regulations (ABDI 2009). The last issue of IBGE survey (IBGE, 2013) sustains the same behaviour.

Meanwhile, these results doesn´t seem to differ sharply from results obtained in recent studies in Europe concerning eco-innovation in SME´s and European clusters (e.g. OECD, 2013; BARSOUMIAN *et alii*, 2011).

Given this scenario, which are the hindrances to the adoption of sustainability-oriented differentiation strategies by Brazilian T&A industry? To answer this question, the authors have conducted a study to identify, describe and evaluate the sustainability related innovative activities of selected firms.

3. First study: the sustainable initiatives of ten Brazilian T&A firms

Ten firms from three distinct regions of the country were investigated (see Table 1). Intentional sampling was used to select them based upon expert advices. The firms were selected by experts according to the following criteria: (a) existence of sustainability-oriented strategies and initiatives; (b) inclusion of both large and small firms; (c) diversity of production processes and goods produced; (d) broad distribution inside Brazil.

Although intentional sampling does not necessarily have to be representative, the Brazilian regions represented account for 80% of the total number of Brazil's firms from this sector (Brazil, 2004). The data were gathered on interviews with the firms' managers, from information on their websites, in assessment reports and in surveys of indicators of technological innovation in Brazilian firms.

Table 1. Sustainability initiatives of ten Brazilian T&A firms

firm	state	size	main products	exports	innovation		formal partnerships with universities	measurement of impacts	international regulations	training	environmental education or projects
					products	processes					
Large Company A	São Paulo	Large	cotton jersey fabrics	yes		wastewater	no	no	no	no	yes
Large Company B	Santa Catarina	Large	Clothing	yes	Oxo-biodegradable bags	wastewater, solid waste, emissions, water consumption	no	yes	yes	yes	yes
Large Company C	Santa Catarina	Large	table, bathroom and bed linen	yes		wastewater, recovery of energy from biomass	no	yes	yes	no	yes
Large Company D	Minas Gerais	Large	cotton fabrics	yes		solid waste, emissions	no	yes	yes	no	yes
Large Company E	Amazonas	Large	uniforms	yes	clothing made from recycled PET fibers		no	no	no	no	yes
Medium Company A	São Paulo	Mid-sized	finishing and clothing	no	natural colourings and softeners from Brazilian plant species in dying process	Waste water	yes	no	no	no	yes
Small Company A	Paraná	Small	Clothing	no	fabrics made from cellulose fiber from sustainable managed forests		no	no	no	yes	no
Small Company B	São Paulo	Small	recycled fabrics	no	jeans made from recycled PET fibers and recycled fabrics		no	no	no	no	no
Small Company C	São Paulo	Small	fashion retailer	no	jeans made from recycled PET fibers and recycled fabrics		no	no	no	no	no

Small Company D	Paraná	Small	hand-made pure silk thread	yes	fabrics and accessories using natural fibers and natural pigments from Brazilian plant species		no	no	no	yes	yes

Table 1 summarizes the sustainability initiatives of the ten selected T&A firms, related to their innovative activities. It points out significant differences between small and large firms, which were not so evident in the mentioned IBGE (2005; 2013) survey.

A) In large firms, process improvements prevail. The innovative activities lean on the acquisition of new machinery and construction of new facilities and they are usually aimed at measuring impacts, fulfilling international regulations and conducting environmental programs for the community. The only large firm found to have introduced a product innovation was Large Company B, which has a long tradition of effective commitment to environmental preservation.

At the time of the data collection, none of these firms had any formal partnership with universities or research and development organizations, although some did contact university researchers for assistance on an *ad hoc* basis. They also had no systematic sustainability training programs. However, in all cases the mere existence of wastewater treatment processes implies in some level of environmental training for the professionals involved in the operation, maintenance and control of the processes.

Two large firms stated that they did not comply with any international regulations, although exporting goods regularly.

All the large firms had some kind of educational initiative or environmental project with local communities.

B) Small firms seem to be keener on developing new products with sustainable attributes, like recycled raw materials, sustainably managed forest dyes and pigments extracted from Brazilian plants species. But they don't endeavor to include their suppliers in these initiatives. The product innovation consists merely of incorporating sustainable inputs already available into their products.

None of the small firms had any formal partnerships with universities or research and development organizations. However, two small firms did provide training in sustainability for their employees and one had an environmental outreach program.

