SAGE was founded in 1965 by Sara Miller McCune to support the dissemination of usable knowledge by publishing innovative and high-quality research and teaching content. Today, we publish more than 850 journals, including those of more than 300 learned societies, more than 800 new books per year, and a growing range of library products including archives, data, case studies, reports, and video. SAGE remains majority-owned by our founder, and after Sara’s lifetime will become owned by a charitable trust that secures our continued independence.
In his book *Design Research*, Peter Downton makes a bold opening statement: ‘Design is a way of inquiring, a way of producing knowing and knowledge; this means it is a way of researching’ (2003: 1). This is a wonderful construct and this is how we should be looking at design. However, in reality the practice of design is rarely a research-driven process aimed at producing new knowledge. When it comes to professional practice, very few designers would have formal training in research, will know how to use research methods, or even understand what research entails.

The *Oxford Dictionary* describes research as a ‘systematic investigation into and study of materials and sources in order to establish facts and reach new conclusions’ (Oxford Dictionaries, 2013a). This implies working to a fixed plan and according to an established form of procedures. Then again, few designers feel the need to learn how to conduct research in this particular manner because many designs do not need rigorous research in order to be developed or produced. The methods of design vary greatly and they can range from being highly structured to interpretive and lateral. They can be investigative in nature, but this investigation is often self-exploratory and it is focused on the immediate processes of design. For many designers this way of working is sufficient and the story ends here. This way of working limits the potential contribution that designers can make to business and society. In order for designers to develop themselves as professionals of broader significance, they will need to learn how to incorporate scientific research in their practice. This is not an easy task. Unlike design, research is not an intuitive process. In fact, it is quite the opposite; it is a process that requires conscious reasoning and there are rigorous rules that need to be followed in order for the research to be verified and recognized as valid. All of this calls for a significant cultural change in the field of design.

The biggest challenge here is that design has been traditionally placed under the domain of applied arts, rather than science – where research dominates. Because of this, design is often perceived as an artistic practice that is often driven by intuition rather than research based on strict principles of validity. Then again, art and science do not necessarily need to be separated from each other. During the time of the Renaissance, merging both was a customary practice for the leading creatives of the period. A prime example of this can be seen in the life and work of Leonardo da Vinci (1452–1519). Da Vinci was equally comfortable in producing masterpiece artworks such as *The Last Supper* (1498) and the *Mona Lisa* (1504–1505), while studying subjects ranging from human anatomy, biology and hydraulics, to engineering bridges or developing plans for a helicopter, an airplane, and a submarine. While da Vinci may have been an extraordinary individual, many luminaries of this period shared similar interests in working across disciplines. Yet somehow, in modern times design has become an increasingly monodisciplinary, art-driven field. Then again, this comes as no surprise given that many formal design programmes have been developed and taught in art schools that were formed around the nineteenth-century.
principles of the Arts & Crafts Movement – a decorative arts movement that sought to revive the ideal of craftsmanship in an age of increasing mechanization and mass production. Even though the world has changed significantly since then, the legacy of this movement still prevails even today, in the twenty-first century, and this way of teaching, learning and practising design continues to serve as a dominant model across the world.

A common practice in the design industry today still entails that once designers become proficient in a range of technical and artistic skills like drawing, rendering, production, model making, printmaking, typography, or layout – or whatever skills are seen as necessary within the domain of their particular design area – it is considered that they have mastered the ‘art’ of design. Then, when designers develop their skills to a professionally acceptable level, it is expected that they will differentiate themselves by excelling in a certain technique or style of work. In return, they are often hired on the basis of their skills and creative abilities. If a client believes that the design style of a certain designer can be used as a ‘profitable differentiator’ for a business or product, then the designer can make a living on the basis of his or her skills and creative output (Muratovski, 2012a: 45). However, as I will discuss further on, things are changing and design has begun to move in another direction.

Nevertheless, I have to note that some might argue that the process of experimentation that allows designers to develop unique sets of skills or creative outputs is a form of research. As both design academic and professional designer, I see the process of experimentation with style and technique as being a part of the design practice and not as a form of research. Any designer, just like an artist or a craftsperson, can enhance his or her skills through continuous and dedicated practice. This process is not always systematic, nor does it necessarily lead to establishing facts or new solutions. Instead, this process helps designers develop a particular style of work. In some cases this process can follow research criteria and then this can be described as an elementary form of design research – in a sense that this is research which is focused on only one particular area: the methods of conducting design practice. But, as I will discuss further, there is much more to design research than this.

2.1 NEW LEARNING

The need for design experts who can bring different disciplines together in new ways is increasingly recognized on a global level. According to the Design Council’s 2010 report on design education in the UK, businesses, policy makers, and academics are increasingly making the case for the importance of design as a tool for innovation, productivity, and economic growth. This is dynamically linked to the design skills supply in two ways: the appearance of new technologies, new industries, and new services; and a supply of differently skilled people who can drive innovation.

