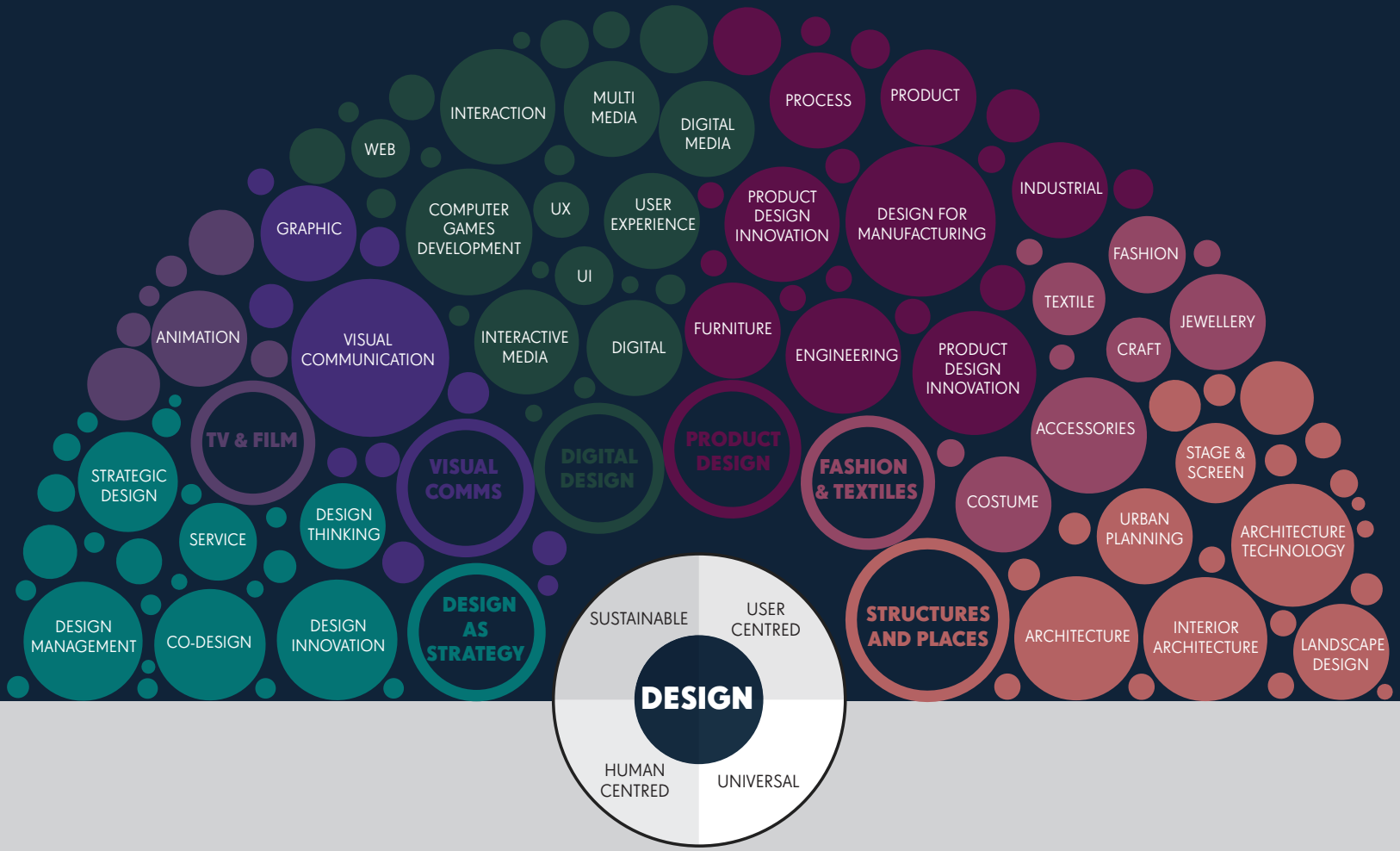


WINNING BY DESIGN

An introduction to the design skills required for firms to be innovative and competitive in global markets

National Skills Council

Expert Group on Future Skills Needs

WINNING BY DESIGN

An introduction to the design skills required for firms to be innovative and competitive in global markets

CONTENTS

FOREWORD

Design has long been associated with aesthetics and what is pleasing to the eye. But it is much more than that. Today design thinking informs the strategies of major organisations and is being used to create innovative services, to address social issues and even to shape better public services and policy-making.

As early as 1937, the Irish Government recognised design in a policy context when the Minister for Industry and Commerce set up an advisory committee on design and industry. Fast –forward to 2017 with this Report, Winning by Design, it is clear that design and industry are not mutually exclusive sectors. In fact, Ireland's policy-makers can, by encouraging a design culture in Irish enterprise, attract and nurture design talent and help to attract and retain foreign direct investment and grow indigenous enterprise.

In the Government's 2016 Action Plan for Jobs, the Expert Group on Future Skills Needs committed to undertake a scoping exercise on the nature of the design skills required across the economy to meet the future needs of enterprise in the traditional non-design intensive sectors[1].

Winning by Design has begun to look at the specific design skills necessary across the economy but also the definition of design, and how businesses that use design as a strategic means to encourage innovation can sharpen their competitive edge.

The Report recognises design as a key component of Ireland's innovation ecosystem. It presents evidence that design can add value to enterprise. The Report illustrates how the digital revolution has given rise to numerous design disciplines that require overlapping skills.

I would urge the National Skills Council to prioritise the primary recommendation contained in this report, to commission a review of enterprise demand for design skills and the provision of those design skills by the education system so that Ireland's enterprise base can grow and compete in new markets.

Tony Donohoe

Chairman

Expert Group on Future Skills Needs

[1] Ireland's traditional design sectors are sectors such as architecture, fashion design, craft, and furniture design.

ACKNOWLEDGEMENTS

The Department of Business, Enterprise & Innovation (DBEI), in particular, Catherine MacEnri of the Education and Skills Policy Unit, would like to thank all the design stakeholders (listed in Appendix 4.1), from both academia and industry, who gave generously of their time, provided insights and material, attended the validation workshop and gave feedback on the draft report. This report could not have been completed without their support.

DBEI would also like to record its appreciation to the members of the Expert Group on Future Skills Needs (EGFSN) (Appendix 4.3) for their commitment and contribution in overseeing the progress and development of the study.

EXECUTIVE SUMMARY

Design is a broad and vague term which can mean different things to different people. The term itself can conjure images of sectors as diverse as fashion, architecture or product manufacturing. There are a myriad of design disciplines, namely, product design, fashion and textiles, structures and places, digital design, visual communications, TV and film, and strategic design. It has played an increasingly important role in business and the economy in recent years.

The objective of this report is to act as an introductory paper to establish what is meant by design and how pervasive it is in our society and economy. In this regard, for the purposes of this report design is defined as the combination of three elements, aesthetics, functionality and user need. On this basis this report examines the nature of design, its evolution, its economic value, and how firms can adopt design strategically in order to foster their growth. The report is the result of desk research, a series of in-depth consultations, and insights captured via a stakeholder workshop.

The digital explosion of the 21st century has revolutionised design and the importance of design to our economy cannot be overstated. Traditionally design has been perceived as a solely aesthetic process entailing a visual component or tangible product, however, this perception of design no longer holds true. Design is now pervasive across many sectors, often working hand in hand with technological advancement. New digital technologies are giving rise to new forms of products and services which in turn are putting new pressures on businesses and society. This is requiring the design of solutions to increasingly complex problems which are often global and diverse in nature. Design thinking is also changing the way businesses operate. Today design thinking informs the strategies of major organisations and is being used to create innovative services, address social issues, and even to shape better public services and policy making.

Design is a strong contributor to the Irish economy and is a domestic driver of growth. In 2012, total design exports from Ireland were valued at €38bn, amounting to 21% of total exports in the economy. Research has shown that innovation is essential for business survival and design is key to this innovation. Design improves competitiveness through increased productivity with new or improved products, processes, services or business models. Design can drive

> The objective of this report is to act as an introductory paper to establish what is meant by design and how pervasive it is in our society and economy.

value as research indicates that products, services and strategies that are well designed are more successful than those which are not. As an activity, design can be viewed as complimentary to R&D as it aids the transformation of research into commercially viable products and services and brings innovation closer to user needs. Design has been proven to drive success and open pathways to winning new markets. Thus the promotion and development of Ireland's capability in business-related design is imperative.

Equally as the definition of design has broadened so too has the design skillsets required by industry. Traditionally design roles have been associated with problem solving and creative ability. However nowadays firms have a clear and strategic requirement to recruit and train designers who possess wider skill sets. The skills widely recognised as being necessary in a designer today include (but are not limited to) multi-disciplinary working, empathy, creativity, technical ability, business acumen and strategic thinking. It is difficult to measure, in this regard, if the supply of designers is meeting demand as the lines between the disciplines are becoming increasingly blurred, particularly in relation to the disciplines of design, ICT and engineering. The emerging hybrids of design mean that job roles no longer fall into neat categorisation. Designers are now being asked to work in ways which transcend disciplines.

The findings and recommendations of this research are dealt with in the final chapter of this report. They can be summarised under three key headings; namely design education provision; design training for businesses and designer upskilling; and funding of design. To further develop and enhance design in Ireland a proposed action plan is drafted and included in Appendix 5.

1 INTRODUCTION

Design has traditionally been associated with the fashion and craft sectors, however, this is an understanding of a very early version of design and not what design is today. Design has evolved alongside industrial development and has incorporated the complexities of a modern 21st century company to become an integral component of industry and the services sectors and yet it is still not well understood. This report sets out to offer an introductory insight on what design is today, its economic value and why it is imperative that companies embrace design strategically and embed it in their culture if they want to win new markets and thrive in these uncertain times.

The talent and reputation for creativity in Irish design provides the foundation for design to act as a key driver of economic growth in these very uncertain times as the country faces the impact from Brexit and the new political regime in the US.

Creative qualifications are highly sought-after by the best global companies because creative graduates are able to think independently and critically, work well as part of a team, multi-task and generate new ideas through debate and discussion.

For some enterprises, design is explicitly included in their strategies and is a source of advantage. For others it is intrinsic to what they do but perhaps not stated/understood as a basis of competitive advantage and as a result not captured, protected and managed as intellectual property. Ireland's registered designs are among the lowest in the EU and about one-third of that of comparator countries such as Denmark and Finland.

Nonetheless, good Irish design has a reputation for being customer and market focused, and being robust and agile. For example, Glen Dimplex has used design as a basis for differentiation and positioning in premium segments of markets for more than 40 years. Similarly, Dairymaster and Keenans are designing products and customising solutions to meet different customer, market, environmental and regulatory requirements. Moocall in association with Dolmen (an Irish product Design company) launched, in winter 2014, a device to monitor cows in calf. It is already a market leader with products in 16 countries.

In the medical device sector good design is an integral part of bringing products to market. In ICT, the first Intel designed chip from Ireland, the Quark x1000, was launched in 2013 and the design firm synonymous with designing the Logitech mouse is an Irish design company, Design Partners, based in Bray. Frontend.com, an Irish interaction design company, has developed a world award winning online and app based product called Mymilkman.ie that is disrupting

traditional markets in the same way as Uber and Hailo have done in the taxi market.