C) The only medium-sized firm has showed characteristics from both precedent groups. Interestingly, Medium Company A has set up a formal partnership with ESALQ (an agricultural college belonging to the University of São Paulo) to research and develop natural dyes.

Overall, the study confirms that eco-innovation is at an embryonic stage in Brazilian T&A industry. Large firms tend to focus their sustainability initiatives on the continuous improvement of their production systems, basically to reduce their environmental and social impacts in order to comply with legislation. Their strategic orientation to economies of scale is certainly behind this tendency. Neither large nor small firms are using systematic methods for developing new products. The lack of formal product development procedures hinders the incorporation of sustainability attributes from cradle to grave and so also the

dissemination of sustainability principles among the suppliers.

However, as Table 1 shows, the sprouting development of sustainable products is clearly concentrated in small and medium-sized firms. Large firms, on the contrary, tend to a more conservative management culture focused on process efficiency, which even includes environmental projects in the neighbourhood. This corroborates Wagner and Llerena (2010), who claim that in many industries small businesses tend to have a broader approach to sustainable innovation, resulting in more radical innovations and in the incorporation of sustainable aspects into their operations, while large businesses seem to be more constrained in their capacity to take action, preferring incremental innovations and putting more emphasis on communication about sustainability.

4. First study discussion

Among the results described in the previous section, perhaps the most striking are that small and medium-sized firms are not used to measure their environmental and social impacts, neither to formalize product development procedures. This may be an important drawback to sustainability improvements. The literature asserts that Life Cycle Assessment (LCA) is being increasingly used in the T&A industry, for instance to compare the impacts of cotton fibers and polyester. Synthetic fibers have been often seen as harmful and associated with stereotypes such as chemical, manufactured and pollution, while natural fibers are seen as inert in that they are biodegradable. However, cotton can actually have a bigger environmental impact than polyester, if its production has used toxic fertilizers and pesticides and a lot of water for irrigation (Kalliala and Nousiainen 1999; Fletcher, 2007; EJF 2007; Shen and Patel 2008). The Danish Environmental Protection Agency has sponsored the development of a database with equivalence factors in the LCA dimensions of six different apparel products, creating different scenarios for each product types (Laursen, 2007). Building up scenarios by using LCA implies in setting the producer's perspective against the consumer's, assessing the choices available to each group. Nieminem, Linke, Tobler & Beke (2006) collected industrial data from five European T&A firms and used LCA to provide inputs for the development of manufacturing technologies with lower emissions.

This leads us to the hypothesis that only the development of the capacity to make quantitative assessments of environmental and social impacts can provide a basis for sustainability-oriented differentiation strategies. The ability to innovate in response to growing sustainability demands depends strongly on the firm's competence to measure impacts. Interestingly, large firms' initiatives to reduce water and energy process consumption have enabled them to create methods for measuring impacts. But sustainability depends on gains in eco-efficiency all along the value chain. Evidence of capacity-building from the use of new methods and approaches to address environmental issues can be found in Tobler-Rohr (2000), Sondergard, Hansen & Holm (2004), and Goerke et al. (2007). Impacts measuring skills inside design and engineering teams will spread the life cycle concept throughout the organization. Shop floors will rethink how they dispose of used materials; logistics planners will be able to understand the need for reverse logistics; CSR managers will interact with neighbouring communities about waste recycling possibilities. This systematization of quantitative assessment will produce a knowledge spill-over along much of the T&A value chain and enhance new skills through over the suppliers and customers, starting a synergic process of creativity to the introduction of eco-innovations.

5. A participatory research on social and environmental impacts quantification: hindrances to a Brazilian fashion lead firm to incorporate the quantitative assessment into its business processes

Nevertheless, the findings of the first study indicate that the Brazilian T&A firms still don't pay enough attention to the need to create a routine of quantifying and qualifying environmental and social impacts. At the present time, even those firms that are keen to attain a sustainability-based competitive advantage are generally not contemplating quantitative assessment that can guarantee a good social and environmental performance of their products. Thus, it was methodologically necessary to take a further step and investigate one of the few initiatives that go in the opposite direction: the *Social, Environmental and Carbon Footprint Project* (SECFP), that has been jointly developed by Osklen, a leading Brazilian retail fashion medium-sized firm and one of its key international markets. Despite not being a complete LCA study, the chosen case reveals the state of the art regarding the capacity for measuring environmental and social impacts currently available on Brazilian T&A firms. SECFP was funded by the Italian Ministry for Environment, Land and Sea and has been developed by SENAI CETIQT's Technological and Marketing Forecasting Institute in cooperation with Instituto-e, a pioneer in environmental and social projects such as e-fabrics. Its goals included:

- identifying, developing and introducing sustainable raw materials, including new organic and recycled fabrics,

- assessing its products' carbon footprint through appropriate tools,

- converting its processes to clean technologies with lower impact of GHG emissions,

- introducing social projects or acquiring emission reduction credits in order to neutralize the accounted carbon footprint.