As industries change and converge, traditional education systems are becoming less capable of supplying industry with people who have an appropriate and useful mix of skills and experience. While this might be a challenge, it is also an opportunity – especially for designers...
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(Design Council, 2010). In addition to this, the Design Council also points out that the skills that are increasingly valued by companies in all sectors include Creativity, Flexibility, Adaptability, Communication Skills, Negotiation Skills, and Management and Leadership Skills (Figure 2.1). As there is no one particular mix of skills that can guarantee good innovation performance in all circumstances, broadening the mix of skills with teams and individuals from other fields is one way to help innovation happen (Design Council, 2010).

From a design perspective, this means that the way designers are trained and educated will need to be changed, or at least adjusted, so that designers can learn to work in a cross-disciplinary fashion. This, in a way, supports Richard Buchanan’s (1999) argument that design should adopt a neoteric model of education – a form of ‘new learning’ based on novel problems encountered in practical life and in serious theoretical reflection. This comes in contrast to the paleoteric model that can be found today throughout many universities – a form of ‘old learning’ that

![Design Skill Set](image)

**Figure 2.1 Design skill set**
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focuses on expanding the knowledge of a particular subject matter, often in greater and greater detail, but rarely contributing substantially to the field of knowledge (Buchanan, 1999, 2001). Ken Friedman (2003) shares a similar view. According to him, in the evolution of every discipline there comes a time when the foundations of the discipline need to shift from ‘a rough, ambiguous territory to an arena of reasoned inquiry’, with things such as research methods, methodology, and philosophy emerging forward (Friedman, 2003: 507).

2.2 DESIGN EVOLUTION

A fundamental problem in the designers’ world today – particularly when designers want to make a genuine difference with their work – is that in most cases they are perceived as decorators, artisans, or stylists (Muratovski, 2012a: 45). As design continues to evolve and to mature as a profession, the definition of design constantly changes and expands. As the world changes, problems that businesses and society are facing, are becoming more and more complex. Designers are adapting to the new challenges, but new problems require new knowledge – and that is why the need for introduction of cross-disciplinary research in the field of design is becoming increasingly important.

The main reason why designers are still not broadly recognized as critical thinkers can be found in the origin of the profession itself. Early designers came from many backgrounds and they were introduced to the profession because of their ability to contribute artistically, decoratively, or constructively to the industry’s growing needs for the development of new or improved products and mass communications (Owen, 1989: 4). Since then, the notion of design itself, and what designers can do, began to change significantly, but many of the original perceptions of the design profession remained.

Designers, unlike architects and engineers, do not necessarily work with a set of principles and rules that prescribe the scope of their work – as Victor Margolin points out (1992: 113). Rather, they invent the subject matter of the profession as they go along. If we look at the history of twentieth-century design, we will see that this has often been the case with many leading designers. Take for example Raymond Loewy (1893–1986) – the iconic American designer/stylist who began his career as an illustrator for Macy’s department store and Harper’s Bazaar and went on to work on an extraordinary range of design projects. From the toothbrush to the locomotive, the lipstick and the ocean liner, he shaped the culture of everyday life in America between 1925 and 1980. With clients ranging from Coca-Cola, Lucky Strike, Greyhound, Shell, and even US President Kennedy, Loewy placed himself in a unique position to produce highly memorable icons of consumption that in a way defined the myth of the American dream. In his illustrious career, Loewy exhibited strong interdisciplinary spirit and took on projects that many of his contemporaries would never even consider. For example, at the height of his popularity he was even involved in the development of NASA’s Skylab – the first US space station (Schönberger, 1990: 7). Other prominent designers of that era such as Norman Bel Geddes, Henry Dreyfuss, and Walter Dorwin Teague shared similar experiences and challenged the
conventions of their own profession. Dreyfuss and Geddes, for example, moved on from designing products to creating model cities of the future for the New York World’s Fair in 1939, with Loewy designing a future rocketport for the same Fair. In the post-war years, creative pioneers such as Franco Albini, Charles and Ray Eames, Mario Bellini, and Richard Rogers continued to break design ‘taboos’, experimented with new design methods, forms, and materials, and inspired a new generation of designers to follow suit (Margolin, 1992: 113).

The idea of change is constant in the annals of design history – especially when it comes to redefining what design is and what design does. Design is no longer used only within the context of objects, visuals, or spaces, or even for resolving specific problems. As the trends in the field indicate, design is now becoming more about listening, asking, understanding, and drafting new possibilities and alternative realities. For example, many designers currently engage in facilitating positive futures such as developing energy-saving products and processes, creating human-friendly environments, encouraging political participation, and even reducing crime. As a result, design as a way of thinking is increasingly being sought in situations where in the past it has not been expected to be part of the solution (Muratovski, 2006: 82–3). However, the road to this point was long.