Multinational corporations who are “in-sourcing” design capability have established design studios or innovation labs in their FDI operation in Ireland, most notably Accenture, who acquired global design company, Fjord, and IBM who have also acquired several independent design companies and is now one of the world’s leading employer of designers. Both companies continue to hire designers including here in Ireland.

The importance of design to success in markets presents an opportunity to promote and develop Ireland’s capabilities in business-related design across all sectors of the economy. Design is critical to success in new and emerging sectors of, ICT, gaming, mobile communications and media, medical devices and connected health.

Under the Government Action Plan for Jobs 2016, the Expert Group on Future Skills Needs (EGFSN) committed to undertake a scoping exercise on the nature of the design skills required across the economy to meet the future needs of enterprise in the traditionally non-design intensive sectors.

There are currently a wide range of design specific and design related courses available in Ireland and the key issue is the extent to which the quantity and quality of graduate output is matching demand now and if this is sufficiently adaptable to the future need of enterprise as design evolves.

The EGFSN carries out research, analysis and horizon scanning in relation to emerging skills requirements at thematic and sectoral levels, drafts reports setting out the projected needs and submit the findings of its research and the agreed Action Plans to the National Skills Council for prioritisation and implementation.

2 CONTEXT

2.1 Historical overview of the role of Government in recognising and supporting industrial design in Ireland[1]

In early 1922, following the signing of the Anglo-Irish Treaty which would establish the Irish Free State, Thomas Bodkin, a lawyer and future director of the National Gallery of Ireland prepared a paper on the functions of a Ministry of Fine Arts. He proposed that in conjunction with the Ministries for Trade, Commerce and Economic Affairs plans should be prepared for the 'education of craftsmen, through technical schools or schools of design' but little progress was made in forwarding the plans.

In 1925 in an unsigned article in the *Irish Statesman* entitled '*The Arts and Industry*' it was pointed out that neglect of the visual arts in Ireland had had a deleterious effect on Irish industry and that appeals to support native industries fell on deaf ears when the quality of design was poor. The author suggested that the situation could be improved by employing artists and 'securing the best design, to give beauty and national character to Irish industries and to win some international repute for quality' whereas any 'attempt to compete with the great industrial countries who have concentrated on mass production was almost certain to fail'. These sentiments were repeated almost 35 years later in the Scandinavian report[2].

In 1935 Bodkin, in a lecture delivered at Trinity College Dublin on *The Importance of Art to Ireland,* blamed the government for the lack of interest in the visual arts in Ireland which contributed to inhibiting the flourishing of design. He cited the development of the applied arts in many European countries which resulted from the fine arts and referred to the investment made by French and British governments in the arts and contemporary craft-based industries.

In 1937, the Minister for Industry and Commerce appointed an advisory committee on design and industry. It made little headway because of its advisory nature and ceased operating at the outbreak of the Second World War.

After the war and following a change in Government, Taoiseach, John A Costello commissioned Bodkin in 1949 to write a report on the arts in Ireland, exploring questions of design for industry, and examining the relations between the arts and industry including activities such as technical training in craftsmanship, the provision of industrial designs, and the interest of manufacturing industries in the importance of design in industry. The design in industry chapter included information on the Council of Industrial Design established in the UK in 1944. He recommended that something similar be set up in Ireland although on a smaller scale.

[1] Excerpts from The Scandinavian Report: its origins and impact on the Kilkenny Design Workshops, Una Walker, Journal of Art Historiography, No. 9, December 2013

[2] Design in Ireland: Report of the Scandinavian Design Group in Ireland, 1962

In 1963 the Taoiseach stated that it had been a mistake to place responsibility for industrial design with the arts council as they presented ‘design to business people as an arty matter, whereas, in fact it is an entirely commercial matter’

The main outcome of this report was the 1951 Arts Bill which instituted the Arts Council of Ireland and included in its remit was Design for Industry.

An Corás Tráchtála (the Export Board), which was merged with Forbairt in 1998 to form Enterprise Ireland, was concerned with the promotion of exports from Irish industries and as such also had an interest in product design and marketing. In 1953 the Board encouraged the London based Design Research Unit to open a Dublin office as no such similar organisation existed that could advise manufacturers in Ireland on design and presentation of goods which would make them acceptable to the American and Canadian markets. The Export Board asked if the Arts Council might organise an exhibition of design in industry to coincide with the opening in 1954 of the Dublin office of the Design Research Unit. The catalogue for the exhibition suggested that the experience of the Nordic countries in the field of industrial design was within reach of a comparable country like Ireland and that the Nordic countries had overcome their disadvantages in the international market by ensuring the quality of their design. Following the success of the 1954 exhibition another one was organised in 1956. By 1958 the Arts Council was offering small grants to commercial firms to cover the costs of employing a designer to improve the design of packaging and in 1960 awarded a substantial industrial design scholarship.

The responsibility for promoting industrial design within the cultural sphere of the Arts Council was recognised later by the government as problematic and was eventually transferred to the Irish Export Board in 1961. When questioned about this in 1963 the Taoiseach stated that it had been a mistake to place responsibility for industrial design with the Arts Council as they presented ‘design to business people as an arty matter, whereas, in fact it is an entirely commercial matter’. He also noted that the Export Board, through the Scandinavian report, had promoted ‘greater interest in industrial design than all the exhortations of Ministers, Arts Councils and others had succeeded in doing’.

The Export Board commissioned a report entitled *Design in Ireland: Report of the Scandinavian Design Group in Irelan*d which was published in February 1962 and stimulated a bout of press articles and letters from the public. Many of the major recommendations were not acted upon, however one new organisation which was able to implement many of the recommendations was established, namely, the Kilkenny Design Workshops (KDW), a multi-disciplinary, state sponsored design consultancy. The aims of the KDW included:

- To supply new designs to industry;
- To generate new manufactures through the provision of designs and prototypes;
- To form a link between industry and designers;
- To provide a centre where overseas buyers could work with designers and manufacturers to develop new ideas.

The KDW opened in 1965. It was influenced, not surprisingly, by the example of the Scandinavian focus on craft-based industries rather than on design for light or heavy industry. By the early 1970s it was becoming clear that the KDW needed to diversify in to areas of production beyond the craft-based industries. A survey of the needs of engineering companies was undertaken in 1973 in response to the enormous expansion in this area since the 1960s. Plans were drawn up to provide model-making, prototyping and technical support for engineering concerns. However the 1970s oil crisis and financial slow down prevented the necessary capital investment. The workshops did however, change over time and worked with companies as diverse as Nokia, Apple and GEC. The first Apple mouse was designed at KDW.

In an ironic twist it could be said that with its focus on traditional techniques and materials the Scandinavian Report in fact inhibited the development of industrial design in Ireland. The Kilkenny Design Workshops closed in 1988.

It could be argued that the Government had no direct involvement in the funding, promotion, and fostering of industrial design since the closing of the workshops in 1988 until 2015 when it sponsored ID2015, the yearlong programme celebrating Irish Design and which marked the 50th anniversary of the opening of the Kilkenny Design Workshops.

2.2 Year of Irish Design - ID2015

Arising from the Global Irish Economic Forum in 2013, the Irish Government designated 2015 as the Year of Irish Design (ID2015). ID2015 presented an opportunity to promote and develop Ireland's capabilities in business-related design across all sectors of the economy and to improve capacity for quality design across the enterprise sector. The aim of ID2015 was to bring visibility to Ireland's dynamic design businesses and to encourage more businesses to utilise design, ultimately creating jobs at home. A detailed review of the success of ID 2015 is available in *Irish Design 2015 – Making Design Matter*[3].

2.3 Policy Framework for Design in Enterprise in Ireland

One of the central objectives of ID2015 was to demonstrate the value of design to business and to the economy. The Department of Business, Enterprise and Innovation (DBEI), (formerly the Department of Jobs, Enterprise and Innovation (DJEI)) undertook a number of research studies in support of this objective. The output from this research was the *Policy Framework for Design in Enterprise in Ireland*[4]. The focus of the research was on the economic value of design to the Irish economy and on understanding the role and importance of design activity in enterprises outside of the traditional design sectors. The development of the Framework was informed by a series of research studies, namely:

- The '*Irish Design Footprint*': Economic Value and Characteristics, Department of Jobs Enterprise and Innovation, 2016.
- *Profile of Business in the Traditional Design Sectors*, January 2016, A Report for the Design and Craft Council of Ireland, by Con Kennedy. (not published)
- *A Study of the Role and Importance of Design in Firms in Ireland in Non-Design-Intensive Sectors*, December 2015, A report for the Department of Jobs, Enterprise and Innovation by CM International and PDR.

The research found that, based on a broad definition of design, design has a significant economic impact on the Irish economy with workers engaged in design roles employed right across all sectors of the economy. (Section 7.4.1)

2.4 Ireland – the Design Island

Ireland – the Design Island: A consultation paper towards a National Design Strategy[5] was published in February 2017 by the Design & Crafts Council of Ireland (DCCoI) as a follow up to the Year of Irish Design 2015 (ID2015) initiative and the *Policy Framework for Design in Enterprise in Ireland*.

[3] Irish Design 2015 – Making Design Matter, DcCoI, 2016
[4] Policy Framework for Design in Enterprise in Ireland, DJEI, 2016
[5] http://www.dccoi.ie/content/files/National_Design_Strategy_ISSUU.pdf

Developing a strong design capability and increasing the engagement in design-driven innovation in the wider enterprise base will not only help to retain, attract and nurture design talent in Ireland but more importantly will attract and retain foreign direct investment and grow indigenous enterprise. A key element in achieving this will be to ensure that the appropriate skillsets are being developed to help the industry to thrive.

An extensive consultation process was undertaken involving a broad range of education and industry stakeholders, including Enterprise Ireland client companies; DCCoI registered clients and member organisations; small and medium enterprises (SMEs) currently using or considering using design, coordinated through the Local Enterprise Office network; multinational companies coordinated through the IDA; as well as higher education design educators and professional bodies.

The resulting document deals with the broad range of issues that need to be addressed in a National Design Strategy for Ireland. It is structured under four themes, which reflect the key challenges faced by the design sector, namely:

1. Policy & Promotion;
2. Research & Innovation;
3. Education through to Enterprise;
4. Society, Culture & Collaboration.

The main aims of the consultation paper are to:

- develop Ireland as an internationally-recognised centre of excellence for design and design research, building on Ireland's rich heritage in craftsmanship, innovation and creativity;
- create a design culture and promote a better understanding of both design and the value of design in business and society
- expand Ireland's design skills base, from primary level education upwards
- increase the use of design as a source of innovation in Irish businesses, especially in the sectors identified as key growth areas for Ireland
- champion the use of good design in addressing Ireland's societal challenges and increase the use of design by public bodies
- encourage the use of design in public procurement processes in order to drive innovation.

The consultation paper will inform the Department of Business, Enterprise & Innovation's plans for developing Ireland's design capability and for encouraging design thinking across all sectors with design now being a specific component of the Action Plan for Jobs process in 2017, both at national and regional levels.

