

Design-driven innovation: exploring new product development in the home appliances and furniture industry

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Abstract

Purpose – This paper aims to investigate the phases of new product development within the design-driven innovation (DDI) process, the role of designers and collaborators in the process and how this process relates to some quality principles.

Design/methodology/approach – This study adopted a qualitative approach using Gioia methodology. In particular, four Italian manufacturing companies in the home appliances and furniture industry were selected, and data mainly collected through direct interviews were analysed through content analysis.

Findings – The new product development related to DDI includes the following phases: the company brief, the designer research, the concept of the designer, the design, legal protection, prototyping, production and the market launch. Designers play a strategic role in the above phases of DDI, but other actors also cooperate and some quality principles affect positively on the process. This study proposes a model for a DDI process in the home appliances and furniture sector.

Research limitations/implications – Although this exploratory study was conducted on only four companies, it advances the DDI research in relation to new product development.

Practical implications – This study makes recommendations to entrepreneurs and managers on how to innovate successfully and to effectively manage designers and collaborators to ensure competition.

Social implications – This analysis highlights that design-based innovation contributes to improving the quality of life of consumers.

Originality/value – To the best of the authors' knowledge, this is the first qualitative study to examine the phases of new product development in DDI process, the actors involved and relationship to quality principles for the Italian home appliances and furniture sector.

Keywords Design-driven innovation (DDI), Industrial design, New product development, Designers, Collaborators, Quality principles

Paper type Research paper

Introduction

The fact that design can improve firm competitiveness appears nowadays unquestionable. In the last decade, the European Commission has strongly invested in the design-driven innovation (DDI) approach at national and regional levels as “Design creates value and contributes competitiveness, prosperity, and well-being in Europe” (EU, 2013).

The importance of design for competitiveness is well documented in many countries with a strong tradition of design, such as Italy (Verganti, 2003, 2008) and Sweden



(Aydin and Erkarlsan, 2019), but DDI practices are also examined in emerging countries (i.e. China and Indonesia; see Zhang *et al.*, 2016; Kembaren *et al.*, 2014). However, DDI has only recently received attention in the managerial literature, and empirical studies are still rare.

In addition to market-pull and technology-push strategies to product innovation, Verganti (2009) introduced a third approach to innovation based on design. He defined DDI as “an innovation where novelty of message and design language is significant and prevalent compared to novelty of functionality and technology.” The novelty of innovation is the “knowledge about the signs that can be used to deliver a message to the user and about the sociocultural context in which the users will give meaning to those signs” (Verganti, 2003, 2006). In the DDI approach, companies with designers and other creative actors can create breakout products adding new and unsolicited meaning that consumers love because they are so different from other products that dominate the market (Verganti, 2003, 2009). Therefore, the strategy of DDI, namely *meaning innovation*, focuses on understanding, anticipating and yet influencing the meaning of emerging new products. However, the DDI process has not yet been sufficiently explored and needs to be better understood from a managerial perspective. Such an understanding is very important as it could assist in strengthening this strategic resource for competition of firms and countries.

Few studies proposed specific phases for the DDI process (Design Council, 2007; Borja de Mozota, 2008; Acklin, 2010; Conti, 2018; Aydin and Erkarlsan, 2019), and others provided only the macro-phases, namely, *listening*, *interpreting* and *addressing* (Verganti, 2003, 2009; Dell’Era and Belini, 2009) as it seems that the complex and iterative design-driven process cannot be formalized. Therefore, there is need to conduct further empirical research to better understand the phases of this kind of innovation process.

Further, it is widely accepted in the literature on DDI that to produce new radical innovations, companies need to build relationships and a continuous dialogue with an exclusive circle of “interpreters” (designers, artists, suppliers, companies of other sectors, etc.) which help in identifying the “meaning” of the proposed innovation for users and customers (Verganti, 2008). However, more practice-based studies to investigate the role of designers and other actors during the DDI process are required. Finally, another area of the literature on DDI which requires further investigation is connected to the relationship with quality. Even though the relationship between innovation and quality has been largely analysed (Prajogo and Sohal, 2001; Singh and Smith, 2004; among others), the specific relationship between DDI process and quality management principles requires further investigation.

Hence, this study aims to address these identified gaps in the literature to provide a more comprehensive understanding of the DDI process in new product development. In particular, it tries to identify the phases of the process, the roles of designers and other actors in the process and the relationship between the process and some quality management principles, such as customer satisfaction/excitement, teamwork capacity and participative leadership.

More precisely, this study adopts a qualitative approach to analyse the Italian home appliances and furniture industry, and from this empirical analysis a theoretical model was built. Specifically, the home appliances and furniture sector was analysed as it is a particular design-intense sector (Verganti, 2006; Dell’Era *et al.*, 2011; Simoni *et al.*, 2014), and Italy is one of the leading countries in the design culture and the furniture industry (Sigolotto, 2010).

In particular, the following research questions are addressed in this study:

- RQ1. What are the phases of the DDI process in relation to new product development?
- RQ2. Which roles do designers and other collaborators play in the DDI process?
- RQ3. How main quality principles relate to the DDI process?

The remainder of this paper is structured as follows. First is the description and analysis of the selected literature. This is followed by an account of the methodology. Then, the results are presented and discussed. In the concluding section, we report the theoretical and practical implications and the limitations of the study and make suggestions for future research.

Theoretical background

Characteristics of design-driven innovation (DDI)

There is wide agreement on Verganti's (2003) interpretation of DDI as a managerial strategy for radical innovation based on the *why* of a new product or service (among others, Verganti, 2003; Dell'Era *et al.*, 2008; D'Ippolito, 2014; De Goeij *et al.*, 2016). In particular, the author discovered that radical innovations often entail an innovation process that focuses on how to come up with a new interpretation of a product's meaning. Companies with designers and other creative actors can create breakout products that add new and unsolicited meaning to things people love because they are so different from other products that dominate the market (Verganti, 2003, 2009). The author suggests that new meaning is determined by the baggage of symbols and emotions that products carry with them and a complex set of qualities depending on the experience they propose.

Further, DDI is considered as complementary to other innovation theories, not a replacement *tout-court*. DDI sees design as a contribution to innovation through creating meaning, such as other drivers like technology or market (Verganti and Dell'Era, 2014). While technology is the driver in technology-push innovations and demand in demand-pull innovations, the ability to give new meaning to things is the main driver of DDIs. However, this kind of innovation may include also technological innovation (Verganti, 2003; Dell'Era *et al.*, 2008; D'Ippolito, 2014). More precisely, according to Verganti and Dell'Era (2014) design culture and sensibility, together with the ability to give new meaning to things, are able to satisfy latent needs and desires and open new markets, creating breakout products radically distant from the past and that show a new future.

Therefore, products characterized by new meanings, languages and innovation do not arise from market requests (Verganti, 2003). In fact, the user-centred perspective, as found in design thinking, is criticized as not fully capturing the rich contribution of design to innovation (Jahnke and Johansson-Sköldberg, 2014) because people are not searching only for new solutions to existing problems (Oberg and Verganti, 2014). In Norman and Verganti's (2014) view, user-centred design (UCD) or human-centred design (HCD) methods are weak regarding radical innovation. Verganti (2009) also affirmed that radical innovation means proposing a new understanding into the users' world instead of asking them what they need. In other words, the public does not ask for anything; rather, the visionary companies are the ones *offering* them something, making new *proposals* (Verganti, 2009). For example, Nintendo Wii is a game console with motion-sensitive controllers that allow people to play games by moving their bodies; it transformed game consoles from an immersion in a virtual world approachable only by experts into an active workout for everyone. No one asked for this new meaning, but everyone loved it once they saw it.