The authors helped SECFP to achieve these goals and, in parallel, pursued their own

objective: finding and exploring hindrances to the implementation of quantitative methodologies.

SECFP's first step was to measure the raw materials and products' carbon footprint throughout the supply chain of Osklen's six main export products that use new materials — as for instance *pirarucu* leather or recycled polyester fibers —, as well as its social impacts. This step also included the definition of the system boundaries, the identification of products and manufacturing processes, the life cycle analysis of the selected products, the GHG inventory (including direct and indirect emissions sources within the system boundaries) and the definition of the baseline year to future emissions measurements. In order to accomplish those tasks, the project team and the authors have analyzed each product's supply chain and, subsequently, have conducted field visits to evaluate the suppliers' processes, regarding its capabilities and degrees of environmental awareness. Those visits also aimed to educate professionals about responsible filling the spreadsheets whit data related to the products' life cycle inventory. The carbon footprint of each product was thereafter calculated. The second step involved the adoption of targets for the reduction of the ecological and carbon footprint and the identification of the best cost-effectiveness mitigation program. With this, the firm met the conditions for certification of the six products' ecological and carbon footprint, but within their life cycle still remained residual emissions to be neutralized. So, the third step consisted in offsetting them by investing in projects complying with the Kyoto Protocol mechanisms, or by buying Certified Emission Reduction or Voluntary Emission Reduction. Finally, the fourth step was the communication of the ecological and carbon performances of Osklen.

Osklen and partners report to have accomplished SECFP's goals and to be satisfied with its results, which are published

on the Internet (INSTITUTO-e, 2012). Considering now the research interest specific to the authors, the results are less enthusiastic. Taking part at SECFP has shown them that the use of Brazilian biodiversity materials has not been accompanied by actions to mitigate environmental and social impacts, due basically to the lack of quantitative or even qualitative assessment based upon theoretical or empirical validated models.

The follow up of this carbon footprint measurement process enabled us to estimate the difficulties encountered by Brazilian small and medium-sized firms when they decide to continuously capture and register data, as new products are launched. As layers of suppliers move away from the contracting firm, problems get bigger: great distances, local energy mix peculiarities, quality unevenness of information and of transports infrastructure, and low regional professional qualification. SECFP's troubles in gathering data were aggravated by the low level of formalization and codification of information within the supply chain, as well as by the lack of competencies and routines for sustainability measurement. Small and medium-sized T&A firms believe they cannot afford an integrated information system coupled with supply-chain sustainability governance.

Another significant hindrance to the quantitative assessment of environmental and social impacts along the supply chain was the lack of a sustainability management unit at the lead firm, in this case Osklen, which could create stronger administrative and technical links between its internal units, especially creation, product development, supply management and commercialization. In fact, a critical factor for information management is establishing bases for technical, administrative and commercial relations among suppliers. This often involves actors who are initially unknown for the lead firm.

Thus, although the quantitative assessment of carbon footprints showed to be feasible, it also revealed the difficulties to incorporate new measures, competencies, technologies and values to the business routines, mostly due to the need of developing sustainability criteria all along the supply chain.

Yet, carbon footprint measurement of Osklen's eco-products instigated some suppliers to ask for quantitative assessment of their own products. Although data collecting was somehow stressful for most of them, those positioned in the supply chain's first tiers did perceive the quantification of impacts as an opportunity to create barriers to access to their competitors. Furthermore, the SECFP´s outcomes were followed by subsequent initiatives to measure water footprints. The same organizations are now involved in a second project.