2.5 The Case for Developing Skills and Talent in Design

Developing a strong design capability and increasing the engagement in design-driven innovation in the wider enterprise base will not only help to retain, attract and nurture design talent in Ireland but more importantly will attract and retain foreign direct investment and grow indigenous enterprise. A key element in achieving this will be to ensure that the appropriate skillsets are being developed to help the industry to thrive.

The Framework was developed based on the opportunities identified for advancing the role of design in support of enterprise, economic sustainability and growth and was based around six elements one of which is the focus of this study, namely: "Developing Skills and Talent in Design".

The *Policy Framework for Design in Enterprise in Ireland* identified an opportunity:

- To review the educational provision of Design Courses to determine their relevance to the needs of Irish industry and the extent to which they reflect the career opportunities that now exist for graduates in new and emerging areas.

Building on the opportunity articulated in the Policy Framework the overarching objective of this study is to:

- Create an understanding of what design is and identify why design skills are necessary to wider enterprise.

The specific objectives were to:

i. Profile the current provision of design skills
ii. Profile the nature and type of skills required across the economy with a particular emphasis on the non-design intensive sectors.
iii. Explore how greater interdisciplinary collaboration can take place within education provision including how to strengthen linkages between the STEM and creative disciplines.
iiii. Identify international best practice which Ireland can adopt to suit its needs.

2.6 Study Methodology

The output from this study includes a mapping of quantitative data where available but is primarily qualitative as it emerged very early in the research that the nature of design today is complex, diffuse and rapidly changing. Therefore, much of the effort was devoted to getting behind what exactly was meant by design, which disciplines of design were more relevant to the wider enterprise base and the role of design and the designer in enterprise.

The research conducted was both desk research and a series of in-depth consultations with design education providers, design consultancies and non-design intensive business who had established design units.

This study will identify the need for Ireland's wider enterprise base to be innovative and competitive in global markets in an ever changing and uncertain world. The focus is not just on what is necessary for the traditional design sectors such as architecture, fashion design, craft, furniture design etc. but also on understanding what design skills are and how they are necessary for the traditionally non-design intensive sectors.

3

WHAT IS DESIGN?

3.1 What is design?

Design is a rather broad and vague term. When someone says “I’m a designer,” it is not immediately clear what their job is as there are a number of different responsibilities encompassed by the umbrella term “designer”.

Before determining what the design skills of enterprise might or should be and whether Ireland is producing both sufficient numbers and the right kind of designers, it was first necessary to understand what exactly is meant by “design”. The word design means different things to different people in different contexts. There is no one agreed definition of design.

When the word design is used several seemingly different things come to mind. Some will immediately think of industrial or engineering design, i.e. the design of products or processes in a manufacturing environment, for others it will be architecture, i.e., the design of buildings, or it might be fashion design which tends to have an allure and aura about it that says fashion design is for an elite, yet everyone wears clothes!

But are there common elements to these different design domains?

The first common element that comes to mind, and for many people the only element, is the “aesthetic”, whether the object looks beautiful or is an object to desire. While this aspect of design is intrinsic and necessary it is also, unfortunately, the component of design that has prevented design being embraced and adopted as a necessary part of any product, process or service being developed and delivered by either the public or private sector.

With the advent of technology and mass production what became more important was the "functionality" of a product, the "how it worked". A complete dichotomy developed between objects that were considered beautiful and things that functioned. One was Art and the other was Technology and they travelled on separate paths.

But something changed towards the end of the 20th century when the use of design in developing better and more user-friendly technological products began to emerge. Nowhere is this more synonymous than with Apple which embraced design to give it a competitive advantage.

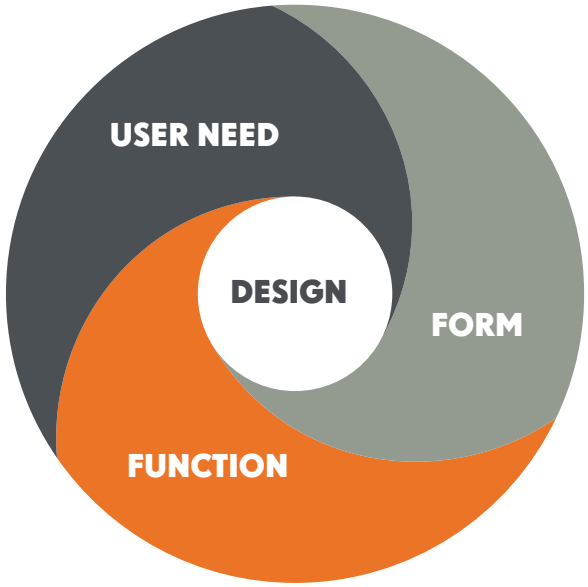
This intersection of design and technology gave rise to a third element of design – the consumer or "empathy with the user" or what is often referred to as human-centred design. (Figure 3.1)

In the 1980s the concept of consumer empathy was remarkably novel. At the time Japan was king of consumer electronics and the prevailing attitude was that devices were not designed for consumers; if they didn't get them, it was *their* fault. This was during a time when the people who used computers tended to be hobbyists. Their threshold for accepting products quirks and flaws was enormous, and most computer makers took that for granted. Alongside this was the acceptance by consumers of cheaper products that were mass produced. The beauty of an object or the intuitiveness or user friendliness of it were sacrificed over cost.

However, Apple adopted a different approach to the Japanese and incorporated empathy - an intimate connection with the feelings of the customer - into its marketing philosophy with the aim of understanding its customers' needs better than any other company.

In the early 1980s, design was a niche profession. "Design thinking," a process that emphasized empathy with user needs, hadn't yet been fully articulated. However it was then that the idea of the consumer experience being part of the design process of technology products began to take root.

Figure 3.1: The triple components of design



Source: DBEI

The success of Apple's products from its desktop filing system of folders on the Macintosh personal computer to the intuitive design of the first iPod with its one central round button control and screen interface, which demonstrated the added value of combining technology with aesthetics and user's needs heralded a new era in design. Apple realised that design did not stop at the physical device, it was a story of experience from opening the box, to the physical and screen interface. At this point Design made a massive leap from the physical to the virtual worlds. It is probably fair to say that while Apple was one of the first companies to see the need for and adopt the tripartite nature of design to their products, they did not invent it. As in almost all success stories there was also an element of fortuitousness as it coincided with a time when consumers were beginning to have a stronger voice. The novelty of cheaper mass produced products that did not always do what the consumer wanted began to lose its shine and an era of personalisation and customisation of products began to grow.

Apple worked with a number of design companies such as frogdesign (German) and IDEO (American) both of whom were early pioneers of human-centred design born out of a desire for improving the everyday lives of people and a passion for innovative technology. Apple's partnership with these design companies ensured the embedding of design as part of Apple's DNA and corporate culture and is an early exemplar of how design is necessary to be successful in today's globally, digitised, technological world.

In conclusion for the purposes of this study Design is defined as follows:

DESIGN = FUNCTION + FORM + USER NEED

There are therefore three elements to design:

i. It works: function

ii. It looks nice: form

iii. It is simple and easy to use, developing a loyalty in the user to the product: user need

Most people recognize that the aesthetic and functional details of a building or the layout of a printed advertisement result from a creative process called design, but fewer people realize that design does not necessarily entail a visual component or even a tangible product. For example, a design can symbolize the organisation of a team of workers or represent a plan for navigating one's way home during rush-hour traffic and the three elements of design in the definition above equally apply to these types of design.

The above definition of design is useful in that it can apply to a product, process or a service and does not depend on any specific design domain.

3.2 What does a Designer do? - the Design Process

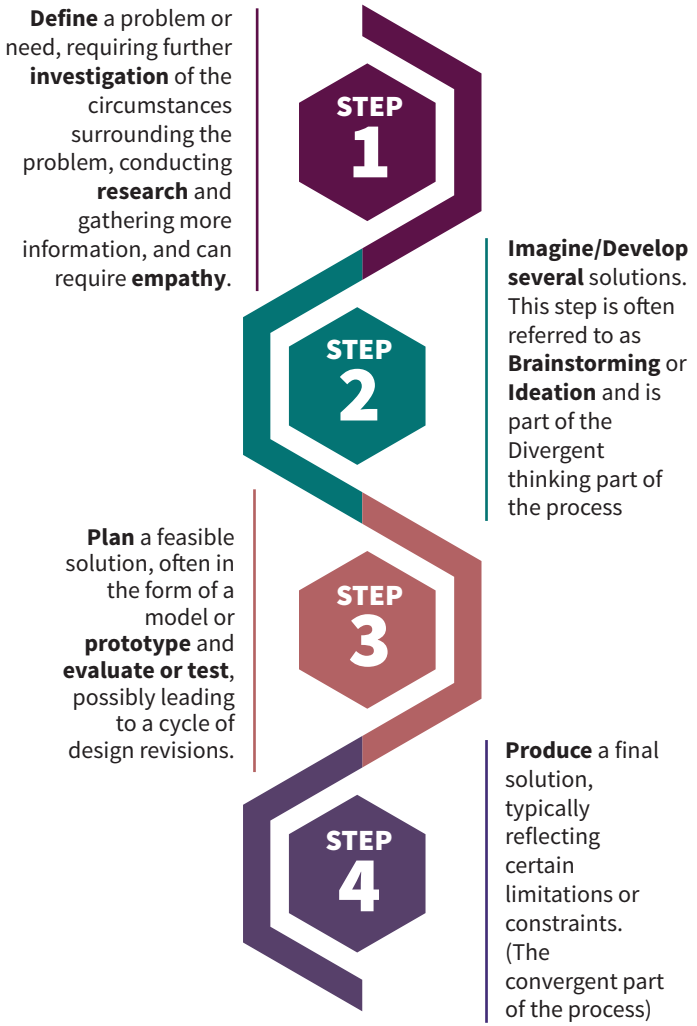
Creativity is an inherent part of designing and has led to an impression that designers just produce a design out of thin air, pure inspiration from a creative mind, and the how they get to their design is a "black box", i.e. completely unknown. This however, is completely untrue as the act of design can be defined as

> "**A purposeful and creative process for developing solutions for defined needs and audiences**"[6]

There are a number of key elements to design which enable a structured process to be developed that does not hinder creativity but in fact facilitates producing the best design possible. The following are some key components of design:

- Design **fulfills a need** or **solves a problem**. It is carried out purposefully and is not random or arbitrary.
- Design **is creative.** It involves the **development of something new**, different, **or improved**, i.e. it results in innovation.
- Design **embodies an aesthetic component**, be it the visual appeal of an object or the organisational elegance of a workflow system.
- Design **is practical** because it provides a solution to a perceived problem or need.
- The **solution is not predetermined.** There can be more than one viable solution or design.
- Design should **respond to a particular audience**. For example, a chair that is designed for a child will likely differ in form and style from a chair designed for an older person.

