# Chapter 4
# A design-driven approach for the innovation management within networked enterprises

Emilio Bellini, Claudio Dell' Era, and Roberto Verganti

**Abstract** The intensification of the international competition and the necessity to compete in a global context push companies to introduce new organizational forms; the continuous evolutions of the contexts both in terms of market demand and available technologies, the progressive reduction of the time-to-market, the necessity to personalize the offering according to the expectations of the single customer favour the development of new organizational paradigms such as the "networked enterprise". Supply-chain organization constituted by clients and suppliers has to consider also a series of actors with very different competences and specializations. If the concept of innovation is interpreted as the output of a new recombination of existing factors, nets of companies appear proper and coherent with the development activities. In many industries the access to tacit and distribute knowledge constitutes one of the principal critical success factor: for example, in the textile industry, the interaction with actors such as research centre, designer, design services, etc. allows to access and to interpret the diffused knowledge along the entire development chain. In this kind of scenario the ICTs cover a critical role. The identification of a model able to describe potential interrelations and synergies between ICTs and organizational structures has to consider a double aspect: (i)On the one hand the diffusion of new organizational models based on the networked enterprise constitutes a continuous stimulus for the creation of new technologies able to improve the effectiveness and the efficiency of the knowledge flows; (ii)On the other hand the availability of new information technologies offers the opportunity to create new organizational models. The increasing presence of international com-

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petition as well as the importance of socio-cultural and contextual settings are transforming the future of industrial and social scenarios. The increasing pressures of international competition are challenging companies that find themselves unable to reach international sources of supply of components and knowledge, as well as unable to offer their products and services worldwide. Moreover, historical, social, demographic and industrial factors are also forcing companies to develop a system of offerings that merge profitability with social and cultural values. Couple these factors with an ever-increasing standard of living means that the development of products and industrial processes in order to survive must not only be profitable for the manufacturers, but also socially constructive. For this reason companies must develop the knowledge and new product development processes that can support them in designing and developing socially, culturally and physically constructive products. The obstacles that obstruct the development of this kind of products are related to two fundamental capabilities: the capability to develop new technologies, and the capability to understand and design new lifestyles. While several methods exist that support companies in understanding the needs from a technically functional basis (such as Quality Functional Deployment) or in managing the explicit knowledge of organisations (Knowledge Management Systems), a methodology for the identification, capturing and interpretation of value intensive information related to socio-cultural trends and latent needs is less formalized.

## 4.1 Introduction

The intensification of the international competition and the necessity to compete in a global context push companies to introduce new organizational forms; the continuous evolutions of the contexts both in terms of market demand and available technologies, the progressive reduction of the time-to-market, the necessity to personalize the offering according to the expectations of the single customer favour the development of new organizational paradigms such as the "networked enterprise". Supply-chain organization constituted by clients and suppliers has to consider also a series of actors with very different competences and specializations. If the concept of innovation is interpreted as the output of a new recombination of existing factors, nets of companies appear proper and coherent with the development activities. In many industries the access to tacit and distribute knowledge constitutes one of the principal critical success factor: for example, in the textile industry, the interaction with actors such as research centre, designer, design services, etc. allows to access and to interpret the diffused knowledge along the entire development chain.

In this kind of scenario the ICTs cover a critical role. The identification of a model able to describe potential interrelations and synergies between ICTs and organizational structures has to consider a double aspect:

- On the one hand the diffusion of new organizational models based on the networked enterprise constitutes a continuous stimulus for the creation of new technologies able to improve the effectiveness and the efficiency of the knowledge flows;
- On the other hand the availability of new information technologies offers the opportunity to create new organizational models.

New ICTs introduction has not be analyzed only in terms of intra and inter organizational interchanges of information and knowledge, but also in terms of comprehension of the interactions with the market: for example, in the textile industry, the use of RFID technologies in the shops allows to develop dataset of customers behaviours and consequently, by datamining techniques, it allows to identify recurrent couplings of some items.

Collaboration is a word too much used to label all kinds of web applications. Technology is often identified as the driving force when speaking in general of Internet's potential to enable business-to-business transactions. In reality, collaboration is not an add-on to the information technology architecture of a firm, putting a new face on traditional buyer/seller relations. It is a synergistic approach to handle evolving business processes, driven by important changes in the economic scenario:

- *Global competition*, favoured by the free movement of capital and information. Companies must measure their growth in a continually changing international market. Competition is no longer between individual companies, but between entire supply chains or supply networks.
- *Speed and flexibility*, necessary to ensure adequate service levels to ever more demanding customers. This means re-thinking, or extending, the integrated corporate model which characterised the 80's and 90's. The downstream demand (customers, distributors) needs to be linked to the upstream suppliers in a single flow that goes from forecasting, to purchase and production planning, to order fulfilment.
- *Virtualisation of business*, imposed by the need to reduce costs and concentrate on key competences. Companies ever more tend to focus on a few high added value processes (finance, research, strategic marketing), while delegating those activities affected by economies of scale (logistics, non-strategic production, distribution) to external partners.

By effect of these changes, processes traditionally carried out within the enterprise "four walls" acquire a broader scope, calling for direct involvement of key customers and suppliers. The ultimate goal is to move from linear supply chains, where communication is limited to buyer/supplier links, to supply networks where each node visibility extends as far as it benefits the overall network performance.

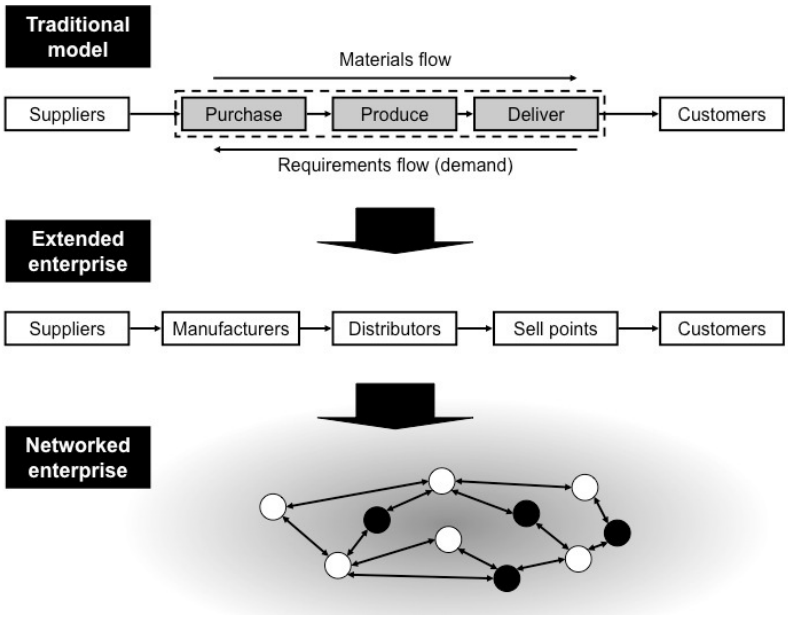



**Fig. 4.1** From traditional model to networked enterprise

*Collaborative-commerce is a framework on which to build deep, rich, mutually beneficial relationships with multiple stakeholders. Stakeholders can be inside the organization as well as trading partners.* (Gartner Group)

According to the leading analysts and experts of business processes, the following phenomena will characterize the near future:

- A decrease in traditionally managed relationships (purchase order);
- A wider use of "open sourcing" via Internet;
- An ever-increasing use of "collaborative"-type relationships.

