

Design-Inspired Innovation

James Utterback (*Massachusetts Institute of Technology, USA*), **Bengt-Arne Vedin** (*Mälardalen University, Sweden*), **Eduardo Alvarez** (*VIGIX, Inc., USA*), **Sten Ekman** (*Mälardalen University, Sweden*), **Susan Walsh Sanderson** (*Rensselaer Polytechnic Institute, USA*), **Bruce Tether** (*University of Manchester, UK*) and **Roberto Verganti** (*Politecnico di Milano, Italy*)

Abstract

What makes products great? What is the role of design firms in creativity and innovation, and how is this role changing? What accounts for design firms' successes? How is the process of innovation and design changing? Does this differ between products and services? This paper reports the results of a study undertaken by the author and six others to address such questions, and is based on interviews of the founders of nearly one-hundred design firms in four countries and several industries. The sample ranged from three divisions of the largest international design firm to some of the smallest and newest ones.

Manufacturers are responding to changes in technology and market demands by trying to introduce new products into the market more rapidly. They are struggling with new technologies and converging technologies that are creating opportunities for development of whole new product categories and for the entry of new types of competitors. While larger firms enjoy great resources in technology and science, these resources seem to be growing more available and open to all. There is also a growing richness of variety in the component supply environment, which enables greater creativity, combination and variety at the system level, but at the same time also widens competition; doubly so when new materials and software capabilities are considered.

The innovation process seems to be becoming more networked, involving a greater number of actors including users, design firms and suppliers. The spread of roles across boundaries appears to be aided and abetted by open standards and increasing use of open source innovation processes. There is greater availability of a widening variety of sophisticated design tools such as computer aided design, simulation and visualization techniques, conferring innovative capabilities on smaller groups and organizations. In addition to the industrial design services they historically offered, many design firms are now providing turnkey services for new products and even entire product lines. That is they are more actively providing material and component choices and sources and marketing concepts to manufacturers in addition to product designs.

We conclude that to be successful today products must be distinguished by more than sufficient function, consistent quality and low costs. A few of the welter of products in the market seem to account for the bulk of sales and profits in many categories. We believe that these examples emphasize customer delight, elegance and enduring value. They may even acquire increasing value over time. Our findings and examples imply that much competitive advantage might be gained by reconsidering traditional products with a fresh eye and approach using newer materials and design techniques.

This paper is the first chapter of a book titled ***Design-Inspired Innovation*** by the same authors to be published later this year by Imperial College Press-World Scientific Publishers.

What Makes Products Great?

A design-inspired product delights the customer. The product emphasizes sophisticated simplicity and economy of means and low impact. If a product's use is apparent, simple, and clear, it will stand out from all those that compete for our attention. Great products are those that have grown in meaning and value over their—and generations of users'—lifetimes. They capture our hearts and make our lives easier, better, or more interesting. Elegant products live on long after trivial variations have been relegated to the trash heap.

Design-inspired innovation requires creativity of a higher order, whether the products are professional tools, machinery for production, consumer goods, or services. It is, in essence, a synthesis of technology and users' experiences—boundaries that we observe blurring. Increasingly, products succeed because they have associated software and services that enhance their value. In the end, what the user remembers is a delightful experience with the entire package, and not whether that experience was provided or enabled by any particular aspect of the design.

Most innovation improves products along accepted trajectories of higher performance and lower cost. By contrast, strikingly innovative products broaden and change the boundaries of performance, usefulness, and meaning. Few designs result in products that create such dramatic market success that they drive a company's overall competitive strategy. People today hunger for products that offer more than sufficient function, high quality, and low cost. Even superb functionality no longer assures success for a new product. To achieve inspired designs and innovations, the aspiration must be for excellence and elegance. Excellence is achieved when a product is eminently good. Elegance—the tasteful richness of a product's design—is achieved when a product is neat and simple.