The design work that was carried out in Europe and in the US from the middle of the nineteenth century through to the first half of the twentieth century began as a trade activity (Swann, 2002: 49). The demands of the industry were introduced into art and craft studios, and early designs began to be treated as applied or commercial art. In time, design programmes were introduced in art schools, and as a result many principles of art became embedded in the design process (Muratovski, 2010a, 2011a). Another big change in the field of design occurred during the Second World War (WW II) when the military started commissioning the corporate sector to help them produce more efficient war machines. As the industries changed their focus, designers followed suit and began to investigate ergonomics, mass production techniques, performance, and efficiency. When the war ended, all these new ways of working continued to be used by the corporate sector and this continued to influence the way designers work (Bayazit, 2004: 17–23).

As the field of design grew in size and artistic expressions were increasingly combined with social and business acumen, design was no longer seen merely as a craft but as an emerging profession. As any other profession, design was also characterized by a tradition of practice and conscious recognition of a distinct type of working and thinking. With time, things in the field of design began to change and the field continued to evolve. Even though the original purpose of design was to follow the needs of the industrial economy, certain design schools and some design professionals continued to challenge industry practices and to introduce new currents of thinking and working (Swann, 2002: 49). For example, in the 1960s, the design focus shifted from developments in technology and form to consideration of human needs and behaviour. This was also a time when designers increasingly became interested in defining their role in society (Bayazit, 2004: 18–19). In other words, the world of design evolved from studying things to studying humanity (Almquist and Lupton, 2010: 3).

The ever-evolving nature of the field has helped design to go beyond the definition of a trade and to be recognized as a rigorous area of study; from a technical profession, design evolved to become an academic discipline in its own right. In the US, between the 1980s and the 1990s,
due to encouragement and demand of the industry, the American government funded the development of new academic research units in a range of design schools across the country. In the 1990s, design research began to gain momentum and this resulted in an increase of doctoral programmes in design in the US and across the world (Bayazit, 2004: 27). Nevertheless, as with any other legitimate disciplinary field, design still needs to fulfil several criteria in order to maintain its status. As a discipline, design needs to demonstrate ‘presence of a community of scholars; a tradition or history of inquiry; a mode of inquiry that defines how data is collected and interpreted; […] requirements for what constitutes new knowledge; and existence of a communication network’ (Del Favero, 2014: para. 2). Therefore, the field of design has an increasing need to produce its own base of knowledge, better expertise, and new skills. For that reason, training in design needs to follow a ‘system of orderly behaviour’ that is manifested in scholarly approaches to understanding and investigating new knowledge, ways of working, and philosophies of thinking – all of which require research (see Del Favero, 2014: para 1). Then again, both ‘research’ and ‘design research’ are not straightforward terms and they warrant further discussion.

2.3 RESEARCH REVOLUTION

To many people, the word ‘research’ connotes some kind of mystique and it suggests an activity that is somehow exclusive and removed from everyday life and from practice. Most people are unsure what researchers do, why they conduct research, what is the purpose and the benefit of their research, and how research contributes to people’s overall quality of life and general welfare, let alone design. To add to this confusion, ‘research’ is a commonly misused word that bears many meanings in everyday life. We hear the word used in a context of various activities. For example, people often use research to describe the process of looking for an item or information, or when reading about something they are unfamiliar with. Businesses often mention research in their sales pitches when they want to promote some kind of innovative product, even when they have slightly modified an existing product to which they might have added some new features. Many of these activities use the word ‘research’ incorrectly. The correct ways to describe such activities include terms such as ‘information gathering’, ‘documentation’, ‘self-enlightenment’, or ‘product development’ – and none of these are equal in meaning to research (Leedy and Ormrod, 2010: 1).

Defining research in a context of design is also problematic. A young discipline such as design is inevitably faced with many conflicting ideas and philosophies, and general understanding of what design research entails is often a cause of debate (Buchanan, 2001: 17). For example, as mentioned above, design education – except for engineering design and architecture to some extent – has had the tradition of the fine and applied arts as its model. In this model, personal exploration is often seen as a sufficient substitute for research (see Owen, 1989: 8). For some designers, design practice itself is perceived as a research process and design methods are sometimes equalled to research methods (see Downton, 2003: 1–12; for an alternative view see Friedman, 2003: 519). For others, doing research into design processes
is synonymous to doing design research (for comment on this, see Dorst, 2008: 6). However, the position I will take for the purpose of this book is that design practice is not the same as doing design research, but that the study of design practice can be considered as design research (see Bayazit, 2004: 16). Even so, I have to add that studying design practice alone is a limited way of looking at design research (see Buchanan, 2001: 17; also Dorst, 2008: 6).

In general, designers rarely participate in research that determines what kind of designs should be produced, and for whom – or why. Most designers choose to focus on investigating design methods that can deliver better form, style, function, and ways of working, and tend to present these activities as research (Laurel, 2003: 16–19). However, many of these activities are not always recognized as research by many universities, or by various corporate or government bodies that fund research activities. Therefore, most of the design research that is currently undertaken is not considered to be of the standard of a scientific discipline (Buchanan, 2001: 19).