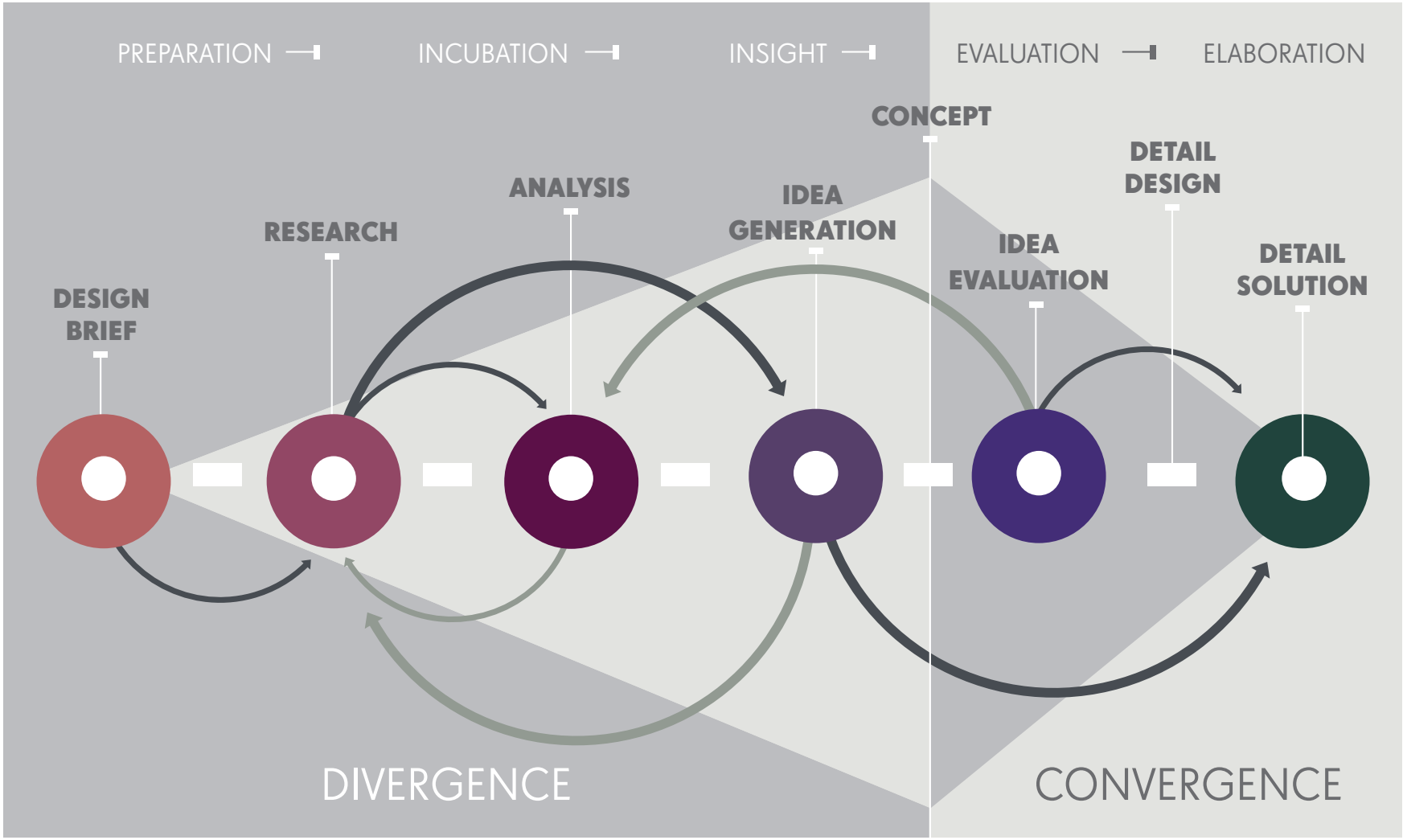
As there are multiple definitions of design there are also multiples of design processes and each designer or design engineer will tweak a design process to suit their way of working or the discipline they are working in. That said there are common key steps in all design processes. The number of steps can vary from 3 to 11 but all design process can be narrowed down to 4 steps, namely:



[6] http://www.nbm.org/schools-educators/design-education/design-the-design-process-and-design-education.html The National Building Museum is America's leading cultural institution devoted to interpreting the history and impact of the built environment by telling the stories of architecture, engineering, and design.

Different words are often used and/or steps elaborated but the process essentially boils down to the four steps outlined above. It is also important to note that the design process is not linear, and actions do not always proceed sequentially. In fact, the phases of the design process often alternates back and forth and repeats many times before arriving at a final design prototype. Design is a constantly shifting, fluid process as shown in Figure 3.2.

Figure 3.2: The Design Process



Source: Enda O'Dowd, MSc. Medical Device Design Co-ordinator, NCAD, Dublin

A key aspect to the design process is the "Divergent – Convergent" part. During the Divergent Thinking phase all creative ideas are on the table before the Convergent thinking phase which involves a narrowing down to the best idea based on the understanding of the identified need or problem. In all the creative design process this divergent and convergent thinking phases occur and can be represented by a diamond shape. However, the Design Council in the UK have developed the "Double Diamond" Design Process[7] indicating that the divergent-convergent process happens twice, once to confirm problem definition and then to create the solution. This is the model seen in the Design Thinking process in Section 5.5 and Figure 5.6. The rationale is that this first diamond phase is critical or the designers end up solving the wrong problem!

3.3 Design Engineer vs Designer

No differentiation has been made between the Engineering Design Process and the Creative Design Process when coming up with a generic Design Process as there is considerable overlap and similarity between the design processes used by both Engineers and Designers. This similarity in the role of designers and design engineers can cause confusion when trying to determine if supply meets the demand for "Design" jobs. There has always been confusion between Design engineering and Industrial design. Today the lines between them have blurred even more, as has a blurring of the lines between Art and Design.

A fundamental difference between the engineer and designer is the way they think. Engineers design from the inside out, taking research and technology and applying it to a market need while designers design from the outside in, starting with human problems and using technology to solve them. Engineering is applied maths and science while Design is applied creativity and therein lies the difference. The complex and abstract elements of design such as the meaning, semantics, values, emotions and social aspects of a product, environment or service are often less well understood by design engineers than by designers. Engineering education focuses on deep specialised training and can be characterised as promoting a sequential gateway development process. This is in direct contrast to the holistic helicopter perspective of design training, with its messy and iterative creative design process. However, that does not mean that creativity is not important in engineering but its starting point is maths and science and while the aesthetics and user needs are the starting point for a designer they also need to understand the fundamentals of engineering, science and how things work. The engineer thinks in terms of measurement and absolutes and ensuring the end result meets specifications and functions while the designer thinks more about the look and feel, the aesthetics, the functionality combined with ease-of-use. In relation to products, designers reach the consumer on an emotional level and there are numerous examples in the modern technological world that show that:

PRODUCTS THAT ARE ENGINEERED SELL,

BUT

PRODUCTS THAT ARE ENGINEERED AND DESIGNED SELL WELL[8]

So it's not an either/or. Both designers and engineers are needed as they each bring different strengths and skills to the table.

[7] http://www.designcouncil.org.uk/news-opinion/design-process-what-double-diamond

[8] Klas Telecom; an Irish engineering and design company which develops highly capable, lightweight communications solutions for use in austere environments won the Red Dot Design award in 2015 and 2016 in conjunction with Irish product design company, Dolmen for the Voyager 8 Portable Data Communications System. The Red Dot Award is one of the most-respected design competitions in the world. The sought-after "Red Dot" award, founded in 1955 and now with around 17,000 entries each year, is the revered international seal of outstanding design quality. The Red Dot Design Award comprises three disciplines: Product Design, Communications Design, and Design Concept.

4 WHICH DESIGN DOMAINS FOR IRELAND?

4.1 Which categories of design are most relevant to Ireland's enterprise base?

The previous section has developed a generic definition of design and a generic description of the design process which applies across all design domains. However, for the purposes of determining which design skills are needed by Irish companies it is first necessary to determine which categories of design are most relevant to the Irish enterprise base.

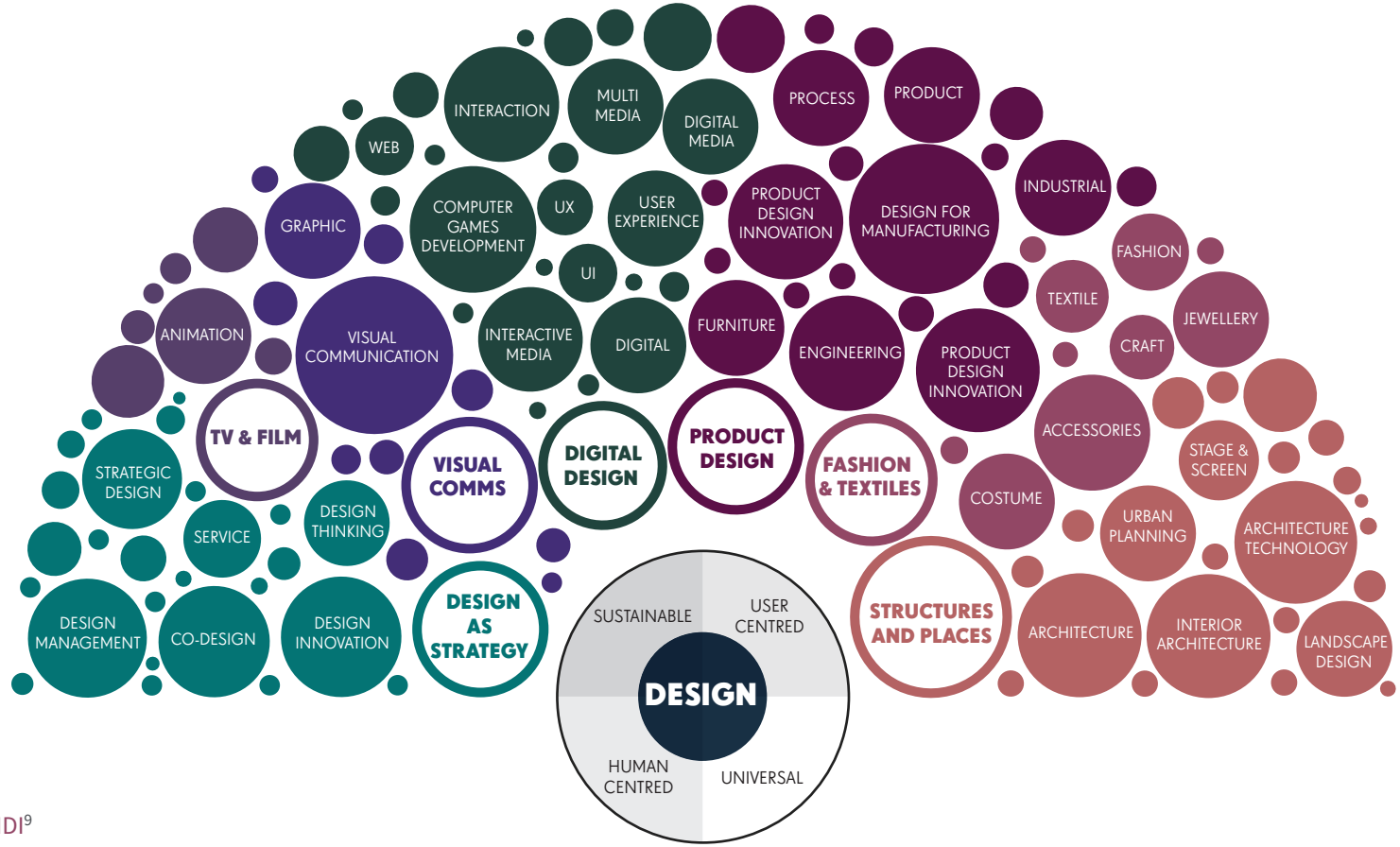
One of the most striking things when one first attempts to work through this is the myriad disciplines of design (Figure 4.1). However, when one reflects on the multiplicity of design activities one realises that it reflects all human activities, therefore design is intrinsic to what we do as humans.