What defines a collaborative relationship often collides with common enterprise practice: collaboration main benefit is visibility into the customer/supplier/competitor data and strategies. This can be the key to higher supply chain performance:

- *Visibility in the development chain* allows to share several inputs for the new product development process;
- *Visibility in the production chain* allows real-time propagation of requirements and engineering changes, as well as the optimisation of materials and capacity throughout the whole chain;
- *Visibility in the distribution chain* is a fundamental prerequisite for the most advanced replenishment techniques: from vendor-managed inventory (VMI) to collaborative forecasting.

At the same time, visibility can hardly be extended to any business counterpart. In the end it is necessary to devise a collaboration strategy for long-term relationships where mutual benefit is evident and trust motivated. Other relations will be handled by a conventional buyer/seller approach, with several shades of collaboration between these two extremes. Despite acknowledging the benefits, the development of collaborative-type relationships is still fraught with obstacles that prevent the concept spreading even among innovative companies. The barriers that are found on the field may be grouped into two categories:

- *Cultural barriers*, deriving from practices which have become ingrained, such as:
  - Difficult relations with suppliers, to whom internal inefficiencies and costs are often transferred;
  - Resistance to the sharing of planning data;
  - Planning only within the four walls of the division or factory.
- Organisational and technological barriers, specifically:
  - "Waterfall" processes, inflexible and excessively formal;
  - Independent and disconnected, yet irreplaceable, information systems over the various parts of the chain.

## 4.2 R&D Organization: an historical analysis

In this paragraph we analyze the state of the art of the literature about R&D organisation in order to identify main trends. R&D includes a series of activities that have changed many times in the last 50 years in terms of management styles and organisation: first of all it is possible to affirm that they passed from an exclusively technology push model to a progressive integration with a market pull approach ( [49]).

In literature five principal R&D generations are described ( [56, 55, 46, 11, 49]).

The first generation is characterized by the low level of interaction with the rest of the company and strong focalization on future technologies; in this sense it is possible to affirm that the management style corresponds to the technology push paradigm ( [49]) and the R&D unit acts as a sort of ivory tower where employees do not have any interactions with other business functions. In the '50s the R&D units were centralized at the corporate level and for this reason they had great autonomy and possibility to identify the research fields more interesting. Corporate research labs had to flourish technological innovations and to stimulate scientific advances.

The second generation saw to prevail market pull approach, characterized by an increasing importance of the Marketing function in the innovation pro-

| R&D Generations | Context | Process Characteristics | Company Response | Managerial Approaches |
|---|---|---|---|---|
| First generation | Black hole demand (1950 to mid- 1960s) | R&D as ivory tower, technology-push oriented, seen as an overhead cost, having little or no interaction with the rest of the company or overall strategy. Focus on scientific breakthroughs. | Corporate research labs | -Stimulating scientific advances<br><br>-Choosing location after competencies |
| Second generation | Market shares battle (mid-1960s to early 1970s) | R&D as business, market-pull oriented, and strategy-driven from the business side, all under the umbrella of project management and the internal customer concept. | Business unit development | -Appointing internal customers<br>- Ideas gathered from market |
| Third generation | Rationalization efforts (mid-1970s to mid-1980s) | R&D as portfolio, moving away from individual projects view, and with linkages to both business and corporate strategies. Risk-reward and similar methods guide the overall investments. | R&D projects | - Structuring R&D processes<br>- Evaluating long-term technology strategies<br>-Integrating R&D and marketing |
| Fourth generation | Time-based struggle (early 1980s to mid-1990s) | R&D as integrative activity, learning from and with customers, moving away from a product focus to a total concept focus, where activities are conducted in parallel by cross-funcional terms | Cross-functional projects | - Parallelizing activities<br>-Involving suppliers and lead customers<br>- Integrating R&D and manufacturing |
| Fifth generation | Systems integration (mid- 1990s onward) | R&D as network, focusing on collaboration within a wider system -involving competitors, suppliers, distributors, etc. The ability to control product development speed is imperativem separating R from D. | Cross-boundary alliances | - Involving company network<br>-Focusing integration<br>- of systems<br>-Separating/linking R and D. |

**Table 4.1** Description of five generations of R&D processes (developed and adapted from [56, 55, 46, 11, 49])

cess ( [49]). This historical period (mid-1960s to early 1970s) was characterized by the necessity to increase the market shares ( [55]) and the main goal was not to propose a new technological standard, but to obtain maximum margins in the short period. For this reason R&D units were incorporated into single business units and turned their attention to the customers' needs, consequently the Marketing function assumed the integration role between several business functions.

In the '70s the interpretation of technology push and market pull paradigms shifted from alternative solutions to complementary ones. Two approaches can be applied in a synergic way giving life to a more interactive research and development paradigm rather than linear as in the first generations. In this historical period, R&D units were characterized by a strong resource rationalization, that brought to the adoption of portfolio logics in the project activation. The main objective consisted on the development of a balanced portfolio of R&D projects in terms of risk and temporal horizon of investments. For this reason, this R&D generation favoured a great diffusion of project management techniques with the purpose to get all consequential advantages to operate for projects. At the same time it was also possible

to assist to a progressive integration among R&D and Marketing, shifting from a sequential collaboration to a parallel and cyclical interaction in order to anticipate in the first stages of the innovation process all possible constraints.

The fourth generation considered the R&D as an activity of integration between client and enterprise, it introduced the concept of lead user and foresaw the early involvement of suppliers in the innovation process in order to compare different perspectives and consequently to increase the cross-functionality; the fourth generation emphasized the role of feed-backs and the point that innovation is by definition cross-functional. In the '80s, the economic context was characterized by the introduction of new functionalities and new services associated to the existing products as a new kind of differentiation. For example great Japanese companies such as Toyota, Sony and Honda introduced some products in the European and America markets with a series of additional services never proposed by competitors ( [55]).

The fifth generation of R&D proposed to manage the innovation process as a network, in which all those people that could bring useful know-how had to participate: suppliers, clients, distributors and even competitor. The role of teams shifted from cross-functional and cross-disciplinary to cross-firms; the necessity to share the huge technological investments and to divide the research from the development, with consequent increase of costs and resources, spontaneously suggested to cooperate with other subjects.