Nevertheless, issues such as this have prompted Kees Dorst (2008) to call for a design research ‘revolution’ – a fundamental revision of how research is used in design, and for what. According to Dorst, in order for design to become a scientific discipline aimed at studying design, which he defines as ‘a complex area of human activity’, design researchers will need to follow four key steps. First, the researchers will need to have the tools to conduct ‘observations’ of complex human activities, then they will need to be able to ‘describe’ their observations, ‘explain’ what has been observed and described, and finally ‘prescribe’ possible solutions that could improve these activities (2008: 4–5).

This, however, is not a new and radical way of approaching design. Some design-driven companies, such as IKEA, already operate in this way. For example, according to IKEA’s 2004 catalogue, we can see that at least their children’s department has operated in this way since 1979:

In order to understand children and how their world is different from ours, we at Children’s IKEA bring in renowned professors who know about childhood development, child safety, human behaviour, and psychology. Then we test every child’s toy and piece of furniture we sell, run risk analysis, and document the results – all against the world’s toughest safety standards. (Cited in Bengtsson, 2013: 299)

Unfortunately, as Dorst points out, design researchers frequently ignore most parts of this research process and choose to focus on the efficiency and effectiveness of the design process instead – often at the cost of excluding everything else (2008: 4–5).

Then again, it has to be acknowledged that not all designers want to adopt such a scientific model. Many still prefer to hold on to the ‘traditional’ model of design education and practice. In design environments that foster this model, whether this might be design schools or design studios, designers are trained to imitate the works of others and tend to focus on the development of technical skills above anything else. This is also known as the ‘apprenticeship’ model of study and work. In this model the students and the junior designers assume the roles of ‘apprentices’ and the lecturers and senior designers assume the role of ‘masters’ of the trade (Muratovski, 2011a).

Even though this classical way of studying and working is still very popular in the field of design, some progressive design schools such as the Institute of Design in Chicago (originally founded as the New Bauhaus) at the Illinois Institute of Technology are opposed to this model.
According to Charles L. Owen, who is a key figure at the Institute, this model is holding back the field of design from introducing new insights into the industry. As he points out, many students choosing design programmes often exhibit a dislike of or an inability to deal with the content of other fields outside their core profession. In the learning process, their reservations, prejudices, and knowledge gaps usually go unattended because their lecturers – most of them with industry experience – are products of the same process and hold similar viewpoints. This in return creates a vicious cycle that withholds the progress of both design and industry. Upon graduation, students go into industry to design departments or consultancies staffed by graduates like them who hold similar views. They then influence the schools from their professional positions to ensure that the schools continue to prepare students as they were prepared, so that design graduates/future employees will have the same skills and attitudes as they have – which they perceive as necessary for employment in the industry. Since in most cases design schools employ lecturers with industry experience, design professionals inevitably return to the schools to complete the loop and train more students to work just like them. Therefore, in order for the field of design to evolve beyond this level, this ‘incestuous loop’, as Owen puts it, must be broken (1989: 7–8).

Owen is not the only one who has noticed this anomaly. David Durling and Brian Griffiths also point out that design schools often attract students of a particular kind whose tendency is to shun theory in favour of ‘making’. These students usually take a narrowly focused view of the subject of their interest, to the point of exclusion of external influences. According to them, new possibilities in design education will arise if different types of students are attracted to design education – students who are more accepting of theorized grounding of design together with interests in the foundations of other disciplines (Durling and Griffiths, 2001).

Bruce M. Hanington also recognizes the value that research adds to both design practice and industry and concurs with both Owen (1989) and Durling and Griffiths (2001) when he says that the introduction of scientific research methods in design practice depends significantly on the type of education emerging designers have (Hanington, 2005). Then again, the introduction of traditional art and crafts fundamentals in design education can be beneficial on a foundational level as it helps students develop a new set of skills and explore new ways of looking at the world around them. Lecturers with industry experience can provide valuable insights into the mechanics of the ‘real world’ and can advise students on what to expect upon their graduation. Nevertheless, design education will need to go beyond this in order to enable students to create breakthrough innovations, and that is why we also need research in the field of design. Then again, it has to be noted that some designers do exhibit concerns that formal research might compromise their creative output, but as I will argue below, this is far from being the case.

### 2.4 Design Thinking

Increased introduction of integrated cross-disciplinary research and critical thinking in the field of design is creating new opportunities for the new generation of designers. Rather than presenting
themselves as creative, artistic service providers who operate on the surface of the problem, many designers have already begun to redefine themselves as strategic planners capable of understanding complex issues. A number of global trend indicators have already identified the potential of design to act as a major force that can improve local economies, environments, and human life by integrating design in fields such as finance, construction, sustainability, health, housing, and public organizations. These new trends indicate that designers’ tasks have begun to shift from ‘product creation’ to ‘process creation’ and that research is becoming increasingly important – especially since new design knowledge is being appropriated from the fields of social sciences, environmental studies, business management, and beyond (Muratovski, 2012a: 46).