Among the extensive literature on design management, many previous studies focused, for example, on the characteristics of a product design; in particular, a product design may be defined as a "beautiful and well made" product which combines functionality, expressed by technology, with aesthetic form and/or symbolic value (Bloch, 2011; Ravasi and Rindova, 2008; Luchs and Swan, 2011; D'Ippolito, 2014). Other previous studies examined the types of barriers and problems small and medium-sized enterprises (SMEs) have to overcome to adopt DDI such as lack of design resources (Cox, 2005; Landoni *et al.*, 2016) or human and financial resources (Fuesglistaller, 2004; D'Ippolito, 2014) or design culture

(Moultrie *et al.*, 2007). Some studies also analysed how a product design creates value for customers as it meets the rational and emotional needs of customers (among others Bloch, 2011; D'Ippolito 2014). However, few studies focus on the DDI process as we will explain in the next paragraph.

DDI: phases of new product development

The new product development models (Cooper, 1996; Benkenstein, 1998, among others) are considered inadequate to describe the DDI process, as they consider industrial design only as part of company's R&D or included it in the conception phase. Furthermore, the managerial literature on design does not focus on the process, process phases or actions for DDI, and little consensus is found among the authors on this subject (De Goey *et al.*, 2016). According to Verganti (2008), the process of DDI is not formalized, is difficult to grasp by applying research methods used in product development and starts from an insight into new product meanings and not with an insight into the needs of a consumer. In order to produce radical innovation, companies need to build relationships with actors or "interpreters" (individuals and organizations) which may help identifying the "meaning" of the proposed innovation for users and customers. More precisely, according to Verganti (2009), companies need to be immersed in the so-called *design discourse* that is a network of interpreters (designers, artists, suppliers, companies of other sectors, etc.) that are explicitly or implicitly engaged in a systematic dialogue in which they exchange insights, interpretations and proposals in the form of artwork, studies, speeches, prototypes and products. DDI is a research process in which knowledge and interpretations are fed into the creation of a new vision or proposal and aimed at creating breakthrough product family or new business. In particular, the author has identified three main activities of DDI: listening to, interpreting and addressing the design discourse (Verganti, 2009). More in detail, *listening to the design discourse* consists in accessing and understanding knowledge about possible meanings and languages of new products, by attracting key interpreters in the outside network (not only designers); *interpreting* is when knowledge is fed into a process that can create a new vision and proposal; it implies integrating and recombining knowledge captured from the design discourse, as well as producing new interpretations, by conducting internal research and experiments; *addressing the design discourse* means diffusing your vision to interpreters, influencing how people give meanings to things; it implies defining appropriate means to allow interpreters to discuss and internalize new proposals (Verganti, 2009, p. 133).

Making the connection to new product development (NPD), Dell'Era *et al.* (2008) identified a so-called meta-project, which occurs prior to product development. Within this project, collaborations among actors are established and changes in sociocultural contexts are researched. Verganti (2008) described DDI as a research process in which technological and design research starts at the beginning of the meta-project phase. Companies and designers search for relevant knowledge about recent design and technology discourses before the generation of ideas. Verganti (2009) defined this context as the *design discourse*.

The process that follows is not divided into clearly defined phases (Dell'Era and Verganti, 2009), as it is a process whereby exploration, diverging phases, and converging phases iterate (Jahnke and Johansson-Sköldberg, 2014).

However, few explorative studies have proposed specific phases for the DDI process (de Mozota, 2008; Acklin, 2010; Design Council, 2017; Conti, 2018; Aydin and Erkarlsan, 2019). Even though in these studies there are similarities among phases, there is not yet a unique widely accepted proposal. For example, according to Borja de Mozota (2008), the creative process of a designer developing a new product is structured as follows: (1) research,

(2) exploration, (3) development, (4) implementation and (5) evaluation. Similarly, [Acklin \(2010\)](#) proposed a model for SMEs structured as follows: (1) impulse, (2) research, (3) development, (4) strategy, (5) implementation and (6) evolution.

In a similar vein, [Conti \(2018\)](#) proposed the following phases of the process of radical product innovation by examining the procedure of a leading company in business-to-business (BtoB) marketing in the furniture sector, whereby designers cooperate strictly with company staff in terms of (1) the brief of the company, (2) the design proposal, (3) the maquette, (4) legal protection, (5) the design, (6) the prototyping, (7) the pre-series production and (8) the series production. In the first step, the brief includes the request from the company along with basic limitations that afford great freedom to the designer; the designer, in the second step, proposes the concept in the form of drawings and written descriptions; after the pre-prototyping phase, known as the maquette, the legal protection and design phases follow. The design step consists of the identification and definition of the details of the components and their successive representation in constructive drawings. In the phase of prototyping that follows, marketing and commercial departments may intervene and suggest corrections to the product, and finally production and launch to the market ensue. Pre-series production anticipates production and is useful for testing the product through feedback from loyal clients, for quantifying its industrial cost and for collecting orders.

Similarly, a qualitative study analysed how Swedish and Turkish companies in the furniture sector undertook research for and designed a novel product meaning for a new customer ([Aydin and Erkarlsan, 2019](#)). The study outlined that the *design push* NPD consists of the meta-project phase, and of the product development phase, which includes prototyping, material selection, product language design and communication design.

Collaborators of the DDI process

As explained in the previous paragraph the network of collaborators, the so-called *design discourse* provided by [Verganti \(2009, pp. 120–133\)](#), plays a crucial role in the DDI process. However, little has been studied and discussed in detail about the contribution of the actors involved in DDI, and empirical research is recommended ([De Goey et al., 2019](#)). Research shows that DDI requires collaborating with external networks to expose companies to different perspectives ([Brøde et al., 2014](#); [Verganti and Dell’Era, 2014](#)). The importance of open innovation processes for value creation is not new ([Leifer et al., 2000](#); [Chesbrough, 2003](#); [Vanhaverbeke et al., 2008](#); [Laursen and Salter, 2006](#); [Mina et al., 2014](#); [D’Angelo and Baroncelli, 2020](#)). Many actors co-produce the product bringing different sources of knowledge to its creation ([Laursen and Salter, 2006](#); [Mina et al., 2014](#)). In a DDI approach, external actors play a critical role as “interpreters” of the evolution of the socio-economic context, thus contributing to develop ideas, insights and new products with new meanings.

Firms developing DDIs must collaborate with different categories of interpreters to explore new scenarios. [Verganti \(2009\)](#) defined interpreters as “firms in other industries that target the same users, suppliers of new technologies, researchers, designers, and artists, that can provide complementary and synergistic knowledge”. These can be grouped into two main categories: the world of cultural production (i.e. people whose core mission is exploring culture and meaning) and the world of technology (i.e. people who focus their efforts on exploring radical changes in technologies and drive technical innovations). To develop DDIs, firms must enter into dialogue with this external network, which enables taking a step back from their view of the industry and facilitates a more holistic interpretation of the surrounding sociocultural arena ([Verganti, 2009](#); [Verganti and Dell’Era, 2014](#)).

A recent study on Swedish and Turkish companies in the furniture sector ([Aydin and Erkarlsan, 2019](#)) suggests that companies should collaborate with various actors from different cultural backgrounds, not only with experts from different sectors, such as

production, service and communication, but also with other experts, such as artists, sociologists, architects and trendsetters to discuss and develop their forecasts.

In summary, the marketing and managerial literature on design reveals some gaps, which the present study seeks to address. First is the innovation process in cooperation with designers and requires further understanding: some authors argue that it is difficult to formalize, while others stress the importance of trying to define the steps of such a process to manage better DDI – through the identification, management and control of the process – which is a strategy for competitiveness. Second, the literature has only poorly investigated the actors (or interpreters) and their roles in this process. Hence, this study tries to understand both the steps of the process and the actors involved by examining four leading Italian companies in the home appliances and furniture sector. In addition, this study aimed to contribute to fill another gap in the literature – the relationship between DDI and quality principles – which will be described in the next paragraph.

Quality management and design-driven innovation

The relationship between quality management, quality principles and design management in general has been studied extensively. Several papers analysed the relationship from a more technical and engineering point of view. For instance, [Andreasen \(1991\)](#) and [Hubka and Eder \(2002\)](#) presented different design methods and tools, including the quality function deployment (QFD), which could be of great help in improving product characteristics and quality. [Pighini et al. \(2001\)](#), introduced a technical approach based on design for X methods with the aim of improving product quality and safety. [Lanzotti and Tarantino \(2008\)](#) proposed a statistical-based Kansei engineering approach. This method, along with the well-known Kano analysis, allows the identification of quality elements satisfying user needs.

