INTRODUCTION

The main body of the research and literature concerned with product innovation, of course with some exceptions, applies a narrow perspective in the attempt to isolate individual phenomena with a reductionistic approach. The focus is on a specific actor, the innovator, its innovation and development action, processes and performances. The objective of this work is to integrate this mainstream approach to product innovation and relate it to broader processes and structures in a specific context, the fiber-textile-apparel filière.

The choice of this particular context was driven by the observation that in any other business product innovation is so systematically intertwined with the competitiveness of firms, localized systems of production, and national industries. Being the filière and its companies' evolution shaped by fashion movements, practices of forced obsolescence and the launch of a steady stream of apparel innovations are to be considered among the major competitive levers entrepreneurs and managers must strategically master. The effective management of such a complex phenomenon requires a thorough and clear understanding of nature, sources, diffusion paths, and process of product innovation and of the variables that influence it.

Therefore, it's with the eyes of entrepreneurs and managers that we look at product innovation along the fiber-textile-apparel filière, in an attempt to better understand it and to consequently design and suggest a set of ideas to improve its performances. From this perspective, we focus our attention across three main levels of analysis: the filière to analyze the possible sources of product innovation and the mechanisms of its market diffusion; the innovating networks to propose a way firms may effectively integrate the contributions of multiple innovators; the individual firms to understand the multiple facets of the object of innovation efforts, the processes through which it is developed, and the impact of information and communication technologies.

In *chapter 1*, we provide a definition of filière and of innovating network, describe the characteristics of the last and distinguish it from the supply chain concept. We define *apparel innovation network* as a *subsystem of the fiber-textile-apparel filière that consists of companies, individuals, and activities that are linked by more or less collaborative and stable relationships to process a set of complementary resources and capabilities in order to generate product innovation*. We put our focus on the process of knowledge contribution, generation, and transformation that leads to the creation of new products. The content of the relationships between network members consists of mainly knowledge-based re-

sources and competencies that may create a network's design and development capability. We propose to move from spontaneous, unaware networks that produce accidental, not coordinated, not clearly targeted innovations to ones that are desired and managed to achieve the development of a steady stream of well-targeted innovations that meet a high level of market acceptance, thus generating a product innovation-based competitive advantage for both the network and its members.

We further clarify the borders of our analysis providing a definition of apparel fashion product, of its multiple dimensions (using the Functional-Expressive-Aesthetic – FEA – model), and of the contexts of apparel perception.

Even though we focus our analysis on narrowly intended product innovation, entrepreneurs and managers should be able to integrate it in a more general framework of innovation strategy.

Therefore, the first micro-question to which we give an answer is related to the dimensions of apparel innovation: can it be considered as being limited to some garment attributes, or should it be thought of as part of a more systemic innovation that involves other objects as well?

Our proposition is that *apparel innovation should be integrated in a consistent multi-level innovation effort that involves products* (their attributes, the collection theme, assortments, and coordination), *services offered* (which complete the overall company offering), *and all those factors that define and communicate the company brand identity*.

With regard to services, in particular, we combine type and level of services integrated in the offering, investments in service industries, and services offered/sourced to improve the fashion companies' process, with the degree of service innovation to distinguish eight strategies: product-centered, system innovation, focused, or continuous, brand extension, discontinuous brand extension, general/administration services outsourcing, innovative services buying, or outsourcing, conservation, in-sourcing and diversification. On a more comprehensive level, the importance of brand in the context of our analysis makes us claim that *innovation should be consistently developed along all the elements that contribute to build and communicate brand identity*, which can be considered as being the result of:

– *Style identity*: the stylistic codes that characterize the brand offerings in a continuous way, for more than one season, at least for a fashion cycle;

– *Image identity*: the permanent communication codes used both for internal and external communications;

– *Distribution identity*: the way products are offered to the final customer: location, channel, range, in-store communication, in-store services (assistance, return policies, tailoring, home delivery, store cards, etc.), layout, animation, etc.

Products, of course, are the main brand identity builder and communicator, but not the only one. Firms should consider the combinated effects of innovations in products, services, communication, distribution, and also businesses (diversifications). They should set a *deliberate brand innovation strategy* and then use all the available levers to innovate the brand positioning and to proactively increase its equity through a coherent framework where the individual initiatives mutually reinforce each other, thus maximizing the overall effect. We, then, propose a *dynamically "consistent brand development and communication system*" model that goes beyond the traditional media of communication

to consider a wider range of means that can be used by an apparel company to build and communicate the brand identity message to the stakeholders.