Figure 4.1: The different disciplines of Design Source: DBEI

In order to focus on those design areas that will add most value to the cohort of Irish companies it is necessary to somehow categorise the different disciplines.

Categorising design disciplines is complex as there is significant overlap. In Figure 4.2 the different disciplines have been grouped together using categories based on the IDI (Institute of Designers in Ireland) categories for their Annual Irish Design Awards. What emerges is a somewhat clearer picture of the design categories.

Figure 4.2: Categorising the disciplines of Design



Source: DBEI and IDI[9]

[9] IDI – Institute of Designers in Ireland, categories of design used by IDI for their Annual Irish Design Awards

THE MYRIAD OF DESIGN DISCIPLINES CAN BE CATEGORISED INTO 7 CATEGORIES NAMELY:

PRODUCT DESIGN

FASHION & TEXTILES

a subset of product design

STRUCTURES AND PLACES

DIGITAL DESIGN

VISUAL COMMUNICATION

better known as graphic design, is one of the first design disciplines and has evolved today to become an intrinsic part of digital design

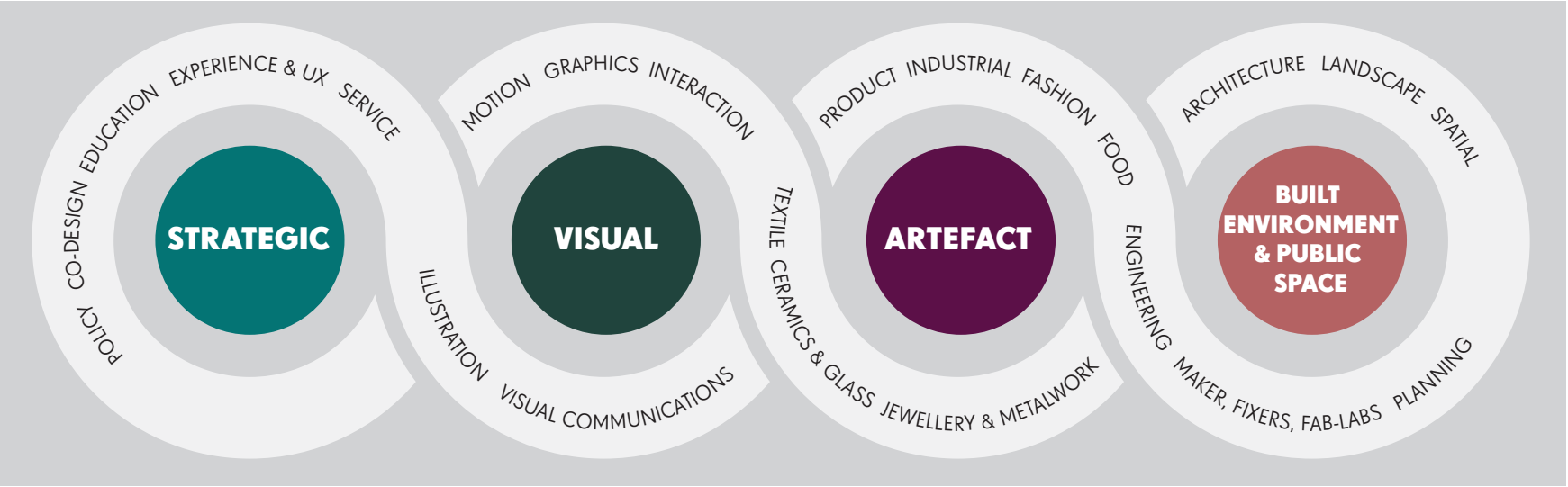
TV & FILM

including animation which has been very successful in Ireland. This is also viewed as a subset of digital design.

STRATEGIC DESIGN

This can be "simplified" further as presented by Iterations[10] (Figure 4.3). This representation while having only 4 main categories demonstrates the complexity and overlaps which are presented in the grey shaded areas. The colour coding in the Iteration graphic of orange for product, green for digital and light blue for strategic design has been used consistently whenever the different categories are portrayed visually.

Figure 4.3: Iterations Design Disciplines[11]



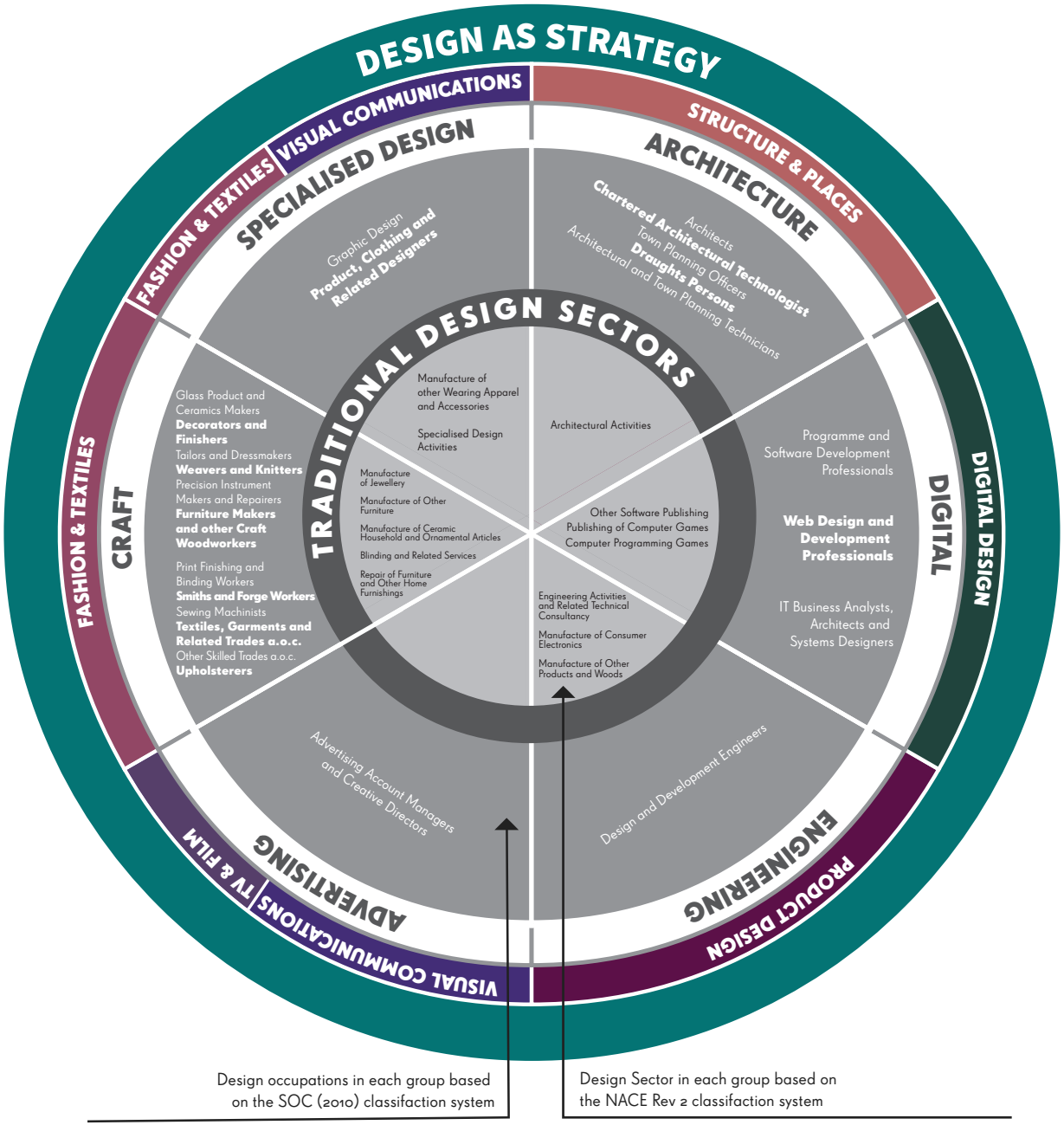
Source: *ITERATIONS Design Research and Practice review, 2015*

The design disciplines are the categories used in the education institutes to teach design but it does not inform which ones are more relevant to the Irish enterprise base. In the "*Policy Framework for Design in Enterprise in Ireland*" the *Irish Design Footprint*[12] was developed to measure the economic contribution of design to the Irish economy as far as is feasible based on available data. The Irish Design Footprint is represented by six Design Groups with business sectors and occupations assigned to each group. The business sectors and occupations are defined respectively by the international classification system for industrial classifications (NACE Rev2) and the Standard Occupational Classification System (SOC 2010). This economic footprint is broadly similar to that used in the UK in their assessment of the economic value of design and is presented in the UK Design Footprint[13].

When the design disciplines are superimposed on the design groups of the Irish Design Footprint a picture begins to emerge of those disciplines of design that are more relevant to the Irish enterprise base. Figure 4.4.

[10] *ITERATIONS –design research and practice review* is a journal, first published in ID2015, that publishes a blend of peer reviewed research papers, reflections on design practice, case studies, visual essays, discussions and opinion pieces, invited editorials, interviews and reviews from practicing designers and design researchers in Ireland and internationally
[11] Simon O'Rafferty & Con Kennedy, Eds. - ITERATIONS
[12] Design Research and Practice review,2015, http://iterations.ie/ [Accessed 14.03.17]
[13] https://www.djei.ie/en/Publications/Publication-files/The-Irish-Design-Footprint.pdf

Figure 4.4: The Design Disciplines and the six Design Groups of the 'Irish Design Footprint'



Source: DJEI – Policy Framework for Design in Enterprise in Ireland, Jan 2016

Based on CSO data available for the Design Sectors and Design Occupations the study showed that the contribution of the design sectors to total exports from Ireland was more than 21% in 2013 and that the contribution of design occupations to the total employment was almost 2.5 % in 2014. However the total impact is heavily influenced by the Digital Group with 48% of design occupations and 97% of the design exports coming from this group.

When taking the design footprint in its totality it clearly shows that the design groups that are relevant to the Irish Enterprise base are the Digital and Engineering Groups which aligns with the focus over the last thirty years on ICT and Life Sciences and consumer goods sectors of both the IDA and Enterprise Ireland. The Strategic Design and Design Thinking is at the centre as it is relevant to all enterprise.