However, all the above-mentioned papers did not study how quality principles could affect DDI performance.

The influence of quality management on innovation seems to have both negative and positive effects. Some common aspects between quality management and innovation such as continuous improvement, performance measurement and an “open” culture ([Prajogo and Sohal, 2001](#)) suggest that organizations that implement quality could be more innovative than organizations that do not ([Singh and Smith, 2004](#)). However, the “tyranny of the market” to which quality management is subject could have negative consequences on innovative performance ([Perdomo-Ortiz et al., 2006](#)).

In a recent study, the relationship between DDI performance and quality management was analysed in Italian manufacturing companies ([Conti et al., 2019](#)). It revealed the existence of many common elements of product design and quality product, especially aesthetics, quality materials, technology and environmental sustainability and their positive influence on the perception of customer value. Further, it stressed that the companies most inclined to innovation pay attention to less traditional and more recent elements of quality and design such as aesthetics, technology and environmental sustainability.

Among important principles of quality culture, three of them seem to have a positive influence on the new product development within DDI. The first principle is related to customer satisfaction and excitement requirements ([Tontini, 2007](#); [Wang and Ji, 2010](#)); the second refers to teamwork capacity ([Escribá-Moreno et al., 2008](#); [Colurcio, 2009](#)); the third concerns the participative leadership ([Parumasur, 2013](#)). Therefore, this study aims also to understand the relationship among DDI and these total quality management principles.

Indeed, apart from studies focused on technical and engineering aspects of the relationship between quality and DDI, few papers deeply investigated quality principles and DDI from a managerial perspective.

The relevance of home appliances and furniture sector among intense-design sectors

This study analyses the home appliances and furniture sector as it is one of the most design-intensive sector (Verganti, 2006; Dell’Era *et al.*, 2011; Simoni *et al.*, 2014) and focuses on the Italian context as Italy is considered one of the most important countries for design culture and innovation (Sigolotto, 2010). To meet people’s needs in furnishing houses and offices and to remain competitive, companies of the home appliances and furniture sector need to constantly innovate in terms of not only technology or functionality but also design (Verganti, 2009). An example of recent DDI in the Italian furniture sector is the innovative furniture system with integrated acoustic insulation panels that meets the new demand for original solutions for co-working workplaces (shared production areas where the emerging class of “millennials” can work together), mitigating the noise-related bad effects on workers (Geniola *et al.*, 2020).

The Italian home appliances and furniture companies need to face many new challenges. In an increasingly customized economy, much of design elements have to be inserted in the final products even though consumers may choose many product’s features (Bumgardner and Nicholl, 2020). Given the increasing consumer interest in sustainability of product design, good furniture design should consider the sustainability issues connected to product design (use of recyclable materials, product durability and reliability, low consumption, etc.) key elements of competitiveness (Bumgardner and Nicholl, 2020). Further, this sector could benefit from the new concept of “knowledge differences” that arise between people, organizations and various phenomena and create boundaries knowledge, a dynamic process that accelerates innovation (Kodama and Kimura, 2020). To grasp these opportunities and strengthen innovativeness and competitiveness, especially SMEs should improve their design management skills (Ferrara and Lecce, 2019).

Methodology

Research design

This study uses a qualitative, exploratory and multiple-case study design proposing four cases of Italian manufacturing companies.

In particular, the case study method was chosen as it is very useful to understand contemporary phenomena and practices (Yin, 1984) and to provide background material to actual issues which are still not well known such as the DDI. Case studies are used to test theory, to describe specific contexts and also to develop theory (Eisenhardt and Graebner, 2007; Yin, 1984). In this study, we use this method to develop a model from the analysis of data collected mainly through interviews. Specifically, multiple-case study method (Yin, 1984) was adopted to identify which are the phases of new product development of manufacturing firms and to gain a clearer understanding and characterization of the phenomenon under investigation by comparing similarities and differences emerging from the analysis (Silverman, 2000).

The four selected cases met appropriateness to the research aim as well expressed the phenomenon of inquiry, and also met adequacy as with four cases information saturation with in-depth information could be reached (Patton, 2002).

Hence, the study adopted a *theoretical sampling* strategy (Patton, 2002): cases were selected on the basis of theoretical reasons, that is, to allow the new product development in DDI to be investigated and cases rich in information to be studied in depth and in detail. The home appliance and furniture sector was chosen as it is one of the most design-intensive sectors, and four Italian companies were selected based on their strong design cultures, their competitiveness as reflected in DDI and their awards received for design.

This paper defines home appliances and furniture industry in a broad sense, including all the producers of appliances, accessories and furniture for home and public places.

Furthermore, to increase the quality of results, cases were selected to have maximum variation for the purpose of obtaining different cases and to have a literal replication, that is, expecting to obtain similar results (Patton, 2002).

In particular, after three interviews with three experts – the president of the local trade association for manufacturing companies (Confindustria Pesaro and Urbino), the president of the Italian Association of Industrial Design (ADI) for the Marche region and an academic in “management and innovation” at the local university (the University of Urbino) – a sample of four companies in the sector was identified. The four companies of the sample have the following characteristics:

- (1) They are market leader in their sub-industry: (1) kitchens; (2) fridges and furniture for bars, ice cream parlors and pastry shops; (3) home accessories, such as tables, chairs and shelves; and (4) cookware.
- (2) They are strongly design-oriented: they are perceived by experts as examples of excellence in their sector by producing design items that offered unique features and high-quality finishings, and obtaining awards for design (especially the Compasso d’Oro).
- (3) They operate on a global scale.
- (4) They have different sizes, encompassing small, medium and large companies, with a turnover ranging from 5 to 60 million and numbers of employees ranging from 40 to 300.
- (5) They are particularly committed to quality management and principles, and they are ISO 9001 and 14001 certified.

Data collection

Information was collected through twenty direct interviews with the four companies of the sample, triangulated with other sources of data (Yin, 1984), such as the analysis of website, balance sheet and archival documentation and a day spent in each company.

In particular, five direct and unstructured interviews were conducted with the entrepreneur (E), the R&D director (RD), the production director (PD), the sales and marketing director (MD) and the quality director (QD) of each company.

The four companies were contacted by phone and gave their availability for open-ended in-depth interviews in the period from August to December 2019 and in March 2021.

The interview protocol (Table 1) was designed in order to answer the research questions, that is to investigate each company’s steps in the DDI process, as well as how the companies relate to designers and other external actors of the creative network. Finally, also the relationship among DDI and quality principles connected to customer satisfaction and excitement, participative leadership and teamwork capacity was investigated. An initial question of the protocol was aimed to obtain a description of a successful design product (e.g. an awarded design product) of each company. It was considered a useful premise to identify the characteristics of the output of the DDI, that is, the innovation process under investigation.

Direct interviews were conducted in a flexible manner to ensure that themes emerged spontaneously in the respondents’ feedback. During data collection, researchers played a strategic role by being an active listener, thus ensuring respondents correctly understood the questions and encouraged the interviewees to describe each aspect in detail. Each interview lasted 40 min. Further, interviews were carried out in Italian, recorded, transcribed and then translated in English for data analysis process.

Interviews with different respondents of the same company and the rigour of data collection approach could reduce problems of bias of respondents (Yin, 2018). The use of

Table 1.
Interview protocol

1	Can you describe one new product designed by your company which received a design award?
2	Can you please identify and describe each specific phase of the DDI process related to the development of new products? (consider that the macro-phases are listening to the design discourse, interpreting and addressing to the design discourse)
3	How are designers involved in the DDI process? (e.g. in which of all phases of that process)
4	How do they work with the company's personnel? (e.g. informal, "warm" relationship)
5	Who are the other actors or collaborators involved in the DDI process connected to new product development? (e.g. artists, suppliers, showrooms, universities, events)
6	How are other external actors involved in DDI process related to the development of new products?
7	How does customer satisfaction/excitement relate to the DDI process?
8	How does leadership relate to the DDI process?
9	How does teamwork capacity relate to DDI process?

multiple informants mitigates, in fact, the potential biases of any individual respondent by allowing information to be confirmed by several sources.