A second micro (but central) issue we address is related to the possible sources of product innovation, the dynamics of its diffusion, and the consequences on innovation strategy and management.

We propose that *apparel innovation is the result of the combination of multiple, complementary sources of innovation. The diffusion of innovating trends can follow different directions, which can be explained with both socio-psychological and economic approaches. The existence of different sources and paths of innovation implicates the need for coping with different situations through the adoption of the best fitting managerial approach.*

Firms organize their innovation-related processes according to their assumptions about the sources of innovation. Most of them are stuck to the conventional assumption that new products are developed by apparel manufacturers and arrange their activities consequently. We hold that *a new garment can be the result of innovations that can take place throughout the filière, including at the consumer locus of innovation.* In *Chapter 2*, in order to understand where innovation can originate and how the market can adopt it, we first introduce the socio-psychological theories of fashion adoption (trickle-down, trickle across, and bubble-up).

Then, we propose an original economic interpretation to the existence of various sources and alternative diffusion paths using the *theory of sources of innovation* first developed by von Hippel to explain the inter-firm dynamics of innovation in the case of industrial products and then extended to consumer goods.

We first use the theory *to interpret the reasons of bubbling-up fashion trends and innovations*, which can be explained with: the existence of asymmetric expectations of temporary economic benefits and, we add, of the risks related to innovation exploitation; the presence of innovation-related sticky information about consumer preferences, of information that is costly to acquire, transfer, and use. The need to unstick the information, or at least to reduce its stickiness, can be satisfied through the implementation of more adequate forecasting and market research methods, the development of intimate or sometimes "tribal" relationships with lead users, and innovation task partitioning and the implementation of toolkits for user innovation (as in the IC3D case, illustrated in chapter 5). More in general, the recognition of the existence of different paths of innovation diffusion and the understanding of its reasons could make it possible for the firms of the filière to accordingly and more effectively set their forecasting, segmentation, design and development, pricing, and distribution strategies.

We use the same theoretical framework *to explain the variables at the basis of the shifting origins of innovation among the companies of the filière.* Once again, the proxies are differentials in the expectations of innovation-related benefits, and the presence of sticky information at different loci of innovation, which implies the need for back and forth shuttling of information with an iterative pattern that can be costly, in both economic and time terms. Minimizing the iterations of innovation-related problem-solving activities that require access to different loci of sticky information might be an effective means to reduce the cost and time of apparel development, particularly when it is done through assigning need-related innovation tasks to the apparel manufacturer or to the customer. We, then, analyze pros and cons of possible alternative ways to reduce the

cost and time of sticky information iterations or to reduce the need for iterating, including: task partitioning, use of CAD technologies, use of in-house freelance textile designers, and unsticking the information through collaborative innovation relationships (to reduce the inter-loci distance), or through long-term co-innovation driven networking (to merge different loci).

After having shown the possible existence of various sources of apparel innovation, again from the perspective of the entrepreneur of the individual firm, we look for a possible way to *effectively coordinate this "chorus of voices" to fully exploit its innovation potential*. The third set of micro-questions we address includes the followings: can an individual firm effectively integrate and manage different sources through the development of innovation-related cross-company intra-filière networks? What might the "reason for being" of such a network be? What could the partners, their roles and influences, and the nature of the relationships among them be?

Our proposition is that, *considering the existence of multiple sources of innovation, the creation of innovation-oriented, trust-based, long-term, intra-filière partnerships, when successfully managed, can improve the overall apparel innovation performance and the product innovation potential of the individual partners as well.*

Therefore, in *Chapter 3*, we use a system of consistent theories, the network theory, the contributions of the organizational learning approach, and the resource-based-view approach to strategy and innovation, to relate individual events taking place among various firms and/or individuals throughout the filière to the overall product innovation process that brings to the development of an apparel collection.