The three design disciplines therefore which Ireland needs to focus on and which are the focus of this report are:

- **Digital design**
- **Product design**
- **Strategic design**

5 THE EVOLUTION AND REVOLUTION OF DESIGN

The digital explosion of the 21st Century has revolutionised design. The new digital technologies are giving rise to new forms of products and services which in turn are putting new pressures on businesses and society. This is requiring the design of solutions to increasingly complex problems which are often global in nature, and as diverse as cyber security to migration. Customers, users and stakeholders are no longer passive recipients of design. Expectations are higher and increased participation is often essential.

5.1 The Four Orders of Design

The traditional understanding of design as simply an aesthetic practice has been challenged. Today design informs the strategies of major organisations and is being used to create innovative services, address social issues, even to shape better public services and policymaking. But this rapid transformation of the design profession is not easily understood. However, the Four Orders of Design which were developed by Richard Buchanan[14] in the late 1990's are a succinct, insightful yet simple representation of the evolution of design from the beginning of the 20th century to today (Figure 5.1).

The four orders roughly correspond to the focus of design as it expanded over the course of the 20th century and with each order the application of the design becomes more complex. The four orders and the design discipline they roughly correspond to are as follows:

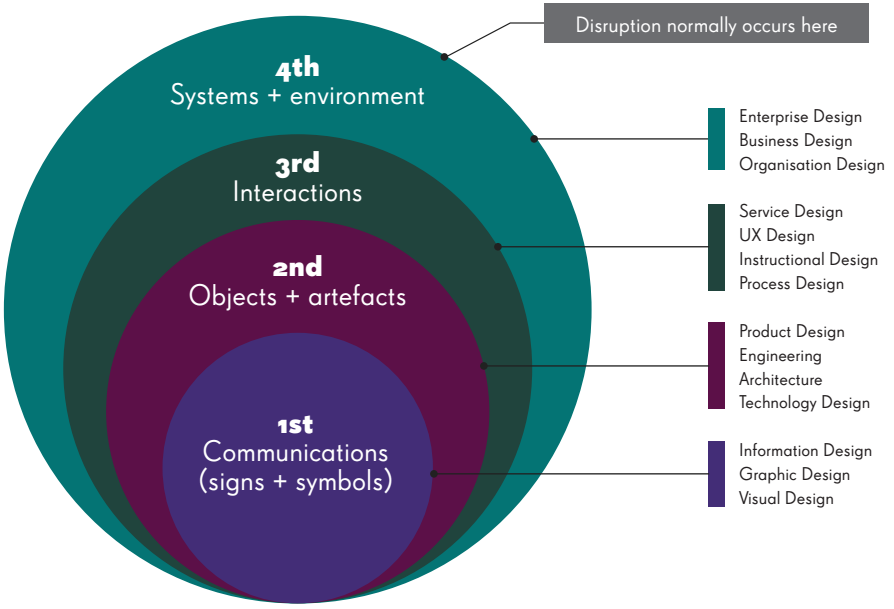
Order 1.	**Symbol**	————	**Graphic Design**
Order 2.	**Object**	————-	**Product Design**
Order 3.	**Action**	————-	**Interaction Design**
Order 4.	**Thought**	————	**System Design**

The first and second orders emerged in the first half of the twentieth century. The first is about communication with symbols and images and essentially is design in a 2-dimensional space. The second order emerged as mass production. Industrial manufacturing became the norm and it is about the design of things, corresponding to design of 3-dimensional artefacts.

By the middle of the 20th century designers began to expand into designing activities and processes, the third order, and interaction design was born. Here the focus is on designing experiences rather than just physical objects. It's about how people interact with other people and things. While the profile of interaction design has been raised by the rise of digital products, the concept of interaction goes back further than this and applies to all types of products. The third order of design introduces the user, the human interface into the design process, which makes it more complex than just the design of an artefact. Interaction design is about people and how they interrelate with the product or service. It allows for a customised experience.

Finally the fourth order is concerned with thought, which is more complex and abstract again. It is about the design of environment and systems. The systems that designers are interested in at this level involve humans and not material things. Understanding how systems work, what core ideas hold them together, their ideas and values are fourth order problems. Modern concerns such as the economic downturn, the health service, our ageing population and climate change have proven too complex to be solved by a single answer. This has opened the door for the multi-disciplinary approach design can offer. Some designers have the ability to grasp the ideas and the values at the core of very complicated systems. These are the fourth order designers.

Figure 5.1: Visual Representation of Richard Buchanan's Four Orders of Design



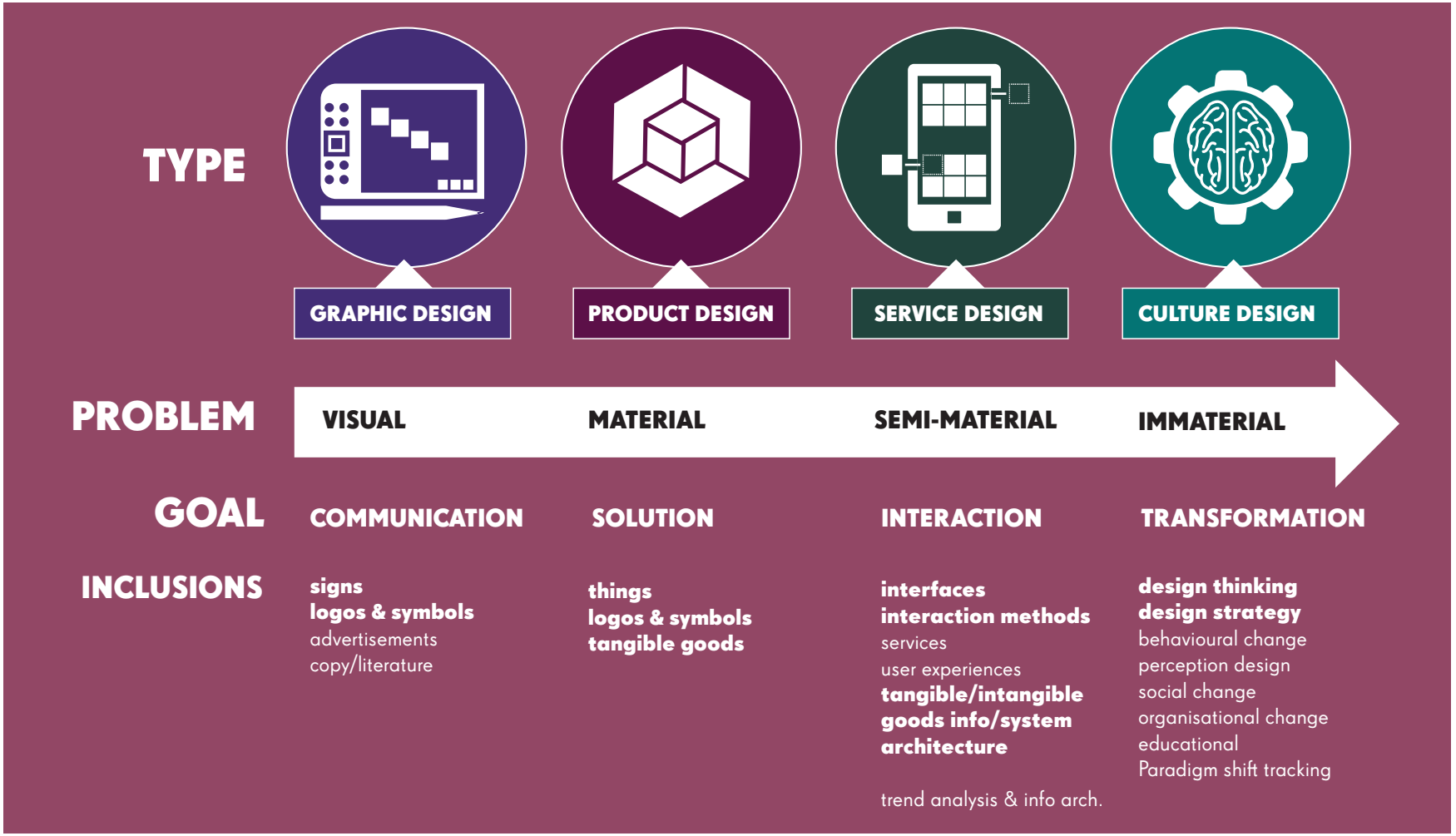
Source: Richard Buchanan

[14] Richard Buchanan, a Professor of Design & Innovation at Case Western Reserve University's Weatherhead School of Management since 2008, and former Head of the School of Design at Carnegie Mellon University, is one of the world's leading **design theorists**. He is well known for extending the application of design into new areas of theory and practice as well as practicing the concepts and methods of interaction design such as the re-design of the Australian Taxation System, the restructuring of service products and information for the U.S. Postal Service. At Case Western, he has researched "collective interactions," focusing on problems of organisational change and the development of management education around the concept of Manage by Designing. His most recent projects involve strategy and service design, including patient experience, information services, and public sector design. He is also co-editor of Design Issues, a premier design journal published by MIT Press.

In Figure 5.1 each order is nested into the other like a Russian doll. This is an important aspect to the visual representation, because within each order the focus of the lower order is still also present, e.g., symbols on objects, the web design on the interface to a system, using a smart device. Even within design systems, communication is important so the signs and symbols will still play a role, as indeed will any objects that are required within the system.

Figure 5.2 below is another representation of the four orders and is summary of the spectrum of design. The concept of a design spectrum is also important as it conveys movement across from one design domain to another.

Figure 5.2: The Design Spectrum



Source: © 2010, John Phillips - adapted from Richard Buchanan's four orders of design

5.2 Industrial Revolutions and their impact on Design

Design is as central to our lives today as it has always been and will undoubtedly continue to be so. In her book "*The Genius of Design*"[15], design historian Penny Sparke states that "although the art of making things functional and beautiful has been part of our lives since the first cave walls were decorated and the first clay pot was thrown it wasn't until modern industrial manufacturing methods emerged in the eighteenth century that design took on the importance that it has for us today."

Prior to the industrial revolution the design and manufacture of a product were conducted by a craftsman who had undergone an apprenticeship. With the onset of the industrial revolution the design of a product was separated from its manufacture: the creative act of determining and defining a product's form and features takes place in advance of the physical act of faster and cheaper mass production of the product and with often greatly inferior results.

From the drawings in caves of the stone-age times to the mechanisation and mass production of the industrial revolutions in the 19th Century and 20th Century to the 4th industrial or "digital" revolution of the today each in turn has involved design, impacted on design and caused design to evolve and keep pace with the changes wrought with each wave of innovation and economic development.

While we continue to inhabit our visual, material and spatial world, the "digital" revolution has created a whole new virtual world which in turn has given rise to an entirely new panorama of design. In a manner similar to how the earlier industrial revolutions spawned "industrial design" the digital revolution has spawned "digital design" which has radically challenged the world of design in numerous ways, for example, computer-aided-design (CAD) has transformed the nature of the design process in the areas of architecture and product design. Similarly, digital manufacturing is revolutionising the production process including rapid prototyping. Furthermore, the growth of interaction design has taken design into the world of the virtual and the conceptual.

In the "*Design in Tech Report*" of 2016 written by John Maeda[16] for Kleiner Perkins Caufield & Byers (KPCB), a global venture capital firm, John Maeda highlights some of the fundamental differences in the design principles of product and digital design (Figure 5.3).