If we look at the scope of the projects that contemporary designers already work on, we can see that many already act as social scientists and business strategists – even though they may be unaware of this and are often undereducated for such tasks. Yet, on day-to-day basis designers identify problems, select appropriate goals, plan, and deliver solutions to problems that involve complex social, political, and economic issues (Friedman, 2012; 144–6; Norman, 2010). The inclusion of formal research in the process of design is helping designers to understand their tasks better and to make informed decisions that can lead to more effective design solutions (Muratovski, 2006: 259, 2012a: 46–7). This way of working has lead to the idea of ‘design thinking’.

‘Design thinking’ is a relatively new term to which different meanings are often assigned. In order to simplify things, I will use the framework of the term as outlined by Dan Formosa, a PhD scholar, award-winning designer, and founding member of the New York-based consultancy Smart Design. According to him, design thinking is a new approach to problem solving that relies on innovation and research when it comes to the development of new products and services (Formosa, 2012). Then again, as Formosa points out, innovation does not necessarily mean invention. Rather, innovation means a new and unique way of thinking, even when it comes to existing problems. For many companies design thinking grounded in design research has become a key to achieving a competitive advantage in a rapidly changing technological world. As evidence of this, Formosa points to Smart Design’s impressive list of clients who adhere to this principle: Coca-Cola, Ford, General Motors, Hewlett Packard, Intel, Johnson & Johnson, Kellogg’s, LG Electronics, McDonald’s, Microsoft, Nike, Samsung, Shell, Toshiba, Toyota, and Yahoo (Formosa, 2012).

In time, the ability of design to deliver innovation and act as a driver of commercial success or social change is likely to increase further. But in the meantime, as members of a relatively new discipline, many designers still need to establish themselves as thinkers and consultants capable of addressing contemporary multifaceted problems. This, however, is not an easy task. On the one hand, the field is being shunned by other disciplines that claim to be better equipped to deal with complex business and social problems than designers. This argument is mostly based on the fact that many designers do not have the same investigative and analytical skills that other, more established disciplines have. On the other hand, traditional designers question whether this disciplinary evolution is necessary or even desirable, especially since many design programmes are still based in art schools. However, what many fail to understand is that design is an ever-evolving field that ultimately acts as a reflection of society. As the fabric of society changes, so does design. Therefore, in order for design not
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to be marginalized or left behind as a discipline, designers will need to find a way to remain relevant and collaborate with other fields. For many, this will mean stepping outside their comfort zone. But in return, this way of thinking has the potential to change the traditional design outputs and to produce outcomes that are no longer mere artistic refinements, but meaningful contributions to society, the environment, and the economy (Muratovski, 2012a).

2.5 CROSS-DISCIPLINARY DESIGN RESEARCH

The world is becoming an increasingly complex place. Negative trends like unsustainable population growth, ageing, global terrorism, and increased stress between people and technology are taking their toll on society. Other critical uncertainties like globalization, natural disasters, environmental depletion, and global epidemics are still present and will continue to be relevant problems in the years to come (Muratovski, 2012a: 46). Such multifaceted problems – often referred to as ‘wicked problems’ in the design community (see Rittel and Webber, 1973) – demand new solutions and unconventional approaches in order for us, as a global society, to improve or even maintain our quality of life as it is.

All of this impacts the field of design in a profound way, in terms of both practice and education. While the demand for designers with technical skills is still constant within the industry, society today demands a new generation of designers who can design not only products and communications, but systems for living as well. For many designers, this means a shift from providing artistic services to becoming strategic planners and professional ‘thinkers’ who can work across disciplines. However, in order for designers to rise to the challenge they will need to become capable of understanding human needs and behaviour, and they will need to develop new problem-solving skills (Muratovski, 2012a: 46–7). This leads us to consider a cross-disciplinary model of design education and research. This model is driven by two key motives: pursuit of results that can be applied in practice; and the search for inspiration that can lead to new, overarching research questions and exchange of methods and conceptual frameworks (Aagaard-Hansen, 2007). In line with this, I have summed up cross-disciplinary design research as an amalgamation of interdisciplinary, multidisciplinary, and transdisciplinary ways of working and associated research practices:

- **Interdisciplinary Design:** Interdisciplinary ways of working call for a collaboration between different areas of knowledge within the same discipline. For instance, two or more mono-disciplinary design teams working alongside each other on the same project. An example of such collaboration can be seen with Apple’s iPhone, where product designers have worked alongside user experience/user interface (UX/UI) designers on the development of an innovative new product. One team has designed the form of the phone, and the other has designed the interface of the phone. Both designs, in this case, are meant to support each other.

- **Multidisciplinary Design:** Multidisciplinary ways of working call for a collaboration between two or more different disciplines when working together on the same project.
This might include a team of designers working with a team of medical practitioners on the development of a new line of hospital furniture and appliances. In such a case, both teams share the knowledge and experience from the viewpoint of their own disciplines, and the result is a co-designed outcome. For example, medical practitioners can help designers to establish the parameters of the problem and may work closely with them through all stages of the design process by providing the necessary feedback.