Customers do not necessarily want a wide variety, but they do want what is exactly the right choice for them. There is also a growing richness of variety in the component supply environment, which enables greater creativity, combination, and experiment at the system level, but at the same time also widens competition; doubly so when new materials and software capabilities are considered. Modularity means that we have the growing ability to design and produce products for small markets or even for a single customer. An example, a new concept for a riding saddle, is explained in detail below.

Design-inspired innovations seem to be aimed primarily at elite consumers in highly developed economies, but we believe that there is no reason to maintain such an excessively narrow focus. Design-inspired innovation creates products that have meaning. Many people strive toward a world of greater beauty, humanity, and ethics, as well as one that provides basic necessities—and we sense a rapidly growing wave of interest in creating more meaningful products that also reduce waste and reside easily in our natural and cultural environments. In the developing world, greater numbers of people aspire to have the goods and services enjoyed in developed economies, while even greater numbers aspire simply to have basic products and services. More products seem to emphasize sophisticated simplicity rather than just a welter of features, and more products seem to emphasize economy of means and low impact rather than simply economy alone.

For example, Tim Brown, head of IDEO, noted his company's success in developing a disposable injection pen for providing insulin inexpensively to help diabetics. Examples in later chapters include a simple and effective emergency shelter and less wasteful designs for food

packaging. Groups such as Britain's Sorrell Foundation and MIT's Age Lab are searching for approaches to provide better experiences and products for younger and older clients.

Our thesis is that design-inspired products, those with both excellence and elegance, will be both more profitable and enduring. Of course, there are worries. Christopher Lorenz, in his seminal 1986 work on corporate use of design, warned that, "the trouble is that right does not always triumph, and principles are not always borne out in practice. Existing deterrents against the fully-fledged use of industrial design in many companies could take on new significance if globalization is managed badly. Design would then be pushed back to the dark ages of skin-deep styling, and the companies would be deprived of that 'meaningful distinction' which, as Theodore Levitt rightly argues, is so crucial to the creation of competitive advantage in an era of crowded markets and global competition."ⁱ

Ironically, the best products may be the ones that almost disappear entirely: the human light, the music library, the wheelchair, a waste handling system. All of these, and other examples, are presented in detail in subsequent chapters, where we put what makes them "best" in the context of excellence and elegance.

Design, especially its integration with other functions of a firm and its strategy, has received less emphasis in previous research than is merited by its importance to success in a competitive environment. For example, as Procter & Gamble CEO, A.G. Lafley, says

"I've been in this business for almost thirty years, and it's always been functionally organized. So where does design go? We want to design the purchasing experience—what we call the 'first moment of truth'; we want to design every component of the product; and we want to design the communication experience and the user experience."ⁱⁱ

Where, indeed, does design go? We will argue that it must constitute the beginning of the innovation process and consider the totality of a product's use and life rather than the design process being one in which the product is just conceived as an artifact or an implement.

What is design-inspired innovation? How does it lead to competitive advantage?

A growing number of companies recognize the importance of design-inspired innovation, especially those that aim to strengthen and maintain high product value. These companies are willing to take the large risks associated with this quite complex and uncertain approach. To answer the questions above requires taking the widely acknowledged definition of design as the integrated innovation of function and form and adapting it further to the framework illustrated in Exhibit 1-1.

INSERT EXHIBIT 1-1 HERE

The Exhibit shows graphically that three types of knowledge are essential to the innovation process: knowledge about user needs, technological opportunities, and product languages. The latter concerns the signs that can be used to deliver a message to the user and the cultural context in which the user will give meaning to those signs. The classic dialectic of function versus form leads designers to relegate the latter to the aesthetic appearance of products. Indeed, the debate often focuses simplistically on the contrast between functionalism and styling—particularly in industries such as furniture and lighting, where aesthetic content is

considered to be the key driver of competition. Exhibit 1-1 expands and elaborates the concept that great design captures the meaning of products, as well as function and customers needs.

In design-inspired innovation, the balance among technology, market and meaning is unique. None can be neglected. Rather, balance results from a vision about a possible future. In Chapter 4, we refer to this as an “ideal design.”