The *reasons for being of the* proposed *apparel innovation network* include: getting access to complementary competencies, maintaining (limited) flexibility, incorporating different perspectives, limiting the time to exploit innovations developed elsewhere through a shortening of the cycle screening-detecting-evaluation-validation-reproduction/sourcing-application-editing, a reduction of the response time to evolving market needs, access to valuable information, combination and absorption of complementary knowledge, facilitating the development of supply chain relationships, reducing uncertainty, better control over innovation through exclusivity agreements and casual ambiguity. Among the quoted advantages, we focus in particular on the process of knowledge creation comparing, using filière-related examples, "design-on-demand" *vs.* "co-design" experiences.

The *network flexibility* issue is also thoroughly analyzed, and especially the risk of phenomena of resource dependability at a network level and of a consequent self-containing development, which can be limited through a right combination of short-term rigidity and long-term flexibility, effective communication and motivation toward a constant innovation effort, the choice of highly innovative partners, and periodical tensions towards "double-loop" innovations.

The development of successful apparel innovation networks requires controlling and governing a system of resources and competencies that are located outside the boundaries of the individual firm but inside those of the network. This implicates the need for resources and competences management through systematic evaluating, sourcing, combining, nurturing/learning, allocating, and protecting activities. In the analysis of these *managerial responsibilities* we assume the perspective of the leader of the innovation network.

It is in this context that we more evidently integrate in our analysis the organizational learning perspective. The reproduction of the competitive advantage, both at an individual company and at a network level, requires that firms create cycles of *intra-network learning* through the employment of specific tools and procedures that are distinct from those utilized for an intra-firm learning. We develop a system of learning by research sharing, collective creative thinking, co-developing, cross-company interacting, intra-network communicating, and meta-organization routines developing, which may generate *apparel innovation network-specific knowledge-based product innovation capabilities* and creation of individual network identity.

These processes of network's resources and competencies development should lead apparel innovation-related relationships through an evolution path that starts from a situation of mere compatibility that guarantees a minimum level of consonance among the partners, through the repetition of collaborative design experiences enabling the development of familiarity, dynamic fitting, stability, mutual understanding, loyalty and trust, can bring to a certain degree of systemic resonance. The *network* can thus act *as a system* with its own strategic view and its own apparel design and development competency embedded into shared norms and values and into processes and routines.

For this evolution to be effective, it is necessary to clearly set roles, responsibilities, and goals for all the network members. An effective goal setting requires a correct identification of how the success of product development process can be measured, possibly with a breakdown of the various performance measurements along the different stages. We, therefore, propose an original *set of performance measures*, including indicators of collection profitability and process productivity, efficiency, and lead-times.

Time performances are particularly important and can create tensions within the network if the efforts toward time compression are translated into pressures played onto firms collocated in the early phases of the filière. We show how the creation of long-term, trust-based, and innovation-oriented collaborative partnerships between companies located at various stages of the filière can ease the pressure of vertical competition and reduce the overall innovation lead-time without transferring upward the burden of time shrinking intervention.

We, then, analyze the *role the various actors of the filière* may play *in the* proposed *innovation network*.

A first example of networking is that among textile designers, bureau du styles, fiber and textile manufacturers, associations, and so on, which are involved in a process of *concertation* that leads to the development of selling season trends.

Fiber manufacturers may be involved in an apparel innovation network as the technologies used in fibers production are widening the range of benefits that can be built into apparel products through better functional performances, aesthetic effects, and the development of emotional attributes through consumer associations.

With regard to the role of *textile firms*, we compare *seven forms of fabric innovation sources control*, market "screening and shopping", relationships of exclusivity with mills, involvement of freelance textile designers, trust-based relationships (also based on particular contexts, e.g., industrial districts), co-design, direct investments in R&D, and upward integration (with a particular focus on the issue of the equilibrated combination of apparel designers driven, pulled innovation and textile designers driven, pushed innovation). We

analyze the internal resources and capabilities influencing the choice of the best strategy, including market power, reputation, negotiation and communication capabilities, relationships building and management capabilities, textile technical knowledge, financial resources, willingness to commitment, and awareness of the need for textile innovation controls. We consider the different outcomes related to the various alternatives, such as internal capabilities development, imitation barriers creation, differentiation potential, innovation potential, rigidity, and investment needs. In the analysis of the alternatives, we put a particular emphasis on the specificities of knowledge creation and on the consequent co-experiencing benefits associated to the co-design strategy.