[15] "The Genius of Design" by Penny Sparke, 2009, which accompanied the BBC Television series of the same name

[16] John Maeda is an American designer, technologist and an internationally recognized thought leader at the intersection of design and technology. He was the catalyst behind the movement to transform STEM (science, technology, engineering and math) to STEAM (STEM with Arts) while he was head of the Rhode Island School of Design (RISD) (2008 – 2014). During his tenure at RISD he repositioned institution to regain its top position. He recently joined Automattic as Global Head of Computational Design & Inclusion. Previously he served as Design Partner at Kleiner Perkins Caufield & Byers (KPCB), a world-leading venture capital firm. He was a Professor at the MIT Media Lab for 12 years and holds degrees in Electrical Engineering & Computer Science from MIT, an MBA from Arizona State University, and a PhD from University of Tsukuba in Japan.

Figure 5.3: Classical Design Principles VS "Design in Tech" (Digital Design) Principles

Design Characteristics	Industrial Design	VS	Design in Tech (Digital Design)
Number of active Users	Few to Millions		Few to Hundreds of Millions
Time needed to deploy the completed product	Weeks to Months through Distribution Channels		Instantaneously Delivered over the internet
Is "Perfection" achievable?	YES – There's a final state		NO – It's always evolving
Designer's level of Confidence	Absolute and Self-validating		Generally high but open to analysing testing/research

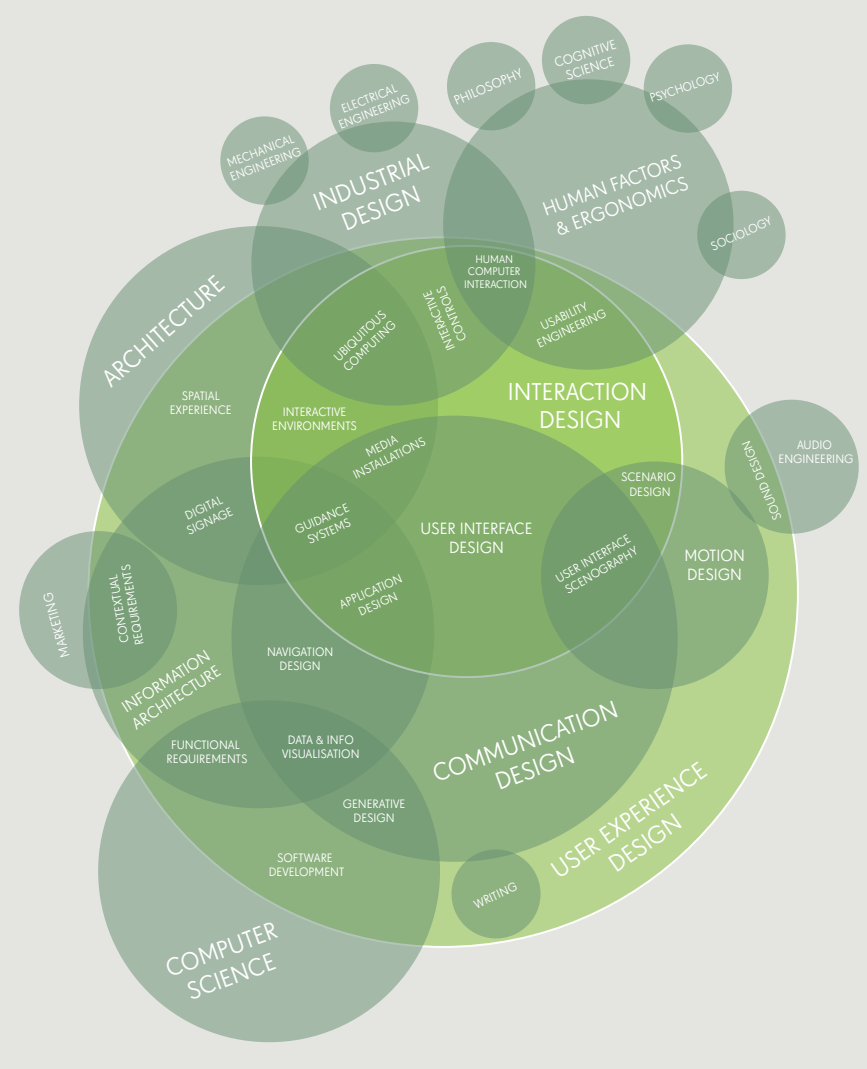
Source: *Design in Tech*, John Maeda, KPCB, 2016

Product and digital designers do not operate independently of each other and with the growing interconnectedness of devices, often referred to as the "Internet of things", we are witnessing a confluence of product and digital design which is spawning a whole new world of design categories and an increasing demand for multidisciplinary teams. Some of the emerging disciplines of design arising from this digital revolution are dealt with in more detail in Section 5.3.

5.3 Designing for a Digitally Connected World

A perceptible shift has occurred in recent years in our digitally driven, disruptive, technological and interconnected smart world that is putting the human at the centre of technology. It is no longer enough to just sell a product or service that enables one to do something faster and more efficiently than before but companies must now truly engage with their customers. The customer wants to feel that they are valued and increasingly expects products and services to not only meet their needs but to delight them with unexpectedly great experiences. Companies that achieve this are rewarded with fierce brand loyalty and higher spending, which translates into fatter profit margins. But that kind of success only happens by design – user centred design. All design today has the user at the centre.

Figure 5.4: The disciplines of User Experience Design



Source: http://visual.ly/disciplines-user-experience-design[17]

Design-related roles exist in a range of areas from industrial design (cars, furniture) to print (magazines, other publications) to technology (websites, mobile apps). With the relatively recent influx of technology companies focused on creating interfaces for screens, many new design roles have emerged with job titles like UX or UI designer. As these new roles developed, designers from traditional design backgrounds such as product design, graphic design and architecture have moved across into these new fields in the absence of new courses at undergraduate or postgraduate level.

The design industry has evolved so much in the last few years that it can be difficult to separate what certain design roles actually do. Figure 5.4 is a "Venn Diagram" initially developed by product and interaction designer Dan Saffer and modified by Thomas Gläser, a UX designer formerly with envisprecisely.com.

This diagram demonstrates the complexities and overlapping nature not just of design disciplines but also where they overlap with other disciplines such as computer science, engineering, psychology, marketing and philosophy, amongst others.

The digital explosion has revolutionised business models and companies who before were in the business of selling products and now find that there is greater value in the service they provide. The explosion in design related roles in the digital sector can be linked to the increase in human interaction with mobile devices, internet banking, websites, social media and mobile apps, all of which require design. The shift in the digital world to meeting the needs of the user and providing a good experience has coined a discipline of design known as User Experience Design or UX, as it is better known.

There is no commonly agreed global definition of User Experience design (UX). It is a concept that has many dimensions, and it includes a number of different disciplines—such as interaction design, information architecture, visual design, usability, and human-computer interaction. It is a design process whose objective is to design a system that focuses on the overall experience between a user and a product.

[17] The Disciplines of User Experience Design was developed initially by Dan Saffer with the mega venn diagram being improved by Thomas Gläser of envisprecisely.com. Author/Copyright holder: Thomas-pluralvonglas. Copyright terms and licence: CC BY-SA 3.0

> The role of a designer, be it a product, UX, UI (user interface)or interaction isn't well-defined. The boundaries between each of these various design roles are very fluid and the interpretation and expectation differs from one company to the next

UX designers are concerned with the interaction that occurs between users and the system they are using. For example, a UX designer would take the principles that state how to make a product accessible, and actually embody those principles in the design process of a system so that when the user interacts with the product it is accessible. They are not just concerned with the interactive elements but also the way that certain elements look, feel or contrive to deliver certain outputs.

As for UX design there is no agreed definition for Interaction Design. It is in a sense a subset of UX Design. The Interaction Design Association (IxDA) defines Interaction Design (IxD) as the structure and behaviour of interactive systems. Its origins are in web and graphic design, it began the day the first screen was designed to hold more than static copy but it has grown into a realm of its own and is still evolving. Far from merely working with text and pictures, interaction designers are now responsible for creating every element on the screen that a user might swipe, click, tap, or type. Everything from a button to a link to a form field is part of interaction design. Interaction designers strive to create meaningful relationships between people and the products and services that they use, from computers to mobile devices to appliances and beyond.

A good example of UX design is one developed for Glanbia by Frontend.com, an indigenous Irish design company, who took the traditional milkman service and translated it online and on app with a payment system[18]. This streamlined the product delivery system and money collection for the milkman, reducing waste, whilst giving the customer the power to change their orders quickly and pay for their deliveries conveniently on their phone. Frontend.com won the world IxDA award in 2015 for this UX design, illustrating the competence of Irish design companies in this emerging field.

Interaction design intersects and overlaps with user experience design. The activity created by interaction design needs to follow some form of UX design process. There's no point in UX designers conducting user research and working out what users want if interaction designers who are responding to those needs are kept at arms' length from UX research outputs. A good interaction design will make the screen interface simple and intuitive to navigate, anticipating the user's next most likely decision.But unlike user experience design, which accounts for all user-facing aspects of a system, interaction designers are only concerned with the specific interactions between a user and a screen. However, in practice things are never so crisply delineated.

The role of a designer, be it a product, UX, UI (user interface) or interaction isn't well-defined. The boundaries between each of these various design roles are very fluid and the interpretation and expectation differs from one company to the next. For example, a product designer may do some front-end coding, conduct user research, design interfaces, or create visual assets. UX designers are also expected to do interaction design, and often UI designers are expected to push pixels[19] as well.

From start to finish, a designer helps identify the initial problem, sets benchmarks to address it, and then designs, tests, and iterates on different solutions. Some companies that want more fluid collaboration within the various design roles opt to have a title to encourage the whole design team to collectively own the user experience, user research, and visual design elements.