Secondary data, collected from multiple sources, such as website, balance sheet and archival documentation, enabled cross-checking through triangulation, revealing a high level of consistency.

Data analysis

A content analysis was undertaken using classic codification to examine the data. According to [Creswell \(2013\)](#), an adequate content analysis describes the thematic content of interview transcriptions by identifying common themes in the texts. Content analysis tries to follow this pattern:

- (1) highlighting in the text what is relevant to the topic of the research;
- (2) initially coding each distinct first-order category;
- (3) grouping similar codes to create more focused categories;
- (4) identifying theoretical themes.

In particular, data analysis and interpretation followed the approach recommended by [Gioia et al. \(2013\)](#), a widely used method to understand management issues (e.g. [Lindh and Thorgren, 2016](#); [Chandra, 2017](#)).

In this study, the analysis of the collected data began with an analysis of data collected from each company, mainly in the form of transcribed interviews, through the lens of our research questions. Each of the authors read the data collected independently to identify codes that are significant "statements", describing, respectively, the phases of DDI process, the role of designers and other actors in such a process and the quality principles related to the process, present in each of the four cases.

This approach consists in coding the data corpus (the informants' voices) using first-order codes, before aggregating them into second-order themes (abstract concepts taken from the first-order categories) and, finally, identifying the aggregate dimensions (the theoretical themes). The aim of this process is to identify themes, that is, phases, actors and quality principles connected to DDI.

Coding was undertaken conservatively, based on what the data explicated. Through a comparison of the codes, similarities and differences were identified, and the number of codes was reduced. In particular, each researcher separately coded the concepts of the first order, carried out consistency checks and carefully coded all the textual data, thus allowing for multiple coding of each textual unit, and thereby guaranteeing the triangulation of the data.

After this, the researchers compared their coding schemes. Any discrepancy that emerged during the discussion was reconciled so that a shared understanding was reached, and a unique coding scheme identified. Codes consisted of significant statements from all four cases connected to the three areas of investigation – phases of DDI, role of designers and collaborators and relationship of the process with quality principles.

Following this, the connections between the concepts that might lead to the development of second-order themes, elaborated on a more abstract level, were identified. The researchers then assembled the emerging themes related to the concepts in the aggregate dimensions – more precisely, with specific reference to the dimensions of the DDI process's steps, the number of codes progressed from 31 (concepts) to 17 second-order themes, and then to seven aggregated dimensions. With regard to relationships with designers and other external actors, the number of codes progressed from 12 first-order concepts to eight second-order themes, and then to five aggregated dimensions.

Finally, with reference to the relationships with quality principles, the number of codes progressed from 11 first-order concepts to 6 second-order themes, and then to 3 aggregated dimensions.

The findings were then discussed using the theoretical lens of Verganti's (2009) model of design approach consisting of macro-phases – *listening, interpreting and addressing* – and the actors or interpreters (designers and collaborators) starting from Verganti's (2008) *design discourse* framework and explained in reference to the literature.

Findings

Company profiles

Table 2 shows the characteristics of the companies in the sample, indicating their specializations in the industry, firm size and experience in DDI, and providing a description of an award-winning product designed by each company.

With regard to examples of design products, company A introduced to the market one of the most revolutionary products in the sector, a breakthrough product consisting of the first round and rotating display case to combine perfect refrigeration (with an enticing display of ice cream) and functionality.

An “evergreen” design product of company B is a collection of pans that are high performing, resistant and suitable for all cooking modes (oven, gas, induction, electric hob or radiant glass-ceramic), and, with their elegant lines, they are suitable for display on the table. This product was apparently inspired by a car design, for which the line was designed in a wind tunnel.

Company C designed a modern kitchen that incorporates innovations in terms of functionality, aesthetics and technical performance, thus creating an environment with a strong “personality.” Product 3 is equipped with an innovative door that seals the cabinet,

Company	Size	Sub-industry (specialization)	Turnover (million €)	Employees	Experience in DDI (years)	An award-winning design product
A	Large	Fridges and furniture for bars, ice cream parlours and pastry shops	50	300	>50	Product 1
B	Large	Cookware	46	300	>30	Product 2
C	Medium	Kitchens	26	100	>20	Product 3
D	Small	House accessories	15	40	>30	Product 4

Table 2. Socio-demographic characteristics of the companies and example of a design product

preventing the entry of dust and small insects, while allowing air circulation with pressure or temperature changes by means of a filter and membrane holes. This is a radical innovation in the sector, and the company has obtained a patent for the invention. Other innovative aspects of this product are its concealed elements and new materials.

Finally, product 4 of company D is a breakthrough product for the sector, a sort of “mirror of the soul”, of interiority, a magical place to recover a dialogue with oneself. Its innovation concerns not only meanings and sense making, but also the form and the processing of glass and functionality. In fact, each single module comprises 21 different elements, worked separately, in extra clear glass. These are glued one at a time and welded using ultra-violet lamps.

New product development phases of DDI

All the companies examined developed new products in a similar way, adopting the following phases: the company brief, the designer research, the designer concept, the design, legal protection, prototyping, production and the launch to the market. The entrepreneurs interviewed agreed that the innovation process consists of three macro-phases: listening, interpreting and addressing.

The innovation process is not linear and rigid but flexible; it is driven by “trial and error”, parallel activities and learning by doing. In addition, innovation is an “open process”, wherein external actors, such as suppliers, artists, and universities, cooperate. Following [Table 3](#), which presents the data on the phases of DDI for design product development, each phase of the process is described in detail.

Company brief

All the entrepreneurs interviewed affirmed that NPD starts with the company’s brief, which presents the problem or the request to the designer, and consists of a rough idea of a new customer desire to satisfy or a new product to develop along with the project limitations. The limitations are few and are expressed in terms of costs (the maximum budget for innovation) and technologies (some new technologies may require too much time or cost too much to be developed and incorporated in a new product); all companies want to leave creatives free to express themselves. Therefore, the respondents asked the designers to make explicit their basic ideas while respecting the minimal constraints. entrepreneur of company C (EC):

We give to designers a quite vague brief, a sensation, and ask him or her to create a project that satisfies the minimum requirements, for example, to use the available glass plates. But designers can become upset and ask to modify the glass plates, which seems to be a constraint.

The cookware industry has many constraints to be respected. entrepreneur of company B (EB) affirmed:

While the architectural structure of the pan—the round pan with a handle—remains unchanged, details, materials, colors, finishings may be changed. We start the process of product innovation with an idea, a brief, and we invite the designer to visit the company to learn the productive process and the constraints connected to technologies and costs.

Similarly, EC stated:

The product innovation process with designers starts with a brief through which the company declares its aims, its needs, and that leaves ample space for designers. For example, before launching the Icon model on the market we wanted to produce a technical and rigorous kitchen, such as the German ones, but at the same time, with an Italian style.