In the analysis of the role of *apparel retailer*, on the basis of the importance of the role played in product development (low or high) and of the nature of its relationships with apparel manufacturers (buyer or private label), we distinguish *four cases*: traditional merchandiser, affixer, apparel developer retailer, and co-developer. The difficulties in creating equilibrated partnerships with co-developer retailers and the possibility of getting a better control over the information springing out a point of sales are two strong forces in determining a general tendency to redesign the distribution strategies toward more centralized forms of distribution and retailing.

We, then, analyze the roles played by *bureau du style*, *cool hunters and other trend forecasting providers*, *freelance designer* and *outside design studios*, and *internal designers* in a networked product development process.

Finally, we consider the possible *influence of being located in industrial districts on the effectiveness of intra-filière networking aimed at product innovation*. Due to its unique nature, the industrial district can be considered an ideal context for the development of textile-apparel product innovation networks. All the elements that we have included among the key success factors for this kind of network, including trust, willingness and capability of collaborating in innovation processes, innovation capability, cooperative relationships with goals sharing are naturally embedded in industrial districts, thus potentially facilitating the creation and successful development of collaborative relationships aimed at product innovation. Nonetheless, there might be some pitfalls related to a self-contained local logic and as a sub-product of the mechanism of rapid innovation diffusion through imitation that characterizes this context.

In *Chapter 4*, we move the focus of our analysis onto the *apparel innovation process that takes place in an individual firm* and into which the contributions from other firms of the network can be instilled at various stages. The questions to which we answer in this chapter are: how is the apparel design and development process structured? How can its performances be improved?

We held that *apparel design and development process might generate better results when clearly defined and effectively managed*.

For every single phase of the innovation process, we suggest some managerial initiatives that can improve its performances.

With regard to the *trend and market research stage*, the recognition of the possibility of innovations sprung out of different sources than the conventionally believed fashions' fathers (designers and, more in general, apparel companies), especially of final customers, and of longitudinal or upward fashion diffusion can make apparel companies' marketing research groups and traditional marketing research and trend forecasting agencies

inadequate. We argue that the positioning of the apparel company and its innovation capability influence the kind of trend research and analysis approach that is used to scan market and society. From a different point of view, the type of trend research methodology being used can affect the company market positioning and its role in apparel innovation. The result is what we call the "*trend analysis paradox*", with the coexistence of bubble-up and trickle-down dynamics governing the diffusion of the same trend and the related coexistence of firms adopting different research and analysis approaches.

We then elaborate a series of tools for *collection guidelines definition and collection planning* that may enable firms to better manage the line complexity, in terms of variety and variability of its composition, thus making the development of well-balanced collections more possible. In particular, the *collection newness map* can provide merchandisers with a valuable tool that can help to develop collections with a degree of innovation that is consistent with the company's available innovation-functional resources and competencies and the reduction of wastes. In fact, it may help apparel firms to compensate two opposite motivations: the need to limit the level of apparel innovation, and that to boost the collection newness. Building on Clark and Wheelwright project plans model, we can map garment groups on the basis of the intensity of two variables: the degree of change of trend-related and style identity-related features, and the degree of change of garment types. Through the combination of these variables, we can classify garment groups into: breakthrough merchandise groups, platform apparel groups, and derivative apparel groups/garments. In this mapping process, we suggest and describe the possibility of using the analysis of fashion trend cycles as a valuable supportive concept.

In the search for equilibrium between creativity and management, the force that dominates the line bias, the nature of the critical resources and capabilities, as well as the process breakdown in sub-phases vary mainly on the basis of two variables: the collection fashion content, and the company size and/or number of SKUs, which influences and can be considered a measure of line complexity. Therefore, on the basis of these variables, we distinguish four cases where the intervention for *process improvement* varies according to whether it is *merchandiser*, *engineers/efficiency*, *design team*, or *designer entrepreneur pulled*. The *elimination of non-value added activities* and the *paralleling of previously sequential phases or activities* are two of the major means to reduce the apparel product development process lead-time, which is particular important for fashion forward firms. In particular, in relation to the line editing sub-process, fashion oriented apparel companies can intervene in various ways in the attempt to speed up the overall process. The company organizational approach can be located along a continuum that goes from a situation of maximum preventive constraints, to one of completely postponed results evaluation, from parallel to sequential. An effective positioning along this continuum may enable to reduce the waste of resources due to the development of non-targeted designs and the innovation lead-time and, sometimes, to move toward a better design constraints/creativity potential trade-off frontier.