- **Transdisciplinary Design**: Transdisciplinary ways of working call for a ‘fusion of disciplines’ – a way of working in which designers have ‘transgressed’ or ‘transcended’ their own disciplinary norms and have adapted ways of working from other disciplines (see Lawrence and Després, 2004). This is a case when designers have achieved a sufficient level of knowledge to enable them to work across disciplines in new and innovative ways. This approach is most suitable for working on complex problems for which no single discipline possesses the necessary methods on its own to frame or resolve them. Working in this way requires an extensive amount of knowledge of research methods and methodologies and many years of experience. Designers capable of working in a transdisciplinary mode will be able not only to work in cross-disciplinary teams, but also to lead them (Muratovski, 2011b).

The benefits of transdisciplinarity are already recognized within the field of design (see Cutler, 2009). For example, this approach can provide a systematic and comprehensive theoretical framework for the definition and analysis of various social, economic, political, environmental, and institutional factors influencing design. Nevertheless, a working model of how transdisciplinary design can be framed within design practice and design education is still not fully developed (Muratovski, 2011a). As the complexity of this research model requires a high level of academic proficiency and institutional support, the only place where it can be nurtured further, at least at this stage, is within design education – specifically, doctoral education in design. However, even in this case, there are several steps that need to be followed first.

### 2.6 CROSS-DISCIPLINARY DESIGN EDUCATION

Design is changing from a craft-oriented profession whose emphasis is on individual creativity and commerce, into a discipline that is robust and committed to conceptualization, configuration, and the implementation of new ideas. Integration of knowledge from other disciplines is particularly important in this process. This, however, does not mean that design should abandon its heritage. Successful design – as Friedman (2002) argues – is a merger between crafts-oriented and interpretative ways of working with scientific knowledge about people, information, and society. That is why he encourages designers to form partnerships with other disciplines. According to Friedman (2002), designers working with social scientists will renew
the idea that design is a process that serves both clients and end-users. Margolin provides a similar argument by stating that design is a part of ‘a large social process’ and that the study of design is a study of ‘human action that arises from a social situation’ (2010: 71).

Nevertheless, for a cross-disciplinary partnership to work, other disciplines will have to become more familiar with the principles that guide design, while by the same token designers will have to become more familiar with the principles of other disciplines – not necessarily as scholars in the field, but as professionals whose work is essentially informed by a wide range of factors (Friedman, 2002). What is more, Friedman (2002) also believes that in the future the distinction between ‘analysers and creators’, or between ‘designers and researchers’, will fade substantially as everyone engaged in the process of defining, planning, and configuring artifacts and systems will be considered as ‘designers’ and ‘researchers’. In line with this, Friedman also argues that design is an integrative discipline that already sits at the intersection of several large fields:

In one dimension, design is a field of thinking and pure research. In another, it is a field of practice and applied research. When applications are used to solve specific problems in a specific setting, it is a field of clinical research. (2003: 508)

Furthermore, Friedman also argues that design can be placed within six general domains: Natural Sciences; Humanities and Liberal Arts; Social and Behavioural Sciences; Human Professions and Services; Creative and Applied Arts; and Technology and Engineering (see Figure 2.2).

Design can incorporate some or all of these domains in various capacities depending on the needs of the project. For example, from one perspective, design can be seen as a field of practice and applied research; from another, it can be seen as a field of thinking and scientific research – and often, these two perspectives cross over (Friedman, 2003: 508). Then again, Buchanan (1999) argues that the right approach is finding a balance between research and practice as the strength of design research is not in developing theory alone, but in developing the proper relationship between theory and practice.

Given the complexity of the above-mentioned issues, Friedman (2002) also argues that we need a new paradigm for design education. As the transition of design from an arts and crafts practice to a discipline driven by theory and research is becoming increasingly visible, so is the need to introduce different models of design education. As many design tasks involve dealing with ‘complex adaptive systems’, a ‘design science’ approach to design education will be able to address those developments in the field. By design science, Friedman (2002) refers to a model of technical or social science that focuses on how to do things and accomplish goals. As such, sciences of this nature emerge when skills-based professions move from traditional ‘rules of thumb’ or ‘trial-and-error’ methods to the use of theory and scientific method (Friedman, 2002).

Terence Love (2001) also argues that educating designers to be able to address ‘non-routine situations’ implies more than teaching creative thinking. Designing across disciplines requires skills and cognitive attributes that will enable the individual to draw on material developed in other disciplines at a professional level. In addition to this, he proposes that the very nature of cross-disciplinary design requires designers to have a high level of commercially-based professional skills and cognitive understanding across a wide area of disciplines. This cannot be
taught within the ‘traditional’ model of design education, as cross-disciplinarity requires an advanced theoretical and cognitive model of education that brings together research methods and methodologies, theories, and findings of a wide range of disciplines (Love, 2001).