In literature it is possible to identify several contributions about this kind of phenomenon: Allen ( [2]) spoke about collective invention, Morrison et al. ( [48]) deepened the role of lead user in the Information Technology industry, [28] analysed the knowledge dynamics in the case of open source software and Von Hippel ( [72]) proposed the concept of open innovation. An example of this type of collaboration could be identified between Toyota and PSA Group that has brought in 2004 to the development of a new city car: Toyota Aygo, Peugeot 1007 and Citroen C1 are three cars that directly compete on the market and share a common research base.

Finally, the fifth generation of R&D foresaw the separation between research and development: they were considered completely different, the first one totally devoted to the exploration of new technological solutions and the second one with a strong engineering component (Kodama, 1995). This separation allowed to use two different organizational models, with the purpose to leave the maximum freedom to the researchers and to formalize the development process.

## 4.3 Innovation and networked enterprise

The increasing presence of international competition as well as the importance of socio-cultural and contextual settings are transforming the future

of industrial and social scenarios. The increasing pressures of international competition are challenging companies that find themselves unable to reach international sources of supply of components and knowledge, as well as unable to offer their products and services worldwide.

Moreover, historical, social, demographic and industrial factors are also forcing companies to develop a system of offerings that merge profitability with social and cultural values. Couple these factors with an ever-increasing standard of living means that the development of products and industrial processes in order to survive must not only be profitable for the manufacturers, but also socially constructive. For this reason companies must develop the knowledge and new product development processes that can support them in designing and developing socially, culturally and physically constructive products.

The obstacles that obstruct the development of this kind of products are related to two fundamental capabilities: the capability to develop new technologies, and the capability to understand and design new lifestyles. While several methods exist that support companies in understanding the needs from a technically functional basis (such as Quality Functional Deployment) or in managing the explicit knowledge of organisations (Knowledge Management Systems), a methodology for the identification, capturing and interpretation of value intensive information related to socio-cultural trends and latent needs is less formalized.

Analysing the Italian lighting industry, [67] observe that companies developing design-driven innovations have to be able to furnish the necessary flexibility, opening and dynamism. The project resources involved in the innovation process have to be organized so that to favour the creativeness and the possibility of exploration and recombination. It is not possible to think that a design firm possesses or wants to develop internally all competences necessary to innovate; rather, the project resources have to be select outside.

There are many studies about Italian districts ( [8, 39, 42, 60]), but they evidence the same weakness: the industrial districts find great difficulties to face radical changes because the local nature of the relationships limits the possibility to introduce innovations produced out of the system.

The amplification and the extension of the relationships out of the system are possible solutions to these limits; the concept of "milieu innovateur" introduced by Camagni ( [7]) can guarantee a greater ability of innovation. Also the dynamic nets ( [45]) or the innovative nets ( [53]) are based on the critical role of some firms that, despite being strongly connected to the local productive system, extend their collaboration to external enterprises and act as intermediary of the knowledge transmission.

Cagliano et al. ( [6]) analyse differences and similarities in managing technological collaborations in research, development and manufacturing: more in detail for each phase of the innovation process they identify some characteristics of the t echnological collaborations (content, motivations, typology of partners) and corresponding organizational forms (number of partners,

contractual formalization, structure of control, time horizon, density of relationship).

Iansiti and Levien ( [29]) introduce the concept of "business ecosystem" and sustain that drawing the precise boundaries of an ecosystem is impossible, but stand-alone strategies cannot work when the company's success depends on the collective health of the organizations that influence the creation of the product.

Other researches identify some relationships between organizational variables (internal competences, access to networks of innovators, etc.) and innovativeness of the company ( [4, 21, 61]).

## 4.4 Strategies of innovation

Models and classifications traditionally proposed in the innovation management literature focus mainly on technological innovations, but interpreting the new product development as a process of generation and integration of knowledge, the literature identifies two principal sources: the knowledge about the availability of new technologies and the knowledge about explicit customers' needs.

Starting from this basic reflection, Dosi ( [16]) analyzes two antithetic approaches to innovation: market-pull and technology-push. On the one hand, the market-pull approach is primarily characterized by the dominant role that the comprehension of market needs plays over the introduction of new technologies. Consequently, in this particular approach, the main source of innovation is the market and the new product development is a direct consequence to explicit needs manifested by the consumers. However, the primary assumption of this approach is that user needs are explicit elements that can be identified, captured and translated in new products able to satisfy the consumer needs ( [62, 59, 64, 9]).

On the other hand, the technology-push approach looks at the innovation process from a completely different perspective; in fact, this approach does not believe in a process driven by the market. Instead, it believes that the source of innovation stems from the research and development activities of the company that, through the identification and development of new technologies, allow to realize new products. If in the market-pull approach the central role is covered by the market and the consumer, in the technology-push approach it is given to the company and the development of new technologies that subsequently drive the company's innovation processes ( [1, 27, 13]).

In more recent literature, a third approach to innovation allows to enrich the possible innovation approaches that a company can adopt. This approach focuses on the importance of design in innovation and can be defined as the design-push approach. Verganti ( [66, 68]) describes this approach as com-

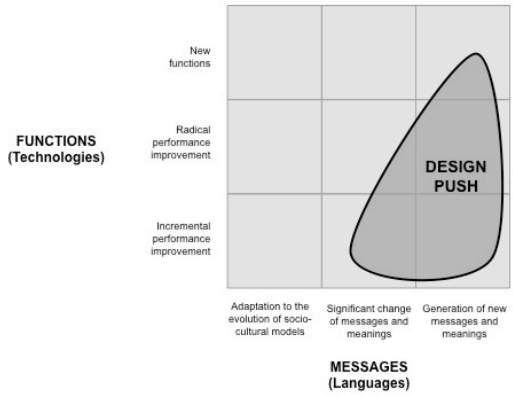



**Fig. 4.2** Design-push approach to innovation (adapted from [66])

plementary to the previously described market-pull and technology-push approaches. In fact, he emphasizes that it may require the development of new technologies or the satisfaction of explicit market needs. In this approach, it is the semantic dimension that drives the innovation process rather than the market or the technology.

More in detail, Verganti ( [66, 68]) proposes a third source of knowledge to add the knowledge about user needs and the knowledge about technological opportunities: the knowledge about product languages "is the knowledge about the signs that can be used to deliver a message to the user and about the socio-cultural context in which the user will give meaning to those signs" (see Figure 4.2).

In all approaches to innovation three types of knowledge (knowledge about user needs, knowledge about technological opportunities, knowledge about product languages) are present, but their relative importance is different: in the case of design-push strategy the driver of innovation, the starting point, is not the technology or the customer needs, but is the capability to understand, anticipate and influence the emergence of new product meanings. Verganti defines the radical design driven innovation as "an innovation where novelty of message and design language is significant and prevalent compared to novelty of functionality and technology" (see Figure 4.3).