Another way to achieve these goals may be an early involvement of companies and individuals located downward along the filière, including consumers, in the design evaluation process. The underlying idea is that of looking for *pre-launch collaboration instead of post-launch validation*. From the perspective of an apparel firm, through the combination of the kind of method (internal presentation, focus group, or market test) with the

kind of firms and/or individuals that are involved, it is possible to pinpoint *seven alternatives*, for each of which we describe pros and cons.

Finally, we suggest the use of the adoption ratio as a fundamental decisional variable for the timing of the elimination of non-value added post-editing development activities.

The last micro-issue we address in *Chapter 5* is related to the impact of new information and communication technologies.

We argue that *the use of information and communication technologies has the potential to favorably influence the apparel innovation performances and to contribute to shape the design and development process as well.*

Important technological innovations that impact on apparel innovation have been introduced into five areas: fiber and fabric production, machinery industry, teleshopping, Internet, and computer hardware and software. We focus our analysis on the last two categories.

The combination of a set of information and communication technologies, including Computer Aided Design (CAD), Apparel Design Systems (ADS), Product Data Management (PDM), make-to-measure technologies (electronic body scanners, online measurement and processing systems, online body model building), and digital printing, for each of which we provide an analysis of advantages and limits, may allow *mass customization*. With this regard, *Internet* can provide an *effective platform for unsticking the innovation-related information that is stuck at the consumer locus*. It can be considered a good example of user-friendly toolkit for user innovation in the apparel business, which enables consumers to self-design their garments using a variety of modules and possible combinations provided in libraries made available online by the apparel manufacturer. We then analyze a case of web-based self-design of a pair of jeans.

Internet may also be used as a marketing research tool to collect both primary and secondary data. We study the possible opportunities and pitfalls of *e-research methods* and in particular we show what the possible consequences of the use of online discussion groups on various phases of apparel development process (trend analysis, concept/theme evaluation, prototype evaluation, pre-editing or pre-presentation design testing) can be.

Firms can use the Internet to more effectively communicate and to share knowledge and experiences, thus enabling the creation of long-term relationships based on trust built on the repetition of successful co-experiences. At the same time, the capability of entering in and maintaining effective partnerships is of paramount importance to developing business-to-business online experiences. Therefore, though the potential of electronic mail, of Web-based product data management systems, and other Interned-based platforms in enabling global cross-company product development along a geographically dispersed filière, for these technologies to be really effective, the partnering companies must first be connected through solid links based on trust and objective sharing. We claim that the *Internet may be used to create particular contexts that facilitate the development of trust-based collaborative innovation partnerships*. These shared contexts of experience may represent a reserve of potential relationships that can be activated to create and develop effective product innovation networks. The effectiveness of these networks is supported by trust that is built on a set of shared norms, beliefs, and experiences embedded in the web-based context. Information and communication technologies may allow building electronic cooperation spaces, a sort of virtual territories, characterized more by shared values and aims rather

than by physical borders. Virtual vertical communities could represent successful models for a non-hierarchical management of online innovation processes involving firms located in different phases along the fiber-textile-apparel filière. We might also refer to this model as digital district as many similarities with an industrial district can be pinpointed. In an industrial district the common context for interactions based on trust and reputation is the territory. In vertical communities it is the digital context, where trust arises as the outcome of participation to the same community, sharing its projects and finality. Meta-objectives and interests sharing replace the physical proximity. Theoretically, the creation of a digital district among firms belonging to the fiber-textile-apparel filière is possible. However, there are important barriers that until now have made it more an ideal theoretical framework than a realistic possibility. Therefore, at least for now we believe that it doesn't belong to the fan of the realistic opportunities. Nonetheless, *Internet and electronic mail can facilitate product innovation-oriented interactions within well-defined intra-filière networks.*

Finally, the potential of the Internet in changing the industry rules is confirmed by the rising success of some *online providers of services to fashion companies.* Business-to-business web sites of this kind can reshape not only the relationships between service providers and other firms of the filière, but also the internal design and development processes. Innovation networks among the various companies of the filière are greatly driven by the need to recompose dispersed information and knowledge in managed systems. Therefore, it is evident how the possibility of having easy and real-time access to a great number of continuously updated pages of industry-related information can also influence the apparel innovation networks.