Sometimes designers have good ideas and make proposals with a high degree of freedom. In this respect, A stressed:

Concepts	Themes	Dimensions
(1) I usually have an intuition to create a completely new product and ask a designer for support. Therefore, the company suggests the idea, reveals the need, and informs the designer about the constraints in designing the kitchen, a very complex product (C)	Brief based on the entrepreneur's intuition and the company's constraints	Company brief
(2) For radical innovation, we cooperate with designers, especially with those who have never worked in our sector. The radical process of innovation starts with some guidelines for the company and a few constraints (costs, materials, coherence with the range of products) (A)		
(1) Only a creative person who is not used to solving everyday problems has a fresh view on firms and is able to conduct radical innovations (B)	Brief as a spontaneous proposal by the designer	
(2) Designers know the context, what consumers would love, before us, and can give very innovative input (D)		
(3) Sometimes designers contact me to suggest a new product (A)		
(4) Designers could have ideas of products before customers desire them and it is important to talk with them (C)		
(1) Designers have undertaken detailed research, depending on their sensibilities, and have studied the evolution of spaces in houses and the trends of artistic environments (D)	Research of industry context and related industries	Designer research
(2) Designers conduct wide-ranging research within their extensive networks of relationships with users, companies, and art curators to understand trends, even in closed industries (B)		
(1) The creatives usually study the industry to understand the successful products of the past and to anticipate future trends (C)	Research into products of the past	
(1) We discuss ideas and invite the designers to visit the company but we remain unaware of the kind of research they conduct (B)	The company remains unaware of the designer's research	
(1) Designers usually prepare two or three concepts (rarely even ten!) and the company selects the one that best meets the technical, economic and commercial requirements (B)	Concept provided in the form of rendering	Concept of designer
(2) The concepts of designers are in the form of rendering and generally maintain the original idea (C)		
(1) Few designers suggest concepts in the traditional paper form. I select the concept that best meets technical, economic, and market requirements (D)	Concepts rarely provided in the form of a traditional paper	
(1) Designers sometimes propose two or three advanced concepts in the form of little prototypes and technical descriptions based on modern living habits (C)	Concepts sometimes in form of little prototypes	

Table 3.
Data on the phases of NPD using DDI
(continued)

Concepts	Themes	Dimensions
(1) We are leader in our sector as we create new products with new meanings, functionality and technologies (A) (2) The best concepts include novelty in terms of functionality, technology, performance and meanings (D)	Concept includes new meanings	
(1) Products are designed to have no defects and each component is defined in detail through relative construction drawings (A) (2) Before the design phase, it could be useful to create pre-prototypes, for example, to better understand the functioning of a component, especially when the product is complex (D)	Design of each component	Design
(1) From the acceptance of the concept of the designer, an iterative process follows between the designer and the technical office to make the concept industrialized (B) (2) Our designer, who is also our artistic director, provides advanced projects already in the concept phase. In fact, the company implements the design in a pre-prototype co-created with suppliers of components who require clear projects (C)	Design process	
(1) We develop breakthrough products and legally protect them, even though we are leader in innovation (A) (2) We obtained an invention patent for radical innovation of a kitchen door (B)	Radical innovations require legal protection	Legal protection
(1) Not all products are legally protected against imitation (C) (1) To remain competitive, systematic innovation is often more important than legal protection (A, D)	Continuous innovation vs legal protection	
(1) We conduct product tests internally and in a technological centers (A) (2) Tests are mandatory only for contract market products, but we test all types of products (D) (3) We do many product tests as the quality and safety of the products are extremely important for success (C)	Mandatory and optional prototype tests	Prototyping
(1) The best way to understand if a product will be successful is to test the reaction of clients at trade exhibitions; they give us strategic feedback (A, B, C, D)	Prototypes are tested at trade fairs	
(1) Production involves teamwork with the suppliers of the components (C) (2) New products are manufactured by assembling internal and external components (A) (3) The final outcome of production is generally very similar to the original design concept (B)	Production involves teamwork	Production
(1) Pre-series production is sometimes required to make photographs for the product catalogue (D)	Pre-series production	

Table 3.

(continued)

Concepts	Themes	Dimensions
(1) Designers do not participate in the communication about and distribution of the products (B) (2) Even though designers are not contractually required to collaborate in the market launch, they like to give advice and know the market feedback (A) (3) Designers are not asked to participate in the market launch (D)	Company is responsible for the market launch	Market launch
(1) Our designer and artistic director cooperates in the market launch and to define the communication strategy and the single-brand stores layout (C)	Designers cooperate for the market launch	

Table 3.

If we want a radical product innovation, we need to work with a designer who suggests new ideas. For this reason, we like to work with designers who have not worked in our industry before and can bring fresh ideas and very original proposals to our company.

More rarely, designers make proposals to companies before being contacted by them.

Designer research

All respondents affirmed that, following the brief, designers conduct personal research to investigate user demand and trends related to the industry, and that, generally, such research includes the study of related industries as well as the artistic and fashion worlds. Every designer conducts research in a broad socio-economic context to develop ideas that could not only meet users' unexpressed desires but surprise and excite them.

Entrepreneur of company C explained:

The designer research is aimed at finding original solutions, which may be very different from the suggestions initially given by the companies. The research is a sort of "applied research" aimed at finding a solution for the company.

Entrepreneur of company B added:

Designers are always immersed in a creative world, made of networks of people and organizations. During the personal and applied research—following the brief—they look for specific solutions.

Similarly, the ED owner explained:

According to designers, the industry trends can be understood if you first look at the artistic and fashion worlds, as they anticipate the tendencies of all the sectors.

The design concept

Each designer usually presents two or three concepts, mainly in the form of rendering and rarely as a sketch on a sheet. A concept consists of a drawing and a verbal description of the new product. Entrepreneurs select the concept that best meets the constraints indicated by the company and, at the same time, propose new, original, functional and emotional products.

According to the EA:

Concepts from designers may vary from the initial suggestions provided by the entrepreneur, but I appreciate this a lot as the originality of the designer is fundamental to developing breakthrough products, which are really new in the sector.

DRD affirmed:

I select concepts that meet the requirements of economic, technical, and market feasibility. By market feasibility I intend how the new products may satisfy the company's target.

More precisely, DRB argued:

Some designers propose even 10 concepts, but we consider the 2 or 3 ideas that best meet our request. We do not have information on the kind of work the designer conducts from the brief to the presentation of the concepts, but we know he is immersed in his network where he develops ideas.

EC added that:

In this phase of the innovation process, it is sometimes necessary that designers present pre-prototypes. In particular, as we produce a quite complex product (kitchen) made of many components, it is important to develop concepts in the form of small prototypes.

Design

Respondents affirmed that in the design phase, each component of the new product is studied and defined in detail through construction drawings. Further, they stated that new products are designed to have a meaning, to show no defects and to be easy to sell; in short, products as an outcome of the DDI process must be "beautiful and well executed." More specifically, the entrepreneurs interviewed agreed on the following elements that qualify a product of design: functionality, aesthetics, technology, materials, performance, processing, meaning and sustainability.

The entrepreneur of company B affirmed:

From the acceptance of the concept of the designer, an iterative process follows between the designer and the technical office to make the concept industrialized. The process lasts about a month and CAD files are developed.

PDC explained that:

Our designer and artistic director is also a good technician and engineer and provides advanced projects already in the concept phase. In fact, the company implements the design in a pre-prototype co-created with suppliers of components who require clear projects.

ED added:

Before the design phase, it could be useful to create pre-prototypes, for example, to better understand the functioning of a component, especially when the product is complex or strongly innovative.

Legal protection

After the design phase, the *legal protection* phase follows. All the respondents agreed on the idea that not all new products are legally protected but the most innovative ones in the sector must be.

However, PDD added:

Although our most innovative products are legally protected, the best way to be competitive is to innovate systematically.

Prototyping follows the legal protection phase. All the respondents explained that products are tested mainly internally, but the most complex products, such as kitchens, fridges and furniture, for the BtoB market are also tested in external specialized laboratories. This is an important step to improve the quality and safety of new products before production. All

companies also stressed that at this stage of the process, little improvements may be suggested, especially by marketing and sales department and by clients.

ED explained:

Prototypes are tested especially for durability and resistance both internally and in Cosmob, a local technology centre. Tests are compulsory for contract products and not for products marketed to consumers, but we test all the products. From these tests, eventual little corrections to draws are made and also marketing and sale departments may suggest product improvements.

In the EC's view, this phase was important as the company wanted to launch only top-quality kitchens to the market:

Tests on prototypes are made especially on materials, resistance to scratches, and thermal shocks. Sometimes, we ask our key clients to test a pre-prototype. But our retailers give us the most important feedback (the real test!) at the exhibition, the "Salone del Mobile", which takes place every two years in Milan. This allows the company to make eventual improvements to the product.