What really matters to the user, in addition to functionality, is a product’s emotional and symbolic value—its meaning. If functionality aims at satisfying the operative needs of the customer, the product’s meaning tickles one’s emotional and socio-cultural needs. As Virginia Postrel argues,

“... ultimately, the only way to mitigate aesthetic conflicts is to establish design boundaries that recognize the wide variety of people and the impossibility of deducing from aesthetic principles what individuals will, or should, value. We have to return to Adam Smith: to accept the importance of specialization and to understand that a large market of many people need not be a mass market of homogeneous goods. Good design boundaries ... will embrace pluralism.”ⁱⁱⁱ

Christopher Lorenz argues that this may seem like trying to have it both ways, but that a critical factor in design is to manage and balance just such ambiguity.

How can a firm achieve a design-inspired innovation? How can it define new meanings that are successful in the marketplace? To answer these questions, let us first look generally at innovation as the result of a process of generating and integrating knowledge.

Product and service design should not be an isolated function within a company. Rather, it should involve every single aspect of the company working together on the entire customer experience. That experience begins the moment the customer first comes into contact with the product, perhaps in a showroom or an advertisement, and continues through every aspect of the interaction across the life of the product or the length of the service. This illustrates that the product itself is only a part of the experience—in some cases, a small part. It is critical, then, that product design teams include members with diverse knowledge, including of finance, marketing, service, logistics, and other functions.

A Business Week article argued, “[A]s the economy shifts from the economics of scale to the economics of choice and as mass markets fragment and brand loyalty disappears, it is more important than ever for corporations to improve the ‘consumer experience.’”^{iv} This shift can be seen at design firms such as IDEO, where, as CEO Tim Brown said in a presentation at MIT, the firm has moved strategically from designing products, to designing services, to currently designing entire customer experiences with products and services.

Procter & Gamble is now IDEO’s largest single customer. IDEO has moved beyond products, services, and customer experiences to an attempt to help Procter & Gamble itself design a culture to foster greater innovation. As head A.G. Lafley, who is attempting to put design “into the DNA” of Procter & Gamble, says:

“I think it is value that rules the world. There is ... evidence across many categories that consumers will pay more for better design, better performance, better quality, better value, and better experiences. Our biggest discussion item

with ... retailers is getting them to understand that price is part of it, but in many cases not the deciding factor.”^v

Product designers, then, must become designers of the customer experience. The Apple iPod, discussed in Chapter 2, offers a prime example. The device itself is nicely designed, but its most important competitive advantage is its seamless integration with more important aspects of the customer experience, such as the iTunes website where content is easily made available to the user. Significantly, the newest service offered as part of the content provided on an iPod, the so-called “Podcast,” was neither designed nor created by Apple. Rather, it is a creation of a user community encouraged and enabled by Apple’s use of standard connections in its product and open standards for its content provision. Podcasts now provide not only time-shifted news and broadcast content of all sorts, but myriad other possibilities from museum audio tours to updates about family events.

More successful designs often involve an extended ensemble of services and accessories that enhance and reinforce the users’ experiences. These may arise through open standards or user communities that encourage users and partners to develop them. Likewise, design firms that work on products that a customer can use easily and in which function is amplified through attendant accessories, systems, and services will be more successful than others.

What strategies encourage design-inspired innovation?

Success in design-inspired innovation requires a broad search for information and robust experimentation, with lots of feedback from customers in both steps. Designers who create modular designs allow greater variety and experimentation at lower cost per experiment, thus creating a greater chance of learning quickly from failure, and in turn heightening the chances of success. Likewise, design firms that introduce a greater number of prototypes grow more rapidly than those that maintain a tight focus. Modular design is a pre-condition for so-called mass customization. With readily connected modules, customers can more easily select the modules that provide an ensemble of preferred features. According to Joe Pine, the most ingenious companies provide design software and services (or “design tools”) that readily allow customers to visualize the result of a selected combination. This idea is discussed in more detail in Chapter 4.