Considering that the field of design does not have a formally established cross-disciplinary model of education and research, for a similar model we can look to the health sector. The health sector covers a broad range of different areas of knowledge and successfully brings together diverse types of professional practitioners with equally diverse types of researchers. A cross-disciplinary model of working there has been introduced on a sequential level – beginning from an inter-disciplinary point of view and then moving on to a transdisciplinary model in a step-by-step process. In this model researchers gradually move in the direction of integration and practical application (Aagaard-Hansen and Ouma, 2002; Rosenfield, 1992). If design students follow this model of education from an undergraduate level to a postgraduate level, then by the time of doctoral graduation they will have developed a high level of cross-disciplinary skills that
can enable them to generate new knowledge within the field of design and even lead diverse research teams (Muratovski, 2011a, 2011b).

2.7 THE CHALLENGES OF CROSS-DISCIPLINARY PRACTICE

Regardless of the benefits of cross-disciplinary research, implementing this in practice can be challenging. In the process, designers may encounter problems establishing collaboration with other researchers due to lack of knowledge of other disciplines, divergent standards, different methodological approaches, or simply due to negative attitudes and prejudices (Muratovski, 2011a, 2011b). As these issues are general in nature, the same problems can be found among other disciplines (see Aagaard-Hansen, 2007). Some of these issues include the following: Quantitative vs. Qualitative Methods; Closed vs. Open Research Approach; Objectivity vs. Subjectivity; and Causality vs. Description, as described below.

- **Quantitative vs. Qualitative Methods**: For researchers accustomed to working within particular discourses, it can be difficult to come to terms with alternative research approaches. For example, difference in data collection methods is usually the first and the most obvious issue that is raised. Each research group may consider ‘their’ method to be the only appropriate way of gathering data in a particular situation. Therefore a cross-disciplinary team will first need to reach an initial, common understanding that the data collection methods need to derive from the character of the research questions, and not by personal preferences.

- **Closed vs. Open Research Approach**: The choice of data collection methods is directly linked to the degree of openness of the research itself. If the aim of the research is to end up with a concise figure describing a certain occurrence (e.g. a combination of variables), then a closed approach is needed. If the aim is obtaining a balanced picture of a phenomenon, then a more open approach is suitable. Both approaches are appropriate under certain circumstances – the first when exploring tangible, quantified correlations between different variables, and the second when the main aim is the provision of a multi-faceted and overarching description of the new field. The closed approach is necessarily based on the researchers’ preconceived categorization, while the open approach is trying to avoid exactly that, and to allow the categories to emerge from the data. Both approaches are valid, depending on the circumstances. The challenge here is agreeing on what research approach is the right approach for a particular research problem.

- **Objectivity vs. Subjectivity**: The open approach can also be described as a subjective approach. Designers, similarly to anthropologists, function as their own data collection
instruments and they allow themselves a greater degree of freedom when it comes to introducing changes in the research process, or interpreting the data. From the perspective of researchers who apply controlled, quantifiable research methods, this often causes distrust in the objectivity of the data produced, as they find it difficult to draw a line between the scientific findings and the researcher’s personal opinions. In return, this position causes scepticism in the eyes of qualitative researchers, as their scientific position acknowledges subjectivity as a basic precondition for research. The challenge in the cross-disciplinary collaboration will be in finding the right balance between the subjectivity and objectivity in research.

- **Causality vs. Description:** Descriptive research, on one hand, is aimed at describing phenomena ‘as they are’. For example, this includes studies that document behavioural patterns in a certain population, or studies of cultural practices of certain ethnic groups. On the other hand, causal research tries to illuminate specific relationships or clusters of interactions that activate particular behaviours or elicit such practices. Notwithstanding the importance of both ventures, this is an area where the two scientific discourses often differ (Muratovski, 2012a, 2012b).

These are only some of the challenges of cross-disciplinary research. Other issues can range from problems of terminology, conflicting evaluation procedures, and different ways of reporting research (Aagaard-Hansen, 2007; Muratovski, 2011b). Then again, many potential challenges can be addressed by applying several practical solutions. As an obvious first step, cross-disciplinary teams first need to obtain ‘mutual knowledge’ about their own disciplines. Insight into the basics of discipline-specific methodologies, theoretical and historical aspects of the various disciplinary discourses can be helpful in the process of understanding and respecting the position of other disciplines (Aagaard-Hansen, 2007).

Due to its complex nature, the management of cross-disciplinary research poses another challenge. Like many things in life, research is influenced by power and status. Research projects can be seen as ‘battlefields’ of individuals as well as disciplines. Historically, some disciplines have been perceived as being more ‘powerful’ than others – either because of access to funds or by virtue of status. In return, disciplinary boundaries are often propped up by attitudes rather than reason. The question of ‘who decides what to study’ within a cross-disciplinary research team is often one of power balance. Negotiating this balance is perhaps the main objective of research managers or principal investigators, followed by their ability to create and maintain a working environment in which synergism between the disciplines can blossom (Aagaard-Hansen, 2007; Muratovski, 2011a, 2011b).