Production and market launch

Production is a teamwork phase used by those companies that manufacture more complex products, such as A and C, where some components are manufactured by suppliers. All respondents affirmed that pre-series may be necessary to take pictures for product catalogues.

With regard to the market launch, all respondents explained that designers may participate in this phase by providing advice or suggestions, but they are not directly involved in the communication and distribution of products, with the exception of C, whose internal designer and artistic director played a strong role in the final step of the IDD process. According to entrepreneurs, designers seem to be interested and satisfied to cooperate in this phase, and they are keen to receive immediate market feedback on the new products.

With regard to production, DPB specified:

Production of new pans may also include process innovation, connected to the introduction of new technologies or new materials or processing. Final products are generally coherent with research designs.

With respect to the production phase, the DPA affirmed:

Pre-series are produced to receive feedback from loyal clients, to quantify industrial costs and to obtain orders.

Concerning the market launch, the DMA stated:

Designers are part of our team and participate in all the steps of the product innovation process, until the market feedback, which represents a moment of satisfaction also for designers who receive appreciation and comments about the products.

With this respect, DPC affirmed that:

In particular in our company the designer who is also the creative director plays a strategic role also in these phases of new product developments, as he designs the stand at the "Salone del mobile" fair and the layout of single-brand stores abroad and cooperate to plan the communication polity.

Finally, DMD stressed that:

The role of actual and potential clients comes at the end of the process, as it is fundamental that they appreciate and buy the new products! This implies that they understand the value connected to the new meanings and other innovations, for example technological innovations, incorporated into new products!

Actors involved in DDI

In this section, [Table 4](#) presents the data for the external actors (or interpreters) involved in the DDI process. A description of the participation of each collaborator in the process follows. Before identifying these actors, the information about the ways companies select designers and cooperate with them is reported.

All the companies examined cooperated with different external *designers* – apart from C, whose internal designer was also the artistic director of the company – and their relationships

Concepts	Themes	Dimensions
<i>Selection of designers and kind of relationship with designers</i>		
(1) We like to work with different designers whose background is outside our sector to create radical innovations (A, B, D)	External designers	Designers selected by companies
(1) As our product is very complex compared to others in the sector, we have decided to hire an internal designer who is also the artistic director (C)	Internal designers	
(1) Designers are part of the company team and we develop a “warm” relationship with them; sometimes we also develop very close and friendly relationships with them (A, D)	“Warm” relationship	Relationship: Designer–company
(1) We cooperate well with them, invite them to visit the company, and let them stay in the company (B, C)	Cooperation in all phases	
<i>Actors (or interpreters) involved in DDI</i>		
(1) Suppliers can propose new materials or new technologies and we may include them in new products (C)	Suppliers give initial input for innovation	Suppliers
(1) Suppliers are the co-producers in the DDI process (A, B)	Suppliers cooperate in the innovation	
(1) Clients and users express their opinions about new products at the fair exhibitions (C)	Contact with clients/users at fair	Clients/Users
(1) Our marketing and commercial department expresses opinions on prototypes to improve them (D)	Opinion of clients/users through marketing/commercial department	
(1) We cooperate with universities and specialized institutions of design, such as the European Institute of Design (IED) (B)	Cooperation with universities	Universities and educational systems
(1) We cooperate with local projects to train creatives and designers (A, C)	Cooperation with educational systems	
(1) We cooperate with the local technological center (Cosmob) to test product components (A)	Local and external technological centers	Technological centers
(2) Some tests are made in external technological centers (C, D)		
(1) First, designers study trends in the art and fashion worlds (D)	Arts and sectors	Creative network
(1) Our designer develops ideas based on the study of our sector and similar sectors (B, C)	Trends of sectors	
(1) We and our designers participate in exhibitions and events (A, B, C, D)	Exhibitions and events	
(1) Design associations (e.g. ADI) and local industrial associations play an important role in developing the culture of design among companies and creatives (A, B, C)	Design associations (e.g. ADI), industrial associations	

Table 4.
Data concerning actors involved in the DDI process

with their creatives were “warm”, open and collaborative during all the steps of NPD (see Table 5).

Famous designers are selected together with young, promising ones, under the criterion that they should bring original solutions to companies. One entrepreneur searched for designers who were not familiar with the industry as they could propose more original solutions. Only two companies affirmed that their designers did not participate in the final or commercial phase after the launch to the market (B and D).

Companies in the sample also cooperated with *suppliers* in the DDI process, especially in the design concept and production phases. As DPC explained:

Suppliers and sub-suppliers play a strategic role in the DDI as they may suggest innovations in materials and technologies, alone or in collaboration with designers and the company.

Further, *users* contribute to the innovation process. Designers study demand trends, and, through their marketing and commercial departments, companies try to understand their market segment and select the most adequate concept of design.

Nearly all the respondents affirmed that designers and companies do listen to users’ desires and cooperate with *technological centres* to test products or components. This is especially true for the most complex products, such as kitchens, fridges and furniture for BtoB markets, where cooperation with these specialized centres is required to test products and/ or components.

Universities and education systems are considered partners in the process, as companies host interns in the company, both students and young designers. In this respect, C cooperates systematically with the Institute of Design (IED) in Milan. DMC affirmed:

We strongly support young creative people; in fact, young designers are always around in the company and participate in design competitions organized by the company.

Finally, the entrepreneurs explained that the company and the designers cooperate with the *creative network*. In particular, all the entrepreneurs agreed that it is important to be aware of *sector trends* and trends in related sectors, and that designers become immersed in the *art and fashion worlds*, visiting *exhibitions and events* connected to design to develop creativity and

Concepts	Themes	Dimensions
(1) Customer satisfaction is strictly connected to DDI, as it measures the success of a design product (C) (1) It is more important to delight clients rather than simply satisfying them with a new design product (A) (2) Sales and customer satisfaction measure the level of success of our products (B) (3) We innovate through design to create a WOW effect to customers (D)	Success and customer satisfaction Sales and delight of customers	Customer satisfaction and excitement
(1) Teamwork is a key aspect for DDI (A) (2) It is fundamental to work in team with designers and internal staff (B)	Teamwork with designers	Teamwork capacity
(1) Teamwork capacity is central also with other external actors (C, D) (1) Leadership in design driven innovation is naturally collaborative (C) (2) Participative leadership and passion for design are must in DDI (A)	Teamwork with internal and external actors Collaborative/ participative leadership	Participative leadership
(1) A leader has to promote creativity (B) (2) Leaders should not punish mistakes (D)	Encouraging creativity	

Table 5.
Data concerning relationship between quality principles and DDI

innovation. The respondents asserted that they had a good relationship with the ADI and participated successfully in the prestigious annual competition Il Compasso D'oro. EC specified "*we cooperate systematically with la Triennale of Milano, a place which hosts exhibitions and events connected to design.*"

Among the creative network are included local *industrial associations*. In recent years, all the companies interviewed have participated actively in an important initiative – "Innovation and Design" – aimed at diffusing the culture of design promoted by local trade associations.

Quality principles

Finally, all the four companies affirmed to adopt the quality principles connected to customer satisfaction and excitement, collaborative leadership and teamwork capacity.

QDA affirms:

Only thanks to the cooperation with designers we can put on the market products that not only satisfy clients, but surprise and excite them.

Similarly, QDC stresses that

Designers are able to innovate in a way that overcome customer needs and desires.

With reference to teamwork, QDD underlines that:

among quality principles the ability to work together with different competences is fundamental for the success of new product development with designers.

In fact, DDI process is based on teamwork capacity, not of designers but of personnel and external actors. Also, another quality principle seems to impact positively on DDI: the collaborative leadership. With this regard, QDB describes very well a common opinion of all the respondents:

a collaborative leadership and a culture of design are the basic skills which may facilitate the DDI in a company.