6. Second Study Discussion

SECFP provided a good opportunity to notice the low integration level of Osklen's supply chain. Coordination carried out by the lead firm does not go beyond the first layer of its suppliers. This happens because Osklen still follows a cost-driven procurement, which prioritizes lowest acquisition prices instead of the chain loyalty level. Such a situation certainly does not favor data collecting routines, especially when people is not used to them and cannot perceive its economic value. Moreover, costs-oriented strategies tend to align and even submit the lead T&A firm creation cores to procurement managers' criteria, which entails the increase and heterogeneity of the suppliers-base. Consequently, the supply chain exhibits great boundaries variability, which brings together uncertainty and difficulties to assess quantitatively environmental impacts. Furthermore, cost-centered strategies also provoke internal conflicts between the usual performance indicators (straight related to costs reduction or to legal and regulatory compliances) and the implementation of

routines to gather and measure previously ignored social and environmental data.

Still, impacts measurement has proven to be an effective method of spreading *learning by doing* over the supply-chain. Assisted by customized systems of information specially designed for small companies, the quantification of environmental impacts can help instead of jeopardize the integration among the chain.

7. Recommendations for the development of sustainability capacity in the Brazilian T&A value-chain

Sustainability-oriented differentiation strategies require new management criteria. Life Cycle Assessment, for instance, implies the re-elaboration of suppliers' contracts and a new chain governance framework. This can hardly result from external knowledge support, as consultancy for example. A socio-environmental responsibility unit is needed to promote the continuous evolution of the organisation's environmental consciousness level, and for continuously improving its technical and strategic systems.

New forms of contracting and subcontracting, supply-chain cooperation and customization of information systems are required to enlarge the lead firm coordination. New criteria for selecting partners in the value chain, new intra and inter-organizational units, management supported eco-innovation principles and methods, and customized sustainability network systems that can capture and consolidate routinized information are the main drivers to sustainability-oriented differentiation strategies in Brazilian T&A industry.

Intra and inter-organizational changes can be synthesized as follows:

a) Value chain governance: Contracting and subcontracting should be guided by the need for trust, extended leadership and integration on sustainability principles. New types of contracts must ensure data collecting, skills development and compliance with sustainability policies.
b) Human resource strategies: hiring and training should include evaluation systems that measure environmental skills at all levels, both in technical and managerial positions.
c) Organizational change: environmental managers must have effective participation in product development and marketing strategies.
d) Integrative technologies: sustainability management systems should be customized to small scale manufactures and semi-craft production. Traditional systems of environmental impacts measuring are not suitable for micro businesses that can´t even support the maintenance of an environmental consulting.

8. Conclusions

This paper explored obstacles to sustainability-oriented differentiation strategies in Brazilian T&A industry. The results suggest that social and environmental commitment is not a simple issue, focused on brand image strategies and eco-friendly discourses; it is a complex matter of learning and evolving sustainability capabilities all along the lead firm value chain. The selected firms sustainability initiatives analysed - whether small, medium or large firms – doesn´t seem to be near from meeting the needs of emerging global conscious consumers that accept to pay more for sustainable innovations; none of the initiatives revealed - at the time of data collection - the adoption of the new methods and technologies that can push then onto global leadership in sustainability-oriented differentiation strategies.

Vital quantitative assessment of environmental impacts demands organizational changes, basically a sustainability value chain approach, that

could guide the development of both internal and external resources such as information technologies, organization structures, business strategies and competencies.

Life cycle quantitative assessment gives a better understanding of products and processes, enhancing organizational learning, trust and eco-innovation capabilities to mitigate environmental impacts. It can also reveal specific handicaps along the value-chain for improving environmental performance at different bottlenecks. As such, quantitative assessment will influence the selection of suppliers and the chain governance model. It also helps to convert human resources into an important enabler of eco-innovation, creating a valuable organizational capability to address rapidly changing environments. But, prior to that, hindrances to chain trust and participative innovation must be removed by appropriate changes in procurement and contracting philosophy, organization architecture and technology resources.

References

Agência Brasileira de Desenvolvimento Industrial (ABDI). (2010). Estudo Prospectivo Setorial Têxtil e Confecção. *Série Cadernos da Indústria ABDI* XVIII. Brasília: ABDI.

Agência Brasileira de Desenvolvimento Industrial (ABDI). (2009). Panorama Setorial Têxtil e de Confecção. *Série Cadernos da Indústria ABDI* V. Brasília: ABDI.

Azzone, G and Noci, G. (1998). Seeing Ecology and 'Green' Innovation as a Source of Change. *Journal of Organizational Change Management* 11(2): 94-111.

Baas,L. et alii (1990). Protection of the North Sea: Time for Clean Production. *Erasmus Centre for Environmental Studies Publicatiereeks* 11. Rotterdam.