Seeking and Experimenting

Clearly, design-inspired innovation might involve much more seeking and experimenting than planning. Great designs might be those that provide for more variations to meet particular customer needs or specifications, or for more variations to be tried quickly in the marketplace to zero in on the version most highly suited to customer needs and preferences. “The work of Scherer (1999) shows that returns from innovation are highly skewed. Only a few innovations in a portfolio produce significantly above-average returns. Similarly, only a small number of academic publications get very highly cited, a small number of patents produce most income, and a small number of products yield the majority of sales. Although the performance of incremental innovations tends to be less skewed than radical innovations, the implications of these skewed returns are clear: as Scherer argues, the chances of success in innovation are such that an

appropriate metaphor is that of a lottery. Spending more on innovation, or buying more tickets, provides more chances of success but large expenditure does not ensure that you win.”^{vi}

We believe greater value is being created more consistently by innovation at the systems level, rather than at the components level. The most powerful designs appear to be those that are architectural and modular—they are defined by creating new *ensembles* of components and connections among them, rather than simply adding new components. Architectural designs in particular often broaden the application of a product or open up entirely new uses for it, thus rapidly expanding the market.

Functional innovation is only rarely based on radically new technology. More frequently, it is a cumulative, incremental improvement of existing components and extension of established product architectures. Given that, there appears to be much potential value in reconsidering products “inside the envelope” with a fresh eye and approach. A wonderful example is a new saddle designed for competitive riders, or more accurately, a saddle *system* for both horse and rider that may serve to illustrate many of the points made thus far.

Linear’s Saddle, Designed for Both Rider and Horse

Most saddles today are modeled on a form established at least 500 years ago, and some 60 percent of riding horses suffer from back problems because saddles aren’t designed to distribute human weight. The lives of these horses are shorter than necessary. The saddle design we encountered through our interviews in Sweden addresses these problems through a totally new saddle concept.

Linear—working with Stockholm-based design firm Propeller—has created a totally new saddle concept. Designed for an anatomically healthy horse’s spine and movements, the Horseback–Modular Saddle System is ergonomically suited for both the horse and rider. The innovative design breaks new ground in a conservative product category by using new materials and industrial production.

The starting point is to consider horse and rider as one *system*. The saddle should be adaptable to individual differences among horse and load. The rider’s weight should be distributed as evenly as possible over as large an area as possible, so as not to restrict the horse’s blood circulation.

Linear’s saddle is *modular*, with the lower part for the horse’s back and the upper module for the rider and the actual riding discipline (see Exhibit 1-2). This allows the rider to switch easily between different disciplines, and eliminates the costly need for multiple saddles. The lower saddle is made not of the traditional leather but a lightweight carbon fiber, which makes for an extraordinarily light 2-pound product and distributes pressure evenly over the horse’s back—at a much lower production cost. At the same time, the saddle allows for good ventilation of the horse’s back. The main advantage: a happier, healthier horse.

INSERT EXHIBIT 1-2 HERE

The saddle design shows clearly the combination of modularity, customization, systems thinking, and inspiration within a basic system that provides saddles beautifully tailored to both horse and rider. The customer is delighted.

We cannot overstate our view that a company's entire strategy should be focused on this single objective: delighting the customer. In today's globally competitive world, it should be expected that some other company will—with relative ease—come along and fill a space void of delight, pushing other companies out of business. Delight transcends reliability and simplicity to achieve something greater than the sum of the parts.

Why is simplicity key to the achievement of customer delight?

Simplicity and elegance are ignored at the company's peril. Our lives are amazingly complex, and complexity is stressful. Modern life is an equation with multiple variables: work, family, relationships, finances, hobbies, education, emergencies, health, maintenance, compliance, expectations, taxes, and so on. As difficult as it is to keep current with all these variables, it is even more difficult to control them in the way we want. Simplicity eases some of the burden and creates space for enjoyment. A product that is simple to use allows us to enjoy what it does.