A proposed model of the DDI process related to the development of new products

Figure 1 shows a model of the design-driven process with the steps, actors and quality principles involved as it has emerged from empirical research. This model is the output of the answers to the research questions and it synthesizes the main findings of this study.

Discussion

This study has explored and deepened the understanding of the phases and actors of DDI NPD and of the relationship between this process and some quality principles to seek answers to the research questions. The data analysed show recognizable similarities to Verganti's frameworks and the cited literature but also propose some additional aspects, enriching the knowledge in the field.

The first research question focused on the phases of NPD related to DDI in the interviewed companies from the home appliances and furniture industry, namely, the company's brief, the designer research, the designer's concept, the design, legal protection, prototyping, production and the market launch. The results confirm that the process of product development within the DDI of the companies examined consists of three macro-phases, namely, listening, interpreting and addressing (Verganti, 2009), and that, in the initial creative phase, known in the literature as the meta-project phase (Dell'Era *et al.*, 2008), the designer conducts wide-ranging and multidisciplinary research.

Key external actors

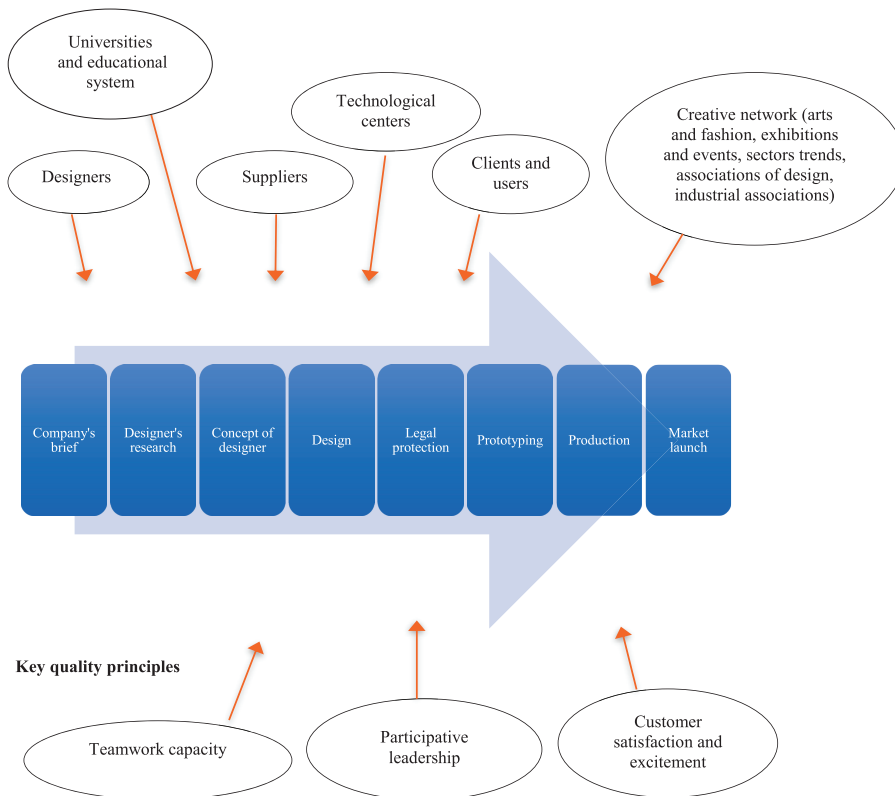


Figure 1. Model of DDI process of Italian companies in the home appliances and furniture industry

This study underlines that the listening to the design discourse is made mainly by designers and that companies do not know how designers conduct their research but are aware that designers are immersed in networks wherein they develop ideas for innovation. Further, companies know that designers conduct a wide and heterogeneous research on the past and future trends of the industry and connected industries, on expressed and unexpressed needs and desires of users, on the history of successful products and on trends in fashion and arts. Thus, this study on the one hand confirms the difficulty in clearly understanding all aspects of DDI (Verganti, 2009; among others), but, on the other hand, it adds knowledge on this initial phase of DDI connected to new product development. This study emphasizes that designer is a sort of a “company intermediary” for external design discourse as he/she has developed important relationships with actors of that wide network to develop ideas. This study also underlines that the work of designers is personal, unique and that he/she develops tacit knowledge difficult to transfer to others.

Further, the DDI phases identified in this study add new knowledge to the field, contributing especially to a deeper understanding of DDI process phases identified in previous studies that are not homogenous (De Bozota, 2008; Acklin, 2010; Design Council, 2017; Aydin and Erkarlsan, 2019). Specifically, this study has pinpointed clear and specific phases of DDI: the company brief, the designer’s research, the designer’s concept, the design, legal protection, prototyping, production and the market launch.

All the companies agreed on the presence of the above eight different phases, although with slight differences: one company does not frequently protect legally its products, and a couple of them do not involve a lot of designers in the market launch phase but leave this option open.

The results of many previous studies stress that the company's brief is the initial phase of the process, while other studies do not explicitly include it (e.g. [Borja De Mozota, 2008](#)). This study confirms that company's brief is the first step of the process. Further, the final phase, the market launch, is never present in the literature. Again, this study sheds light on the process stressing that market launch is the final step of the process. Most of previous studies do not include this phase in the process. Conversely, aspects such as pre-series production and legal protection are covered in the literature. This study provides a detailed explanation of each phase, thanks to in-depth interviews with entrepreneurs and managers.

This is the first study to investigate the home appliances and furniture sector as a whole, a particularly design-intense sector, which has been never examined as macro-sector including all related industries, such as furniture, accessories, kitchens and cookware. In fact, another recent study focused solely on the furniture sector ([Aydin and Erkarlsan, 2019](#)). Like the furniture sector, all the sub-sectors of the home appliances and furniture industry are mature, and technological or functional innovation alone is not sufficient to ensure competitiveness. Companies can innovate by introducing new meanings and languages, together with innovations in technology and function. This study confirms that DDI considers many aspects of the product innovation, including meanings, functionality, aesthetics, performance, materials, and sustainability (e.g. [Verganti, 2003](#); [D'Ippolito, 2014](#)). Therefore, the study reinforces the idea of design-driven innovation as a new way to innovate which is not only complementary to other kinds of innovation (incremental innovations in the examined companies are demand-pull) but may also integrate other kinds of innovation (new design products of the companies examined often include also technological innovation) ([Verganti, 2008](#); [Verganti and Dell'Era, 2014](#)).

It is clear in this study that the driver of innovation neither demand nor technology alone, but new meanings and sense together with improvements of functionality, technology and so forth ([Verganti, 2008, 2009](#)). From the interviews, it emerged clearly that clients and customers may eventually suggest little corrections to products in the final phases of the DDI process, respectively, after prototype and/or pre-series phases. This result provides empirical evidence which is needed in this relatively recent managerial field.

The entrepreneurs and managers interviewed have a great design culture and consider industrial design as a main driving factor of competitiveness. All respondents revealed that they started the process of product development with a company brief, which indicated the scope of the company and the basic idea for the new product that the designers were asked to develop. Therefore, entrepreneurs are interested in and passionate about design. Usually, basic ideas and sensations are formulated by entrepreneurs, and, more rarely, designers spontaneously contact entrepreneurs. This step of the process stresses the importance to develop a strong feeling, understanding and cooperation, especially between entrepreneur and designer in the initial steps of the process in order to develop radical innovations.

The study stresses that the majority of concepts consist of renderings of the new products, and, where products are complex, such as kitchens, designers propose small prototyping, so that production may be anticipated by pre-series production to allow loyal customers to give feedback about the new product. The study found that nearly all products are legally protected.

In answer to the second research question – the role of designers and other actors in the DDI process – this study stresses that designers play a strategic role in the process and conduct personal research (the meta-project phase) in their networks, referred to as *design discourse* by [Verganti \(2009\)](#). As explained above, designers are the key actors in the innovation process who listen to the design discourse and interpret it, proposing new products in cooperation with companies and other actors in a team work, until the launch of

the products on the market (addressing the design discourse). While the previous literature has identified in general terms all the actors of the external network (Verganti, 2009), this study has identified the specific actors that usually participate in the process: designers, suppliers, clients/users, universities and education systems, technological centres and creative networks. Further, this study examined their roles more in depth, contributing to fill a gap in the literature (De Goey *et al.*, 2019). While it is intuitive that designers cooperate successfully in the process, this study has stressed the importance of other actors, for example, suppliers cooperate with designers and companies, and sometimes even anticipate them in the innovation of components. Additionally, technological centres are fundamental for testing products as the majority of companies cannot conduct many product tests internally.