Barsoumian S., Riggio R., Severin A. & Spek T. (2011). *Eco-innovation in cluster organisations in the chemical and textile clothing-leather sectors*. Study performed by Greenovate! Europe EEIG Brussels for the European Cluster Observatory managed by the Centre for Strategy and Competitiveness at the Stockholm School of Economics.

Bento, A.M., Ho, B., Poe G.L. and Taber J.T. (2010). Culpability and Willingness to Pay to Reduce Negative Externalities: A Contingent Valuation and Experimental Economics Study. *Selected Paper prepared for presentation at the Agricultural & Applied Economics Association 2010.* AAEA, CAES, & WAEA Joint Annual Meeting. Denver, Colorado: 25-27.

Borchers, A.M.., Duke, J. M. and Parsons, G.R. (2007). Does willingness to pay for green energy differ by source? *Energy Policy* 35(6): 3327–3334.

Brasil. Ministério do Trabalho e Emprego (2004). Relação Anual de Informações Sociais. MT: Brasília, DF. AUTHOR, (ed.) (2007).

Campbell, J. (1991). Assimilative Capacity of the Environment. *Proceedings of Towards a Clean Society. Seminar 1: The Principles of Clean Production.* Stockholm: Stockholm Environment Institute.

Csikszentmihalyi, M. (1999). Implications of a systems perspective for the study of creativity. In R. J. Sternberg (Ed.), Handbook of creativity (pp. 313–335). New York: Cambridge University Press.

Elfenbein, D.W. and McManus, B. (2010). A Greater Price for a Greater Good? Evidence that Consumers Pay More for Charity-Linked Products. *American Economic Journal: Economic Policy*. 2 (2): 28-60.

Fletcher, K. (2008). *Sustainable Fashion and Textiles: Design Journeys*. London: Earthscan.

Garcia, R., Motta, F., Scur, G., Lupatini, M. and Cruz-Moreira, J.R. (2005). Esforços Inovativos de Empresas no Brasil: Uma Análise das Indústrias Têxtil-Vestuário, Calçados, Móveis e Cerâmica. *São Paulo em Perspectiva* 19(2): 60-70.

Gereffi, Gary; Humphrey, John; Sturgeon, Timothy. (2005). The Governance Of Global Value Chains. *Review of International Political Economy*, 12(1): 78-104, february.

Gereffi, G. (2005). *The New Offshoring of Jobs and Global Development*. Jamaica: ILO Social Policy Lectures.

Goerke et alii. (2007). Environmental Product Declaration as a Competitive Advantage. *Melliand´s Textile Report* 3: E35-37.

Hermosilla, J.C., Del Río, P. and Könölä, T. (2010). Diversity of Eco-Innovations: Reflections from Case Studies. *Journal of Cleaner Production* 18(10-11): 1073-1083.

Hewson, M.J.C. (1999). Textiles and water: are they finishing the environment? In: *International conference on water and textiles*. Edited by Gandhi, K.L. and Pearson, J.S. Huddersfield: University of Huddersfield.

Hatzichronoglou,T. (1997), Revision of the High-technology Sector and Product Classification, OCDE, STI Working Paper 1997/2), Paris.

Hung, R. Y. Y., Yang, B., Lien, B. Y., McLean, G. N. and Kuo, Y. (2010). Dynamic Capability: Impact of Process Alignement and Organizational Learning Culture on Performance. *Journal of World Business* 45(3): 285-294.

Instituto-e. (2012). Traces: Social, Environmental and Carbon Footprint Project. Internet Site. Viewed 25 mar. 2014, http://tracesefabrics.org/instituto-e.

Instituto Brasileiro de Geografia e Estatística (IBGE). (2013). *Pesquisa de Inovação Tecnológica 2013*. Rio de Janeiro: IBGE.

Instituto Brasileiro de Geografia e Estatística (IBGE). (2005). *Pesquisa de Inovação Tecnológica 2005*. Rio de Janeiro: IBGE.

James, P. (1997, July). The Sustainability Cycle: a New Tool for Product Development and Design. *The Journal of Sustainable Product Design* 2: 52-57.

Jones, E., Stanton, N. A. and Harrison, D. (2001). Applying Structured Methods to Eco-Innovation: an Evaluation of the Product Ideas Tree Diagram. *Design Studies* 22 (6): 519-542.