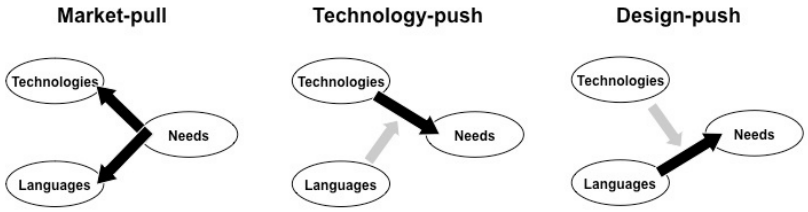



**Fig. 4.3** Knowledge drivers in a different approaches to innovation ( [66])

It becomes evident the relationship that exists between the technology-push and design-push approaches: whereas in the technology-pushed approach the driver is the development of new technologies, in the design-push approach the driver is the meaning or semantics of the resulting product, but product languages and messages can be modified acting on the technologies.

Plastic pieces of furniture developed by Kartell in the sixties can be considered meaningful examples: Castelli, founder and past president of Kartell, gave a new sense of modernity to furniture products through the use of plastic materials. The adoption of the plastic was reinterpreted to the point that it assumed the meaning of ”noble” material, breaking the dominant cultural models that foresaw the diffusion of other materials such as wood, steel, marble and glass in the furniture industry.

For what concerns the relationship between the market-pull and design-push approaches, it lies mainly in the fact that a consumer can manifest explicit needs from a semantic perspective only when the innovation is incremental. A radical design driven innovation however drives towards the development of new meanings that change the socio-cultural context. Consequently, as long as the degree of innovation is incremental, the two approaches can coincide and operate complementarily. This, however, cannot be the case when the degree of innovation tends towards radical since the market and/or consumer is not able to manifest coherent needs that can stimulate the company in developing new product meanings that break with the past. More in detail it is presumable that the role of market factors in the design-push approach changes according to the level of novelty of product meanings.

Market drivers become remarkable in the case of incremental innovation of product meanings, where, in other words, incremental adaptations of product meanings are determined by the continuous and natural evolution of explicit cultural models adopted by the customers. On the opposite, market factors lose importance in the case of radical innovation of product meanings, where innovations originate from a cultural scenario developed through the collaboration between companies and designers. In other words

radical innovations of product meanings require the comprehension of possible or latent social dynamics that can influence consumers lifestyles and behaviours. The above considerations can be summarized in the following two propositions (see Figure 4.4):

- The market becomes less capable to propose semantic innovations the more radical the change in meaning. Consequently, the more radical the design driven innovation, the less it can be generated by a market-pull approach;
- The more the technology represents a mean to generate a change in meaning, the more the technology-push approach to innovations can be considered design driven.

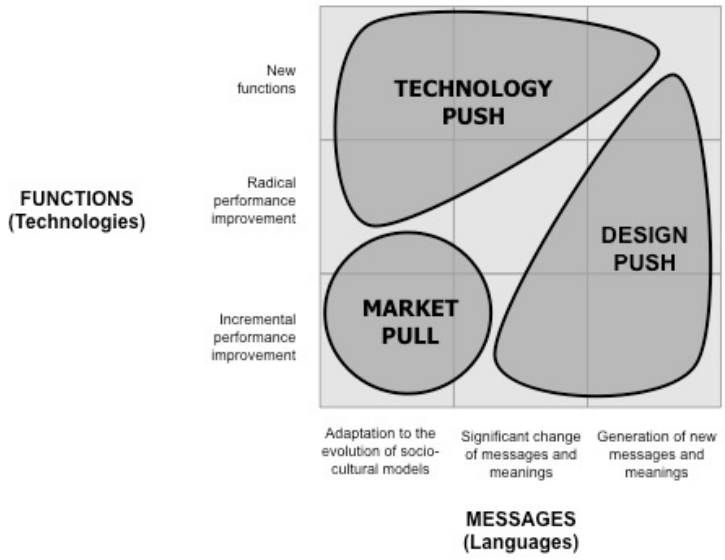



**Fig. 4.4** Mapping different Approaches to innovation (adaptated from [66])

In order to adopt the design-push approach it is necessary to develop a particular sensibility towards the evolution of socio-cultural contexts; it is indispensable to recognize "weak" signals that will be fundamental characteristics of the future scenarios.

A correct management of radical design driven innovation allows companies to interpret new lifestyles and subsequently to propose a coherent system of values to the market. The considerations mentioned above evidence the necessity to access to a series of stakeholders connected one each

other in order to comprehend the evolution of socio-cultural contexts and then to introduce radical design driven innovations.

The following paragraphs describe in detail two approaches to innovation: the user centered design is based on the market-pull approach, while the design driven innovation starts from the frameworks associated to the design-push approach.

## 4.5 User centered design

A specific approach to design, usually referred to as "user centered design", is the basic topic of several recent researches ( [9]). The success of major design firms such as IDEO (Kelley, 2001) or Continuum (Lojacono and Zaccai, 2004) underlines the potentialities of the user centered design approach; it foresees that product development should start from a deep analysis of user needs. The basic assumption is that a company can successfully innovate by asking users about their needs or, more effectively, by observing them as they use existing products and by tracking their behaviour in consumption processes.

This kind of approach abandons the classic and common interpretation of design as style and provides a deeper and more valuable interpretation of design as an organizational process. For this reason in the recent literature it is possible to find several contributions about tools and models that support the application of user centred design approach (Patnaik and Becker, 1999; Kumar and Whitney, 2003; Rosenthal and Capper, 2006; Sutton, 2001).

Some theoretical references related to the classification of the needs are particularly useful before describing the methodologies mostly used in the analysis of the users' needs. The basic classification of needs in explicit and latent depends on the degree in which they are clear and evident to the subject. Obviously the more needs are explicit, the more it is easy to satisfy such needs, while it could be particularly arduous to understand and satisfy the i rrational feelings that cannot be explicit.

Maslow's theory (1974) classifies human needs according to a hierarchical structure that goes from the most urgent to the less pressing (see Figure 4.5).