Why, then, are most products and services *not* simple? Why does a new digital camera come with a 200-page user manual? Complexity is a grand temptation for designers because, more often than not, it is a means by which to compensate for or mask poor design. An architect might compensate for a poor or uninspired house design with moldings, textures, and colors. "It makes sense intuitively," write Rust, Thompson, and Hamilton, "that an overload of features detracts from a product's usability. It's also been proven over and over again in research."^{vii} Similarly, a product designer tends to add features and ornaments to hide fundamental deficiencies in his design. What else explains, for example, the ubiquitous echo feature on surround-sound home audio amplifiers that makes a movie viewed at home sound the same as watching it in a stadium?

Perhaps "... engineers can't resist the temptation to equip existing electronic components with more functions. Of course, they are not looking at the whole equation, which includes the intangible costs of reduced usability."^{viii} In short, designers often confuse or confound desirable attributes such as beauty, elegance, and quality with extra features and ornamentation. "The experience of using a product changes the equation underlying consumers' preferences. ... Put simply, what looks attractive in prospect does not necessarily look good in practice. Consumers often become frustrated and dissatisfied with the very cornucopia of features they originally desired and chose."^{ix}

Simplicity: The Case of Two Search Engines

A comparison of two search engines on the World Wide Web—Yahoo and Google—affords an illustration of the power and desirability of *simplicity*. Yahoo offers a vast categorization system, but at an early point in the process it is quite easy to forget what the original search was for. Yahoo forces the user to browse through dozens of links, advertisements, and unneeded information. Google, however, provides a straightforward, focused, and *simple* user

experience.

Google achieved this simplicity in part with the approach the company took to developing its search engine product. “When we started,” explains Sergey Brin, Google co-founder, “we didn’t have a webmaster. The result was a nice, simple interface. And we stayed true to that because we realized it helps people get their searches done faster. They don’t want to hang out on a home page when they want to get information quickly.” Keeping the development team small helped avoid over-engineering Google’s web interface.

It is Google’s simplicity and reliability that has allowed the company to achieve an amazingly large share of the U.S. web search industry. According to the July 2005 Nielsen NetRatings, 54 percent of web searches were performed at Google.^x Yahoo came in a distant second, with only 23 percent—despite that Yahoo is a larger company with more resources. A 2003 survey offers further proof that users respond to simplicity. “Google, the powerful search tool that presents Internet surfers with a minimum of visual clutter, came top in a global poll of 1,315 respondents to a survey by Interbrand, a leading British branding agency.”^{xi}

Google’s simplicity is not only about its user interface, but also has to do with the company’s technology and even its very business model. Everything has been designed with one thing in mind: the customer is looking for *precise* information and wants it *fast*.

Still, Google confronts the dilemma of trying to grow while preserving simplicity. “That famously Spartan user interface is about to face a major test as the outfit seeks to drum up attention for its many new offerings,” reports *Business Week*. “Change has been one of the only constants at Google. In five years, its payroll has rocketed from about 100 to over 4,200 staffers. Sales have jumped from \$19 million to more than \$3 billion. And its product offerings have mushroomed from simple Internet search to include dozens more, from e-mail to maps to instant messaging. Despite this roiling change, Google’s famously minimalist home page looks almost as it did when the upstart search company owned just 1% of the market.”^{xii}

Even those companies that achieve the kind of simplicity that generates customer delight can find it difficult to remain faithful to the simplicity principle. Time and again, companies that owe their initial success to the simplicity of products they design “kill the golden goose” as they exhibit the seemingly natural tendency to make the next generations increasingly complex.

“New England villages are admirable because they are limited. They were built in tight confines, against the surrounding wilderness. They were built of the simplest materials: wood, nails, plaster, bricks, stone, mortar and glass. ... The graceful place is born of limits: in material, knowledge and time.”—Howard Mansfield^{xiii}

Examples abound: consider Quickbooks Accounting Software, Palm Pilot personal digital assistants, and the Windows operating system. These products were category killers because they were simple and easy to use, but the companies, feeling the pressure to grow, pushed their designers to create more complex new versions—in other words, to add “bells and

whistles.” Systems engineers cynically call this phenomenon the “second system syndrome,” meaning that once something is working in a well thought out first version, everyone’s favorite idea or feature is thrown into a cumbersome second version.