Kalialla, E. M. and Nousiainen, P. (1999). Environmental Profile of Cotton and Polyester-Cotton Fabrics. *Autex Research Journal* 1(1): 8-20

Laroche, M., Bergeron, J. and Barbaro-Forleo, G. (2001). Targeting Consumers Who Are Willing to Pay More for Environmentally Friendly Products. *Journal of Consumer Marketing* 18 (6), 503-520.

Laursen, S. E. (2007). *Ediptex - Environmental Assessment of Textiles*. Copenhagen: Danish Environmental Protection Agency.

Nieminem, E., Linke, M., Tobler, M. and Beke, B.V. (2007). EU Cost Action 628: Life-Cycle Assessment of Textile Products: Eco-Efficiency and Definition of Best Available Technology of Textile Processing. *Journal of Cleaner Production*. 15(13-14): 1259-1270.

Organization for Economic Cooperation and Development (OECD). (2005). *Science, Technology and Industry Scoreboard 2005 Anexe A*. Paris: OECD (ISBN 92-64-01055-6).

Organization for Economic Cooperation and Development (OECD). (2013). *Green entrepreneurship, eco-innovation and SMEs*. Working Party on SMEs and Entrepreneurship (WPSMEE). Centre for Entrepreneurship, SMEs and Local Development. Final Report.

Potts, J.; Cunningham, S.; Hartley, J.; Ormerod, P.. (2008). Social network markets: a new definition of the creative industries. *Journal of Cultural Economics*, (32):167-185.

Rennings, K. (2000). Redefining Innovation – Eco-Innovation Research and the Contribution from Ecological Economics. *Ecological Economics*. 32(2): 319-332.

Sarkis, J., Gonzales-Torre, P. & Adenso-Diaz, B. (2010). Stakeholder pressure and the adoption of environmental

practices: The Mediating Effect of Training. *Journal of Operations Management* 28 (2): 163-176.

Schor, J. (2005). Prices and Quantities: Unsustainable Consumption and the Global Economy. *Ecological Economics.* 55(3): 309-320.

Shen, L. and Patel, M. K. (2008). Life Cycle Assessment of Polysaccharide Materials: a Review. Journal of Polymers and the Environment. 16(2): 154-167.

Sondergard, B., Hansen, O.E. and Holm, J. (2004). Ecological Modernization and Institutional Transformations in the Danish Textile Industry. *Journal of Cleaner Production.* 12(4): 337-352.

Sturgeon, Timothy J.. (2002). Modular production network: a new American model of industrial organization. *Industrial and Corporate Change*, 11(3): 451-496.

Tobler-Rohr, M.I. (2000, May). Life Cycle Assessment of a Cotton Fabric in Textile Finishing. *Meeting Program of Fiber Society for the Advancement for Scientific Knowledge of Fibers, Fiber Based Products and Fibrous Materials*. Guimarães, 17-19.

Wagner, M. and Llerena, P. (Sept 22, 2008). Drivers for Sustainability-Related Innovation: a Qualitative Analysis of Renewable Resources, Industrial Products and Travel Services. *Working Paper of BETA*. Strasbourg: Bureau D´Économie Théorique et Appliquée. http://ideas.repec.org/p/ulp/sbbeta/2008-22.html (Accessed Jul. 2010).

United Nations Industrial Development Organization (UNIDO) (1979). Water conservation in the textile industry based on the work of G.J. Parish. Textile Monographs UF/GLO/78/115. New York and Geneva: UNIDO.

United Nations Conference on Trade and Development (UNCTAD) (2007). Web Based Database. New York and Geneva: UNCTAD.http://www.unctad.org/templates/page.asp?intitemid=3139&lang=1 (Accessed May 2007).

Uricchio, William. (2004). Beyond the great divide: collaborative networks and the challenge to dominant conceptions of creative industries. International Journal of Cultural Studies, (7)1:79-90.

Wang, C.L. & Ahmed, P.K. (2007). Dynamic Capabilities: A Review and Research Agenda. *International Journal of Management Reviews*. 9(1): 31-51.

Wu, L. (2010). Applicability of the Resource-Based and Dynamic-Capability Views Under Environmental Volatility. *Journal of Business Research.* 63(1): 27-31.

Zhou, K.Z. & Li, C.B. (2010). How Strategic Orientations Influence The Building of Dynamic Capability In Emerging Economies. *Journal of Business Research*. 63(3): 224-231.