The classification proposed by Maslow describes a broad range of needs: from primary needs, to the safety desire, to the needs linked to the affective-sentimental sphere up to those of respect and self-realization. According to the structure proposed by Maslow, product attribute assume different importance and consequently a company can design them in a precise way: at the lowest levels, the set of functional characteristics respond to the hygienic and safety regulations, while, rising in the structure, the needs gradually move towards the semantic, symbolic and cultural dimensions: sense of affiliation, love, status, style, recognition, etc. In this sense design plays an important role in the development of basic and crucial product aspects that

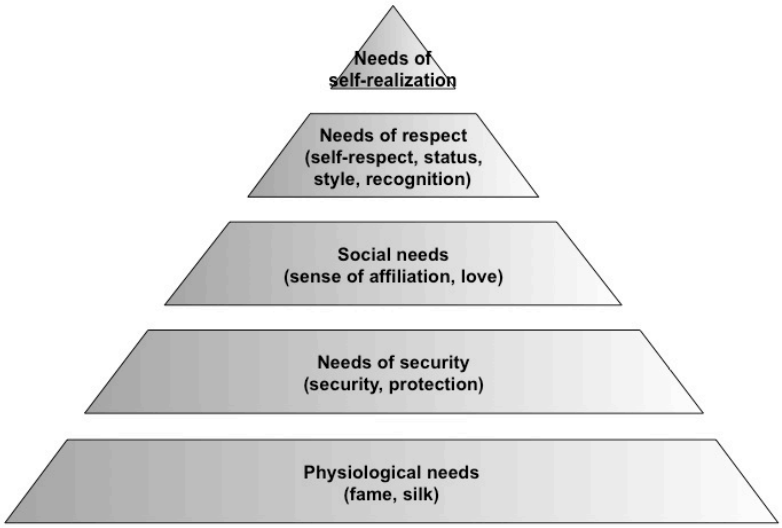



**Fig. 4.5** Hierarchy's needs (Maslow, 1974)

allow to s atisfy needs and desires connected with the last three levels of the pyramid.

Despite the classification provided by Maslow is particularly interesting and stimulating, it does not consider the role played by the context of use. For this reason recent literature about new product development process tries to better describe the interconnections between users' needs and context of use going from the "design for users" paradigm to the "design with users" one (Sanders [57]).

During the first years of the 1980s many designers used to collaborate with sociologists and anthropologists in the process of user needs analysis, but this kind of approach showed very soon several limits: it didn't gather many aspects connected to the emotions, to the memories of the consumer, to his actual and ideal experiences. With this intention in mind, it was necessary to introduce the philosophy of triangulation that analyzes the three following different degrees of knowledge about the consumer (Sawhney et al., 2003): What people say, What people do, What people make (see Figure 4.6).

Explicit needs can be identified by listening what the customer; at the same time, it is necessary to consider that customer reveals only what he wants, and consequently he determines the direction of development of the analysis. To analyze what the customer does and uses can be insufficient




**Fig. 4.6** The phylosophy of triangulation

because it underlines only the observable needs skipping an unexplored area connected to what the customer knows, feels and dreams (Sanders).

The investigation related to knowledge and convictions of the customer provides to the researcher some indications about perception of the reality and different experiences of the customer; moreover the comprehension of feelings and sentiments can allow to increase the empathy with the analyzed subject, underlining the tacit knowledge (Polanyi, 1983). What the customer dreams, exemplifies how he/she would like the future to be. However, to gather such information it is necessary to actively involve the studied subject in the development process in order to observe the kind of solutions that he/she proposes without knowing the need from which they originate. For example the paradigm of the Experience Design focuses on the creation of an experience for the customer: the emotional aspect of the interaction with the product become the fulcrum of the entire project (Figure 4.7).

It is possible to observe that the analyses traditionally effected by the marketing are directed to the identification of the explicit needs (what people say), while the observation on the contexts of use, typical of the designers, are more directed to identify what the customers do with the products (what people do and what people make). Anthropologists mainly develop analyses about the category what people make using tools such as the collage ( [57]),

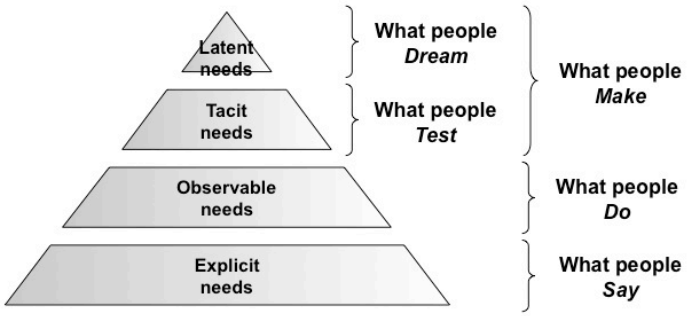



**Fig. 4.7** Typologies of needs

the narration (Lerdhal, 2002), the construction of metaphors ZMET (Zaltman, 1997)

The three categories of needs can be also reinterpreted according to the temporal horizon : what people do underlines the actual situation; what people say reveals the past and the immediate future; what people make stimulates the researcher to investigate in the remote past (memory) and in the most distant future (dreams).

The category of needs that a company wants to analyze has obviously also an impact on the more appropriate technique of investigations to apply. In the research field a first distinction consists in qualitative and quantitative investigations; having said this, it must be clear that we are dealing with a binary variable in which the analysis can either be quantitative or qualitative, in reality we have to manage a continuum of methods that range from purely quantitative analyses to purely qualitative ones.

The quantitative investigation uses formalized systems of data collection; its more typical tool is the questionnaire with multiple-choice answers, it allows to implement statistical analysis. It is typically very useful for the detailed verification of well-circumscribed hypothesis (eventually consequential from a first qualitative investigation).

Instead the qualitative research uses tools that don't present a rigid formalization; the most typical and common tool is the free interview. This kind

of analysis is very detailed, and it allows to examine also variables initially not anticipated. The qualitative investigation foresees a strong interaction between the researcher and the observed subject.

Naturally the given definitions are very general and they do not refer specifically to methodologies developed for investigating the needs. Market investigations (from the analysis of the sales of a product, to the investigation of the percentage of stock-out, from the observation of the unsold up to benchmark with the direct competitors) and questionnaires to be submitted to statistic revision can be considered quantitative investigations.

Instead, the qualitative researches go from the focus-groups, to the analysis of the lead-users, from the ethnographic to socio-cultural researches. As shown in Figure 4.8, moving from the left side to the right one the capability to interpret the influence of context of use on user needs and his/her active role increase.

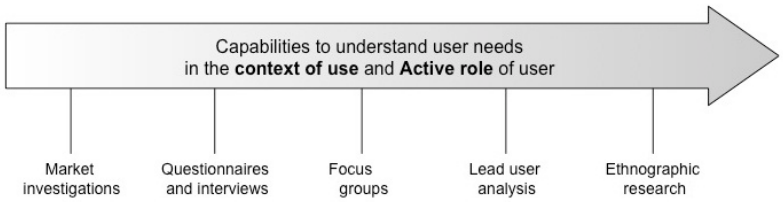



**Fig. 4.8** Methodologies of user needs analysis

## 4.6 Design driven innovation

The interpretation of the meaning that a customer will give to the product is essential in the field of design driven innovation; it cannot be unilaterally imposed by the company or the designer because the interpretation depends on the cognitive schemes of the customer and socio-cultural context in which he lives.

The meaning attributed to a product descends from its languages and the customer's interpretation filtered through individual, social and cultural models. In the case of design driven innovation it is necessary to develop a great capability to interpret the social groups in which the user lives because the contextual cultural factors have a strong influence; the culture has to be considered as one of the fundamental factors in the identification of the

perceived needs (Kotler and Scott, 1999). Kotler and Scott (1999) propose a model that supports the analysis of the factors influencing consumer needs (Figure 4.9).