Designers who want to stay true to the simplicity principle must acknowledge the need for constant discipline to prevent the urge for more short term sales to lead to disappointment and declining sales later. Rust and his colleagues note that BMW’s overly complex dashboard, with a huge number of options, has led to a 10 percent sales decline in 2005.^{xiv} Simplicity is even more compelling because most developed countries confront aging populations (which, we posit, appreciate and indeed require simplicity), as we detail in Chapter 4.

How is the innovation process changing?

All of this discussion points to changes in the innovation process among companies and industries—for better or worse. We perceive a growing trend to view design in the same light as contract manufacturing has been viewed for more than a century. The increasing pressure on corporations for financial performance encourages companies to contract out all activities that are seen to provide no competitive advantage. Each of the design firms we interviewed concurred that they were also seeing more design contracting. One firm offered that “it’s a huge pond” regarding growth in the product development industry.^{xv} There is other evidence of firms seeking outside assistance, through design contracting, to acquire capabilities they do not themselves possess. The use of outside design services is growing in the United States, Japan, and other countries.^{xvi} Tim Brown of IDEO noted in an early 2006 presentation at MIT that there is a movement from small partnerships centered around one individual toward more organized and integrated firms and collaborations.

In his “Open Innovation” study, Henry Chesborough suggests that the innovation process has shifted from a closed process within corporations toward an open process drawing on many sources of knowledge. He notes that “companies can find vital knowledge in customers, suppliers, universities, national labs, consortia, consultants, and even start-up firms.”^{xvii} Applying this concept, Larry Huston and Nabil Sakkab of Procter & Gamble demonstrate how the company has gone from 15 percent of external product origination to 35 percent, towards a goal of 50 percent. R&D productivity has jumped by 60 percent, and the innovation success rate more than doubled.^{xviii}

The clients of product development firms know that their competitors are getting technology from many different sources, including design firms. Therefore, some firms have linked a competitive benefit to contracting for design. The bilateral transfer of knowledge during design collaboration for competitive advantage is a phenomenon that is both obvious and subtle. Of course, both the client and the product design firm can learn from one another during the design of a product, but the subtlety is recognizing this fact so that it can be exploited through knowledge management practices. What we observe, as noted at the beginning of this chapter, is a more network-centered innovation process, involving a greater number of actors, including users, design firms, and consultants. Increased networking is aided both by the increasing popularity of open standards and open source forms of development, and by the greater prevalence of sophisticated design tools which augment the capabilities of smaller groups and organizations.

Firms tend to search locally, and innovation efforts tend to be amplified by the presence of diverse local partners and connections. Sources of innovation are not uniformly distributed, but

rather are concentrated in a few regions of sophisticated demand and expertise. In some cases, such “clusters” are becoming distributed, or “virtual,” but are still characterized by rich connectedness among actors and agents. A gathered cluster of suppliers and customers makes design firms more viable, and vice versa. While the cluster environment is the same for all firms, each individual firm will differ in terms of number and strength of linkages to other players. More successful firms will include both customers and suppliers within their design activities, as illustrated in Exhibit 1-3. At the same time, they will be different enough from their customers in culture and action to bring them fresh perspective and direction in product development.

INSERT EXHIBIT 1-3 HERE

In summary, the innovation process has become more networked and involves a greater number of actors—users, design firms, and suppliers. Open standards and the increasing use of open source innovation seem to be spreading roles across—indeed, breaking down—boundaries. Many design firms now also provide turnkey services for new products and even for entire product lines. That is, in addition to product design, they are more actively providing manufacturers with material and component choices as well as sources of supply and marketing concepts.

What is to follow?

All of these observations are made more explicit in our discussion throughout the book. Chapter 2, “Creating Design Classics,” presents the common features of elegant “classic” models. One such feature is often the creation of formal and informal communities of users and accessory providers. In the chapter, we also analyze and illustrate the economic value of outstanding design, noting that a mere 5 percent of models of several products garner the lion’s share of profits. These classic models last nearly twice as long in the market as other examples.