As explained above, also clients and customers may provide suggestions in the final phases of the process, but only in terms of eventual little innovations to improve the success of the products.

However, important roles are also played by universities and industrial associations. A special actor of the external environment is the “creative network”, which, in the home appliances and furniture sector examined, is represented by actors in relationships with designers and/or companies, art and fashion, exhibitions and events, other related sectors, design associations and industrial associations. All these actors participate in specific steps of the process and cooperate with companies and designers in a team work, who lead the process.

It is important to underline that this study tries to formalize the DDI product development process of the home appliances and furniture sector with the intention not to “simplify” the process or to consider it a linear one, as it is complex and iterative; the aim of this contribution is to understand in more depth the macro-phases and to identify the eventual similarities between companies in the same macro-sector.

Therefore, this study takes the cognitive approach of innovation studies and confirms that innovation is open innovation (e.g. Chesbrough, 2003, 2006), as many actors co-produce the product bringing different sources of knowledge to its creation (Laursen and Salter, 2006; Mina *et al.*, 2014).

In answering the third research question, according to what was found from the literature, all the four companies adopt the quality principles connected to customer satisfaction/excitement, collaborative leadership and teamwork capacity. In particular, the research aimed to investigate eventual relationships among DDI and some important quality principles. From this point of view, we can confirm what is already known from the literature, specifically the adoption of principles like customer satisfaction/excitement, collaborative leadership and teamwork capacity could facilitate DDI product innovation. Hence, this study reinforces those contributions in the literature which stress a positive influence of quality on innovation (Singh and Smith, 2004). According to the respondents, the three principles of quality positively affect the DDI process connected to new product development, and therefore the relative performance or outputs. While previous study analyses the relationship between quality and innovation in general, this study focuses on specific quality principles and DDI in a high design-intensive industry.

Hence, despite the increasing number of scientific studies in this area, to the authors’ knowledge, no qualitative studies have proposed a model including various phases to analyse the DDI process connected to new product development, the role of designers and collaborators and how it relates to quality.

Conclusions

Despite the theoretical ferment with regard to design management in recent years, the related empirical research is still in its infancy. This study has contributed to increasing the

theoretical research and empirical evidence in the management literature by investigating the phases of and actors in NPD within DDI by examining the home appliances and furniture industry, one of the most design-intensive sectors. This paper aimed to address gaps in the literature by identifying the phases of DDI and the actors involved with designers in the Italian home appliances and furniture sector context. The main findings of this study that contribute to the research area are as follows: (1) the phases of DDI: the company brief, the designer's research, the designer's concept, the design, legal protection, prototyping, production and the market launch; (2) the actors involved in such a process: designers, suppliers, clients/users, universities and education systems, technological centres and creative networks; (3) collaborative design: while designers are strongly involved in all phases of the process, other actors are involved in single phases; and (4) some quality principles could affect positively the DDI process: customer satisfaction/excitement, collaborative leadership and teamwork capacity.

This study reveals several theoretical implications. First, it adds new knowledge to the still unexplored DDI process in the managerial literature by identifying and analysing in detail the phases of such a complex process. This exploratory study suggests a model of clear and distinctive phases, building on empirical research through a sample of companies from the home appliances and furniture sector, a very design-intensive sector, which includes the furniture sector and related industries, such as accessories, kitchens and cookware. Few previous studies have explored these phases (Verganti, 2008; de Mozota, 2008; Conti, 2018; Aydin and Erkarlsan, 2019); one suggested three macro-phases and stressed that it is difficult to formalize such a process.

With respect to the above research, this study specifies the steps, starting from the brief of the company, which is not present in all studies, and ending with the market launch; this final phase is not included in previous studies but is very important, as designers should participate in all the phases.

It is quite intuitive that designers have to be part of a team to work under better conditions but that they also need to have the freedom to suggest radical innovations. While confirming that the process is complex and iterative, this study is new and original with respect to the previous contributions, as it offers an original model of the phases of the DDI process and of the actors involved in it through an empirical analysis of the home appliances and furniture sector. All these industries are design-intensive industries, connected to living in the house, and have never been studied together. In this study, we found that the companies in these sectors use the same designers and have similar phases for new product innovation. Few previous studies have analysed the sector in detail. Hence, this study has addressed deficiencies in the existing research.

Third, this study has explored the role of designers and other actors, which is an underinvestigated aspect of DDI process. Beginning with Verganti's (2009) proposed networks of actors in the sociocultural context called *design discourse*, we add knowledge to this generic scheme by identifying the specific actors involved in the DDIs of the companies in our sample in the home appliances and furniture sector, and explain how these actors participate in the product development. From this study, it is clear that clients and customers among external actors may eventually provide little corrections to products, thus confirming that design is the driving force behind this peculiar nature of innovation, that is, DDI.

Further, these results have many managerial implications. This study suggests to entrepreneurs and managers how to successfully manage new DDI product development and how to relate to designers and other interpreters. Some preliminary managerial implications of this study include:

- (1) Entrepreneurs and top management should provide guidelines and constraints to designers to allow them to create freely and to radically innovate; management

should include designers in the personnel of the company, developing a “warm” relationship with them.

- (2) It is also strategic to allow designers to participate in all phases of the new product innovation process, until the launch on the market.
- (3) The relationship with other actors or interpreters who cooperate in the DDI process should be carefully developed and managed, as other actors also play a strategic role in innovation.
- (4) It is important for companies to develop relationships with external creative networks (such as associations of entrepreneurs, design associations and technological centres) even though they may access these areas through designers who are immersed in such external creative networks.
- (5) Entrepreneurs and top management should carefully select designers and other interpreters; thus, it is important to develop a culture of design.
- (6) It is important to manage and adequately incentivize designers and interpreters and to collect feedback from them.
- (7) Quality principles such as customer satisfaction/excitement, participative leadership and teamwork should be encouraged as they may have a positive influence on DDI.

As DDI is strategic for firms and countries, it is crucial for governments to both incentivize this kind of innovation and promote the match of demand with the supply of creativity skills. Local government and associations of entrepreneurs, together with universities and technological centres, should also cooperate to reinforce the culture of design and promote initiatives connected to design, which is a strategic asset of competitiveness and innovation. A better understanding of DDI process and a wider diffusion of this kind of innovation in manufacturing companies have also practical implications for societies. In fact, beautiful and useful design products may contribute to improve the quality of life and social conditions of consumers.

The limitations of this study include its exploratory nature and the small sample of the Italian companies analysed. Further, interviews were conducted only with entrepreneurs, while investigation with other stakeholders is important for better understanding the phenomena.

Agenda for further research

Future research on this topic is recommended. There is a need to better understand the DDI process through qualitative research conducted in different industries and in different countries through the use of the case study method, in-depth interviews and direct observation. In this research, only entrepreneurs and managers were interviewed, but it is crucial to investigate the opinions of designers and all interpreters (e.g. suppliers, technological centres, customers) who cooperate in the innovation process, and also of local government, associations of entrepreneurs, design associations, artists and other relevant parties. Further, longitudinal studies are highly recommended to understand how the relationships between companies and designers and companies and interpreters evolve over time.

Although the empirical research on design is more advanced, there remains a need to investigate the impact of designers and external interpreters on the kind of innovation undertaken and on the business performance. Future research should also analyse whether designer profiles (e.g. gender, age of designer, nationality) affect the output of DDI or business performance.

Last but not least in terms of relevance, we reckon that the relationships between quality principles and design innovation should be better studied, both in terms of managerial aspects and practices.

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