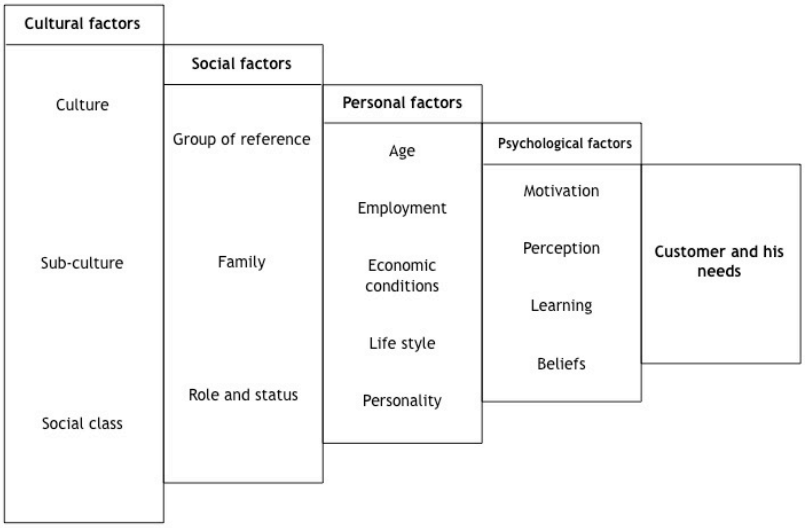



**Fig. 4.9** Influencing factors

The investigation of a target market needs requires to analyze the characteristics of the group that individuals belong and the socio-cultural models that can influence determined personal and psychological aspects. Literature states that a individual's buying choices are influenced by four major psychological factors: motivation, perception, learning and beliefs. Several psychologists have developed numerous theories of human motivation. However, given that the scope of this chapter is not related to the psychology of motivation, it focuses on social and cultural factors.

Every person presents some peculiarities: from the age to the employment, from the economic condition to the lifestyle, etc. The term personality represents the set of characteristics that distinguish the individual and bring him to answer in coherent and constant way to the environment; in this field it is possible to introduce concepts like self-realization, dominance, autonomy, ability to socialize. A consumer's behaviour is influenced by such social factors as reference groups, family and roles and status.

A person's reference group consists in all the groups that have a direct or indirect influence on a person's attitudes or behaviour. Groups having

a direct influence on a person are called membership groups (e.g. family, friends, neighbourhoods, co-workers etc.), whereas groups having an indirect influence on a person are called aspiration groups. Groups to which a person aspires to belong (i.e. a teen-ager may hope one day become a football player for the F.C. Juventus). Consequently, marketers must try to identify their consumers' reference groups and their attitudes towards the product that they are trying to sell in order to understand how reference groups can influence brand and/or product choice.

Manufacturers of products and brands where group influence is strong must determine how to reach and influence the opinion leaders in these reference groups. Marketers try to reach opinion leaders by identifying demographic and psychological characteristics associated with opinion leadership, identifying the media read by opinion leaders and directing messages towards these people in order for them to then directly or indirectly influence people that are part of their reference group. A person's position in society can be also defined in terms of role and status. A role consists in the activities that a person is expected to perform. Each role carries a status. People choose products and brand to communicate their role and status in society. Consequently, for marketers, this means that they must are aware of the status symbol potential of their products and brands.

In addition to social factors, cultural factors represent the broadest and deepest influence on consumer behaviour and can be divided into the two following sublevels: culture, subculture and social class. Culture can be summarized as the most fundamental determinant of a person's desires and, consequently, behaviours. In fact, we as individuals acquire sets of values, perceptions, preferences and behaviours from our external environment that we internalize into our personality.

Each culture consists of smaller subcultures that provide more specific identification and socialization for its members. Typical subcultures include nationalities, religions, racial groups, and geographical regions. These subcultural strata predominantly influence or consumption patterns (I.e. food and clothing preferences carrier aspirations etc).

All human societies exhibit social stratification. More frequently, stratifications take the form of social classes, which can be defined as hierarchically ordered groups of individuals whose members share similar values, interests and behaviour. Social classes do not reflect income alone, but also other indicators such as occupation, education, area of residence etc. Social classes differ in their dress, speech patterns, recreational preferences, media preferences where, for example, upper class segments prefer magazines and books and lower class segments prefer television (Geertz, 1973).

A product innovation can be communicated acting on the product signs and languages; it can be understood by the customer if the company knows the social and cultural models that surround the customer and embeds an opportune lexicon in the product. The criticism of the analysis resides in the different speed with which the models evolve: the evolution of a new

reference model or paradigm has to face a sort of inertia that increases with the number of involved subjects. For this reason the individual interpretative models evolve more rapidly than socio-cultural models

The society employs a significant amount of time to align the behaviours of different subjects to the dominant models until they become interpretative standards. The same phenomenon occurs at the level of relationships among different societies until an interpretative scheme is spread and becomes part of the culture of reference. The whole phenomenon was described by Flichy (1996) through three concentric circles of different dimension, in movement with different speed but with the same quantity of motion (Figure 4.10).

The comprehension of cultural models is particularly complicated, but provides results characterized by a long term validity. The development of radical design driven innovations requires to capture and interpret cultural aspects because they aim to strongly change the meaning attributed to the object. This type of innovation is particularly risky because it implies deepened analysis that require time and have a remarkable impact on the final result; the slow dynamics of the cultural models explains the difficulty connected to the innovation in this field: a change at cultural level is a sum of rapid movements at individual and social level.

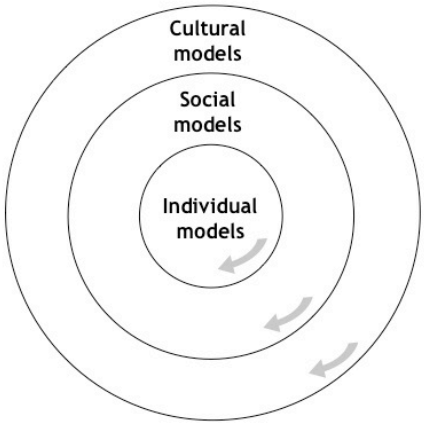



**Fig. 4.10** Individual, social and cultural models

In the last years many scholars have developed several studies about the semantic dimension of a product recognizing and underling its importance ( [14, 36, 30, 43, 22, 24, 31, 40, 20, 50]).

Different terminologies have been used to describe the communicative qualities of a product. McDonagh-Philp and Lebbon use the term *emotional domain*, *soft design* or *soft function*, while Desmet et al. write about *added emotional value*, *emotional fit* and *product emotions*; finally Durgee (2001) refers to *product soul* while Marzano (2000) speaks about *product experience*. The semantic dimension allows to innovate creating new meanings and acting on the socio-cultural models or, in less radical way, modifying the already incorporated meanings in the products.