In Chapter 3, “Integrating Function and Design” we contend that research on the economics of innovation and technological change is too concentrated on research-intensive activities. Our focus here is on design activities, and within that more particularly on product design activities, often overlooked when dealing with what is termed as “research and development.” The chapter is based in large part on a survey of firms in the United Kingdom, where a sizable effort is vested in what is described as “silent design.” It is interesting to note the positive correlation between economic performance and design interpreted more broadly.

The anecdotal evidence to suggest that independent design firms are playing an increasingly important role is presented in Chapter 4, “Managing the Design Process.” These firms are supplying innovation to corporate America, as we discuss. Given that it is normal that the leader at one stage of technology loses out to a newcomer at the next stage, how might design affect this pattern of passing the baton? What are the lessons from successes in designing entire systems, thinking in architectures and modules rather than single products? We provide an in-depth description of how an innovation project has been carried out in conjunction with a leading industrial design consultancy.

Chapter 4 advocates taking a step back to get a larger view, and in Chapter 5, “The Work of Designers,” we draw lessons from Swedish design consultancies—some of which suggest “starting from dreams” and “thinking the impossible” as part of the design process. Almost all Swedish design firms perform innovation services integrated into their design work for their customers. These services form part of a larger menu of offerings: the country or the firms don’t

offer a scale sufficient for narrow specialization. Thus, our interviews in Sweden give us a good opportunity to view the process in the larger context. Broader context also is often their recipe for servicing their clients: taking a life cycle approach; designing a corporate image; a corporate strategy; a value chain. Bringing in knowledge from starkly different industries is an important quality, as is staying close to scientific and technology breakthroughs.

Chapter 6 details “The Design Discourse,” focusing on Italy. Successful Italian manufacturers in design-intensive industries owe much of their success to unique capabilities in mastering design-driven innovation in messages transcending form and function. Italian firms appear to have developed capabilities to understand, anticipate, and influence the emergence of new product meanings. The discourse referred to takes place in a greater Milan design system, transcending what is normally seen as a resource dependent cluster. Designers in Milan and Lombardy interpret and are affected by cultural signals and stimuli shared with, among others, publishers and advertising agencies. The design systems view also informs the interaction between design firms in Massachusetts and its industrial substrate (Chapter 4) as it does for the Swedish transportation technology and industrial engineering systems respectively (Chapter 5).

The lessons of the Italian experience inform, to a large extent, our overall conception of design-inspired innovation and the guidelines we develop in our final chapter.

In Chapter 7, we take off from the concept of “messages” discussed in Chapter 6 and provide an extended example of design influencing innovation in a particular product arena. This chapter, “Broadening Human Possibilities through Design,” focuses on innovative sports wheelchairs. For a disabled person, a wheelchair is inarguably an implement with meaning. The chapter illustrates the extent to which functions, components, and design features, first tried and tested in a demanding sports environment, spill over into “ordinary,” active wheelchairs, promising great future demand from the growing elderly population in the world. It further highlights that the design of a product is a statement about the product’s owner: why should someone disabled be shut out of sports? Intelligently, elegantly designed technology comes to the rescue.

Chapter 8, “Design for a Vision—Visualizing for Design,” explores alternative design processes being used by design firms for the development of products in order to elucidate the changing nature of practices in the pursuit of outstanding products. As we have discovered, the traditional adage that form follows function no longer works. However, visualization, form, is certainly at the core of design and designing. Sketches allow for efficient communication and for provoking bold ideas. Visualization turns out to complement more established analytical tools and, with the advent of computers as well as new insights into how our minds work, holds out promises for entirely new opportunities to arrive at elegant products and services.

Our aim is to promote the wider diffusion of tools and practices, including effective alliances between manufacturing firms and design firms to create more widespread, successful product designs. Thus, we end the book with what we believe are valuable guidelines to assess and predict the effectiveness of product development and design processes.

Notes:

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- ^x On the basis of search provider.
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