### 2.8 CONCLUSION

In the nineteenth and early twentieth centuries, design was meant to be used as a tool to make products and communications more appealing to the masses, either through beautification or...
by improved functionality. Things are somewhat different today, and design is increasingly being seen as a strategic resource of broader significance. This has happened due to the introduction of research within the field of design and the willingness of some to look beyond the constraints of their own profession and challenge existing conventions. Nevertheless, for many others, design is still perceived as a kind of ‘mythical gift’ that allows designers to provide creative solutions in a consumer-driven marketplace. While some might find this appealing, the mystique that surrounds the notion of how design works puts into question the accountability, responsibility, and validity of the profession (Swann, 2002: 49; see also Buchanan, 1998: 63–6).

Given that design is an interdisciplinary profession aimed at serving different needs, designers are now expected to work in multi-disciplinary teams whose nature and consistency changes according to the nature of the projects. Also, in order to progress higher within their profession, or within other corporate echelons, designers will need to demonstrate higher integrative skills. This means that they will need to learn more things than they once had to in order to remain competitive and in demand (Friedman, 2012: 144).

The difference between design education today and design education over the past century is that now, in a post-industrial economy, designers are expected to replace the old ways of working based on common sense, trial-and-error, and personal experience, with new ones based on strategy modelling, simulations, decision theory, and systems thinking (Friedman, 2012: 149). Therefore, in order for designers to work successfully in increasingly complex environments and contemporary economies, in addition to their general technical skills they will also need to gain a range of new research skills – hence the need for new knowledge that can transcend disciplines.

Cross-disciplinary research comes in many forms, ranging from quantitative market research to personal interviews, experimental design analysis, and qualitative research. The great benefit of cross-disciplinary research is that it can help designers to gain a keen understanding of various phenomena, people, cultures, and belief systems – and this kind of knowledge can be indispensable in the real world. As such, cross-disciplinary research represents a willingness to look beyond the immediate concern of crafting a project, as well as openness towards integrating new insights to both design and industry (see Ireland, 2003; Zimmerman, 2003). For example, cross-disciplinary research can challenge existing assumptions and provide a sound and up-to-date overview of potential business development opportunities. This type of research can provide business entrepreneurs with directions that are often new and important – directions that may not be identified within mono-disciplinary environments (Cooper and Press, 2006).

The need for more designers with cross-disciplinary research skills is even more evident if we take into account that a great deal of the corporate research that can be classified as design research is already carried out by experts who were not trained as designers. Google, Microsoft, IBM, Hewlett-Packard, Intel, and many other large corporations already hire doctoral graduates coming from fields ranging from electrical and software engineering to anthropology and psychology to conduct their research on future products and systems development, and this research is then used in the development of design briefs. This is obviously a downfall for the field of design as designers should be a part of this research and development process (Margolin, 2010).
In order for things to change, designers will need explicit, quality education, and experience in research methods. This, however, raises the need for qualified design educators who can teach research methods and guide integrated design projects and strategies, as well as integrate such specialized courses within university design curricula (Hanington, 2010). Currently, there are not many design academics that have such skills, but with universities increasingly demanding that their teaching staff obtain doctoral degrees, things will most certainly begin to change in the near future. As a result, making research an integral component of design education can help create a new generation of designers capable of introducing changes to the practice of design as well. This process is unlikely to happen overnight as the changes within the design curricula will need to be introduced gradually, but evolution of design practice through design education is inevitable (Muratovski, 2011a).

In spite of the complexity associated with this type of research, there can be many opportunities for generating new knowledge when researchers with diverse backgrounds begin working in a cross-disciplinary fashion (Aagaard-Hansen, 2007). The challenges and opportunities that I have presented here, albeit in simplified and polarized form, do highlight the need for relevant and innovative cross-disciplinary research within the field of design. Designers who pursue a cross-disciplinary model in their own education will be better equipped to work in complex environments, and in time they can even lead cross-disciplinary teams towards the pursuit of new knowledge (Muratovski, 2011b). Overcoming these challenges is certainly not an easy task, but it is not an impossible one. This book will hopefully introduce you to a number of techniques that can help you to achieve this.

2.9 SUMMARY

In this chapter I have examined design research and its role in the field of design. Here I have touched upon some of the different ways of seeing research within the design context and I have explained the need for adopting a scientific approach to design research. Furthermore, I have considered the potential for developing a model of cross-disciplinary research that can transcend the disciplinary bounds that are inherent in the typical monodisciplinary design practice and research. A review of the literature shows that such a model can be placed within a broader educational framework by bringing interdisciplinary, multidisciplinary, and transdisciplinary ways of working together. The proposed taxonomy highlights the benefits of this model for the advancement of the field of design and suggests the introduction of cross-disciplinary ways of working in design education and research.