According to the approach of these scholars, design deals with the meanings that people give to products, and with the languages that can be used to convey those meanings. In this sense the following definition proposed by Klaus Krippendorff on Design Issues in 1989 ( [36]) results particularly meaningful:

*The etymology of design goes back to the latin de + signare and means making something, distinguishing it by a sign, giving it significance, designating its relation to other things, owners, users or gods. Based on this original meaning, one could say: design is making sense (of things).*

Gotzsch ( [24]) introduces the concept of symbolic value in opposition to the concept of functional value and proposed the following working definition: *some products include a symbol or a message that is subconsciously recognised by its customer. This subconsciously recognised symbol adds important value to the product as its user feels that the product really suits him*.

Sanders ( [57]) underlines the relationships between the success of a product and three specific factors: usefulness, usability and desirability; the latter represents the communicative aspects of the product and the psychological aspects linked to the interpretation of the customer.

Some interesting considerations come also from scholars of brand management: in particular Holt (2003) speaks about "icons" as myths created by leader companies and able to propose charismatic visions of the socio-cultural contexts; moreover Holt (2002) interprets the brand as the "culture of the product", in his opinion the innovation process has to borrow inputs from anthropology, history and sociology in order to propose products as *cultural artefacts*.

In order to underline the increasing interest to the semantic dimension of a product, Gotzsch ( [24]) describes the different philosophies in product design of the 20th century (see Figure 4.11). She tries to demonstrate how the attention of practitioners and academics has been moved progressively from the functional dimension of a product to the semantic aspect.

In this sense at the beginning of the twentieth century the paradigm "form follows function" became the dominant approach in the USA and later it was reinterpreted and refined by the German Bauhaus and the Ulm School. But,

partially in the 30s, and, above all, in the 70s, new approaches move their interests to the aesthetic dimension of the product.

Last breakthrough in terms of design philosophy was probably introduced by Ettore Sottsass who leaded the Italian design movement in the 80s: he proposed to shift the attention to the product meanings. In his eyes, the design has to participate to social and cultural phenomena and for this reason design products became a sort of media to transfer values, emotions, meanings and messages. The dialectic of "Function versus Form" is a classic that very often leads to confine the interpretation of the term "Form" to the aesthetic appearance of products. However, a product can bring messages to the market in several ways; styling is just one of these ways. While the functionalities of a product aim to satisfy the operative needs of the customer, the product meanings aim to satisfy the emotional and socio-cultural needs of the customer.

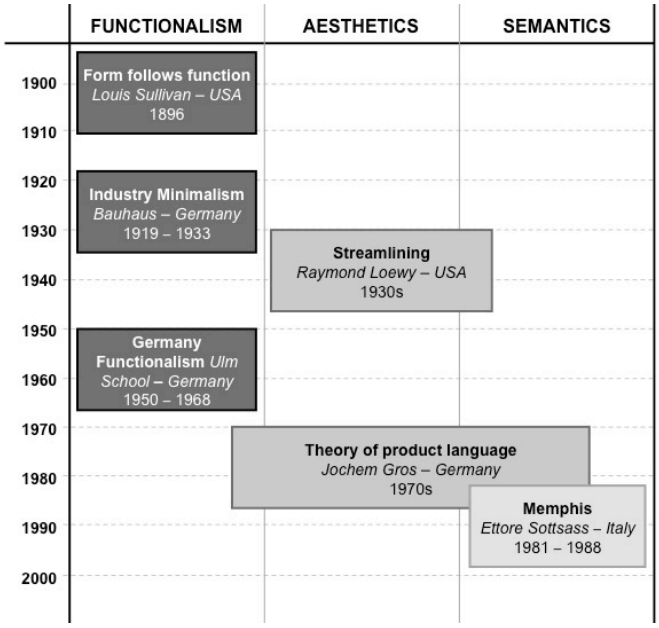



**Fig. 4.11** Philosophies in product design of the 20th century

As mentioned before, successful Italian companies such as Alessi, Artemide, Kartell or B&B Italia base their innovation strategy on the development of new product meanings in terms of sense, personality, identity, emotion and values. What consumers are looking for more and more in consumer products are new forms of psychological satisfaction that go beyond normal and simple consumption.

Today, more than ever, products define their own presence not only through their attributes, but also through the meanings that they assume, through the dialogue that they establish with the user, and also through the symbolic nature that they emanate. They become magnets of meaning. Therefore, adopting a design-push approach means having the right set of skills to understand, anticipate and influence the emergence of new product meanings and messages.

Design driven innovations allow to communicate new meanings and values to the customers and for this reason they can be defined as semantic innovations. As a functional innovation can improve technical performances in an incremental or in a radical way, an innovation of product meanings may be more or less radical.

Many "fashionable" products are often the result of incremental innovations; they adopt design languages that match existing aesthetical frameworks and definitions of beauty, and propose messages in line with the existing socio-cultural models. Contrarily, as far as a radical semantic innovation is concerned, embedded languages and delivered messages need significant reinterpretation of meanings.

In many luxury industries (fashion, jewels, watches, etc.) the rapidity to capture and react to the emergence of new customers' needs can be considered one of the principal critical success factors because these sectors are characterized by continuous incremental improvements. Contrarily radical semantic innovations sometimes are not immediate: they take time to diffuse and achieve acclaimed success.

The comprehension of new radical product meanings and messages requires that users find new connections to their socio-cultural context, establish new patterns of interaction with the products and explore new symbolic values. If radical technological innovations require profound changes in the technological regimes, radical semantic innovations ask for profound changes in the socio-cultural models.

Design driven innovations allow to develop products that are completely different from "fashionable" or stylish products, they may contribute to the definition of new aesthetic standards proposing new interpretations of socio-cultural models. Differently from "fashionable" or stylish products, radical innovations of meanings can become icons and can contribute to the definition of new aesthetic parameters.

In other words design driven innovations cannot be considered answers to user needs, but the result of a dialogue with consumers in order to satisfy not only utilitarian needs but also symbolic end emotional meanings. Successful Italian manufacturers in design-intensive industries such as Kartell, Artemide, Alessi, B&B Italia, etc. have demonstrated unique capabilities to understand social needs and develop systems of offering with higher value for the socio-cultural environment. They have superior capability to understand, anticipate and influence the emergence of new product meanings. Their product portfolio is characterized by many incremental innovations

and few strategic projects developed with the purpose to introduce breakthrough changes of product meanings. Analyzing the innovation process of these companies, it is possible to observe that they do not apply user needs analysis such as ethnographic research or in general user centered methodologies. Contrarily, entrepreneurs of leading design driven companies demonstrate a completely different approach to innovation:

*Market? What Market? We do not look at market needs. We make proposals to people.*[Ernesto Gismondi, Chairman of Artemide]

*Working within the meta-project transcends the creation of an object purely to satisfy a function and necessity. Each object represents a tendency, a proposal and an indication of progress which has a more cultural resonance.* [Alberto Alessi, CEO of Alessi]

These sentences underline that the adoption of a design-push approach does not start from users' insights and for this reason customers have to considered a limited source of knowledge to introduce radical innovations of product meanings.

The diffusion of socio-cultural models and consequently their impacts on the interpretation of design languages depend on many interactions between several stakeholders; customers' interpretations are in line with what is happening today and for this reason they can rarely provide interesting indications in terms of radical changes.

Today socio-cultural context in which consumers are immersed and the current values in the society shape users needs and interpretations. Both managers claim that their companies make proposals to people rather than develop answers to customers. They are able to introduce radical innovations of product meanings by looking at long-term phenomena with a broader perspective.

In this sense the design-push approach seems more similar to the technology-push rather than the market-pull one because, as suggested by Dosi ( [16]), changes in technological paradigms are mainly technology-push while incremental innovations within existing technological paradigms are mainly market-pull.

Each product has particular language and meaning and they can be innovated; besides to consider product functionalities, the framework proposed by Verganti ( [66]) expands and elaborates the concept of form, in order to consider the symbolic and emotional values of a product (see Figure 4.12).

As mentioned before the radical design driven innovation is defined as *an innovation where novelty of message and design language is significant and prevalent compared to novelty of functionality and technology*. Design can be defined as a set of activities that aim to create meanings ( [36]).

Product languages developed by designers allow products to speak and convey precise meanings. For this reason, on the one hand, the designer has to understand the socio-cultural context that surrounds customers and, on the other hand, he/she must also be able to translate this inputs into concrete product languages. Consequently, it is particularly important to apply the

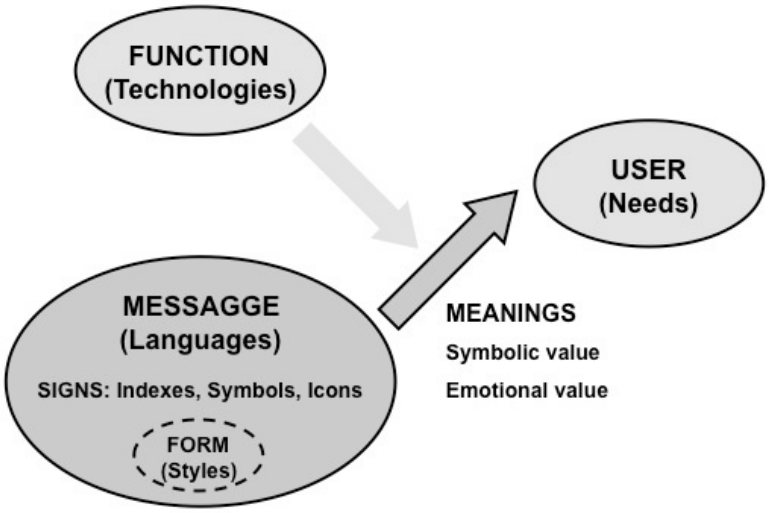



**Fig. 4.12** Design driven innovation

knowledge and techniques developed in the disciplines of semantics and semiotics.

Many studies analyse the potential advantages and disadvantages of the external acquisition of knowledge and technology ( [25, 3, 15, 26, 71, 11]) as well as many others propose several typologies of co-operation with external sources of knowledge and technology ( [5, 34, 10, 17, 47, 65, 12]).

Most of these studies deepens the technological collaborations, but it is necessary to underline that the knowledge about the dynamics of socio-cultural models shows different specificities (for example, two peculiarities of how knowledge related to socio-cultural models differs are the elevated degree of dispersion of knowledge among several actors, and the relative implicit structure of this knowledge).

Designers can support companies in the creation of breakthrough product meanings acting on the semantic dimension; they capture, recombine and integrate knowledge about socio-cultural models and product semantics ( [36]), but they have not to be considered the only possible support.

Unfortunately there is not a centralized repository where it is possible to retrieve all information about future scenarios; the affirmation of socio-cultural models and consequently their impact on the interpretation of product languages depends on many interactions among several stakeholders: users, firms, designers, communication media, cultural centres, schools, etc. Verganti ( [68]) sustained that this knowledge is diffused within our environment in a design discourse (see Figure 4.13).

For this reason, in order to introduce radical design-driven innovations it is necessary to develop several channels to access tacit and distributed knowledge about socio-cultural trends; it is necessary to be part of a network in which several stakeholders interact and share their knowledge.

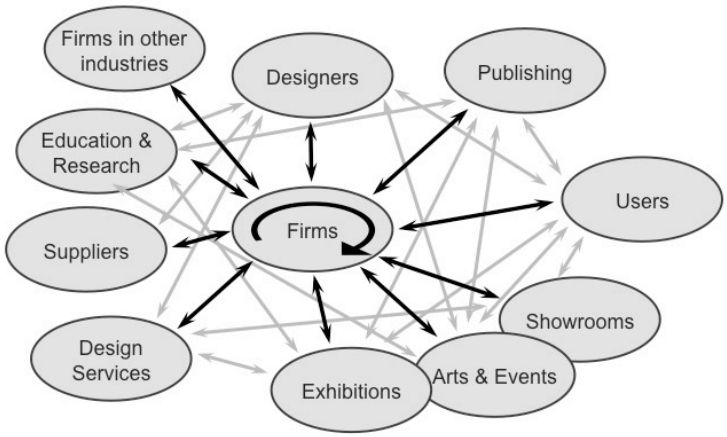



**Fig. 4.13** Design discourse

All these actors are not only interested in understanding possible future domestic scenario, but they have also the possibility to influence user needs and desires with their actions and outputs (products, projects, reports, art-works, shows, etc.).

For this reason Italian leading companies consider these actors as key interpreters of the evolution of future scenarios and for this reason they develop continuous dialogue about possible visions of the future, exchange and compare information about emerging trends, verify the robustness of their assumptions.

In this way they can, on the one hand, to be part of design discourse and, on the other hand, to influence its evolution. The networked research process can be considered one of the principal difference between design driven innovation and user centered design (see Figure 4.14):

- Design driven innovation is based on a huge amount of relationships that span widely outside the boundaries of the firm, including users, but also and mainly several other interpreters;
- Design driven innovation is based on sharing and exchanging of knowledge about socio-cultural models, product languages and meanings;
- Design driven innovation aims not only to capture and interpret socio-cultural models, but also to influence and modify meanings and values in the society thanks to the collaboration with the interpreters;
- Differently from the user centered design that considers fundamental to get as close as possible to users, support the identification of implicit needs and finally be creative in finding solutions, the key capability in design driven innovation is accessing and sharing knowledge about socio-cultural models and emerging values and meanings in the society.




**Fig. 4.14** User centered design vs. Design driven

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