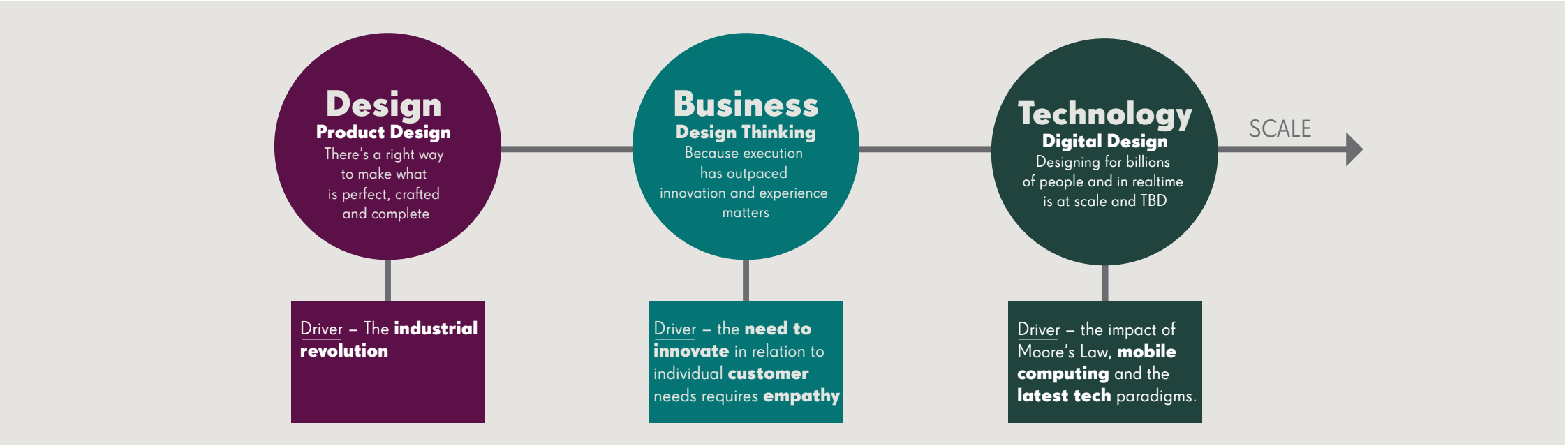
[18] http://www.frontend.com/our-work/glanbia-mymilkman.html

[19] To "push pixels" is the modern version of the term "pencil pusher". It generally refers to the person who works in the field of computer-based graphic design, especially a web designer. Its meaning is slightly ironic but not pejorative

5.4 Three kinds of design in the 21st century company

In his 2016 "Design in Tech" report John Maeda identified three kinds of design relevant in the 21st century and why they are important. Two of these have been dealt with in Sections 5.2 & 5.3, namely product and digital design. In the report Maeda refers to Classical Design which includes product design, architecture, fashion design and visual communication (graphic design) but for the purposes of the analysis in this report the focus is on just product design.

Figure 5.5: The three kinds of design today.



Source: Adapted from Design in Tech, John Maeda, KPCB, 2016

It is interesting to note that these three types of design are also the three kinds of design identified as relevant and important to the Irish Enterprise base (Section 4.1).

According to Maeda the two growing categories of "designers" are those coming from Business and Technology but all three categories are co-dependent and companies will find that they must embrace at least two of these categories in order to win in this century.

> *"Design thinking is a system that uses the designer's sensibility and methods to match people's needs with what is technologically feasible and what a viable business can convert into consumer value and market opportunity." Tim Brown, IDEO*

5.5 Design Thinking

The third kind of design identified by John Maeda as necessary today is the one that helps companies be competitive by being innovative and requires them to incorporate empathy to identify with their customers' needs. This kind of design is better known as Design Thinking and can be used across all kinds of businesses whether they are delivering products, processes or services or are an international NGO trying to address some of the world's most intractable problems.

"Design thinking is a system that uses the designer's sensibility and methods to match people's needs with what is technologically feasible and what a viable business can convert into consumer value and market opportunity." Tim Brown, IDEO[20]

The capacity to innovate has become a critical skill for the 21st century business person and entrepreneur operating in an ever more complicated and fast changing world. Design thinking is a term used for the combination of the processes, skills, cognitive steps and attitudes that are used in design that are now being used to infuse innovation into businesses. It is an approach to innovation that uses deep customer understanding, problem framing, a range of ideation techniques, iterative prototyping, and critique to generate and develop implementable concepts that meet user needs.

It is not about graphic or visual design but rather a systematic approach to problem solving through the use of the design process. If managers thought more like designers problem solving would be driven by three core beliefs:

- **Empathy** – Start by establishing a deep understanding of human needs
- **Ideation** –Discover new possibilities
- **Iteration** – Use the first solutions only as stepping stones to a better one.

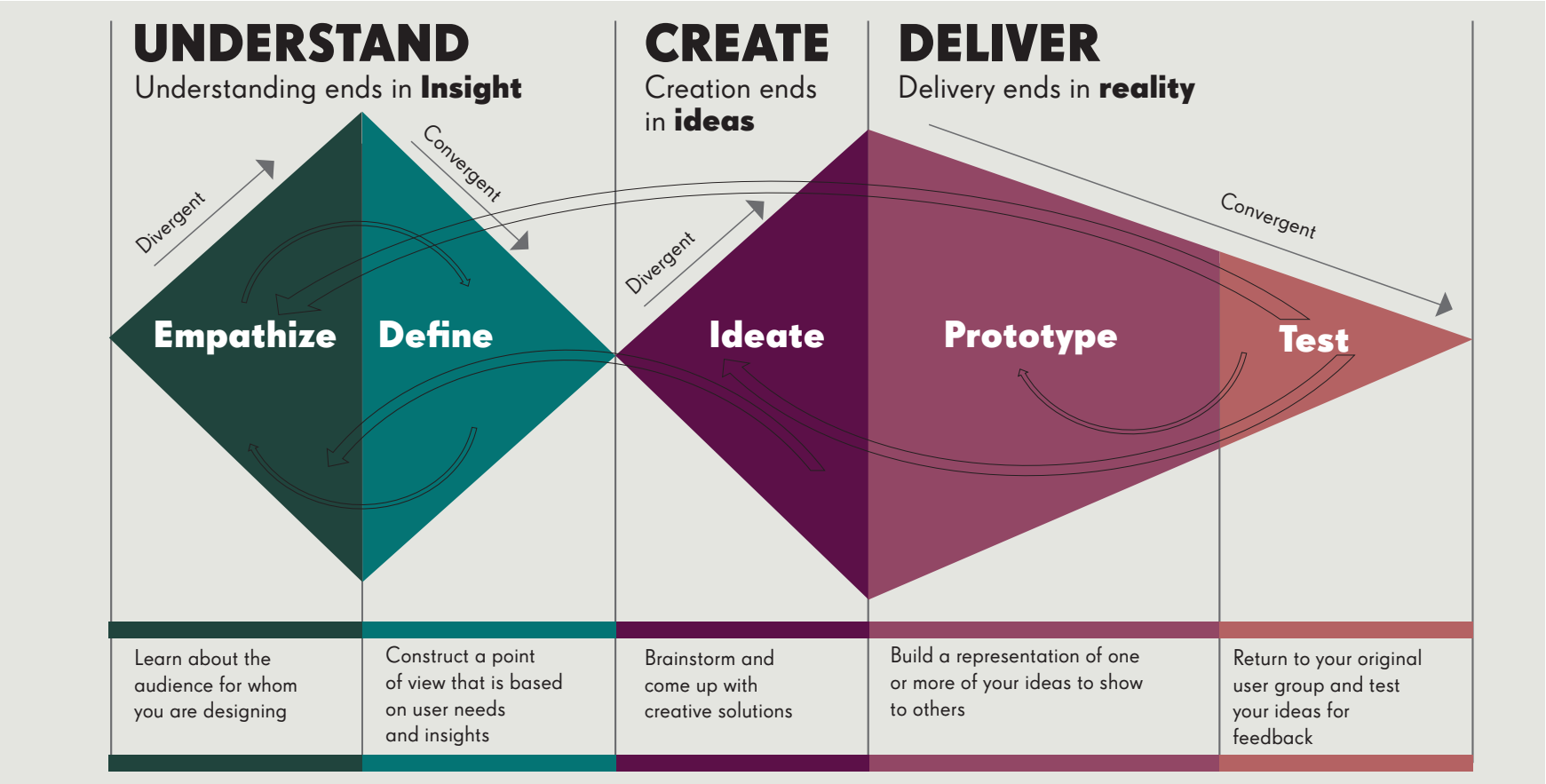
The design thinking approach creates solutions from a user-need perspective rather than through the conventional approach of defining a potential market, and force-fitting solutions. The process of design thinking provides a common, customer-centric language to discuss the opportunities available to the organisation. Problem framing, and the emergent thinking used during the exploration of the problem, allows design and business to develop a common understanding of both the challenge and possible solutions– together. Understanding how to approach design problems and apply design thinking enables designers, managers and CEOs to maximize their contributions in the work environment and create incredible, memorable solutions for their users.[21]

Figure 5.6 presents the 5 steps of the Design Thinking Process as developed by the d.school in Stanford who came up with the concept of applying the design process to tackling problems in the business environment. While some of the words used might be different this is essentially the design process as outlined in Section 3.2.

[20] Tim Brown, author of "Change by Design", is the CEO of US design and innovation consultancy IDEO. Founded 25 years ago in California by David Kelley of Stanford Design School, IDEO have been hugely influential in raising the profile of human-centred design. They have produced celebrated work for clients including Apple, Ford, Palm and Steelcase.

[21] Interaction Design Foundation https://www.interaction-design.org/literature/topics/design-thinking)

Figure 5.6: The 5 steps in the Design Thinking Process



Source: Based on the Stanford d.school design thinking process and image by Roshi on https://inkoniq.com/blog/science-of-design-thinking-to-create-worldclass-ux/

5.5.1 Design Thinking in Crisis

The potential value of design thinking is indisputable. It is a useful tool to help understand and face complex challenges in which analytical approaches have proved insufficient. The volatile, uncertain, complex and ambiguous nature of the 21st century is exactly the right time for organisations to embrace design thinking. Design thinking has the ability to play a role in the innovation shift similar to the one that TQM played in the quality shift.

However, a growing body of voices are beginning to question the value of Design Thinking, most notably, Bruce Nussbaum, a key advocate of Design Thinking who has recently questioned its current usage.[22] It is now widely argued that companies have absorbed the process of Design Thinking all too well, turning it into a linear, gated, by-the-book methodology that delivered, at best, incremental change and innovation. CEOs in particular, took to the process side of Design Thinking, implementing it like Six Sigma and other efficiency-based processes. It is this that is killing the potential of design thinking.

Design thinking is not designing. It is about managers and businesses understanding and applying the processes used by designers to identify a problem and spot an opportunity. From the beginning, the process of Design Thinking was scaffolding for the real deliverable: creativity. It applies divergent and creative thinking and considers all possibilities. The iterative process ensures the company arrives at the best solution. Key to its success is beginning with the customers' needs in mind. Satisfying customers will give a company the competitive advantage. But in order to appeal to the business culture of process, design thinking was denuded of the mess, the conflict, failure, emotions, and looping circularity that are part and parcel of the creative process. In a few companies, CEOs and managers accepted that mess along with the process and real innovation took place. In most others, it did not.

5.5.2 From Design Thinking to Design Culture - 'The rule of three'

Design consultancies that promoted Design Thinking were, in effect, hoping that a process led approach would produce significant cultural and organisational change.

To ensure that design thinking moves beyond a 'faddish' management process it is essential to embed design within the culture of an organisation.

Leading design agency Fjord describe this as the 'rule of three', which is comprised of

- **design thinking**
- **design doing**
- **design culture**

Design thinking means assembling a group of innovative designers capable of problem-solving within a company, whether that's a change of focus or creating a fresh product for a consumer.

Design doing is about taking this design thinking and collaborating with different stakeholders to move beyond the sticky notes and brainstorming design thinking methods widely adopted to actually create new products and services.

The most difficult of the three, is design culture, due to the challenge of instilling a creative culture within some companies that have, for years, cultivated a sterile office environment.

Without adopting all of these rules, companies will grow frustrated at the perceived failure of design thinking to generate tangible long term positive change.

[22] https://www.fastcodesign.com/1663558/design-thinking-is-a-failed-experiment-so-whats-next

5.6 Design as Strategy

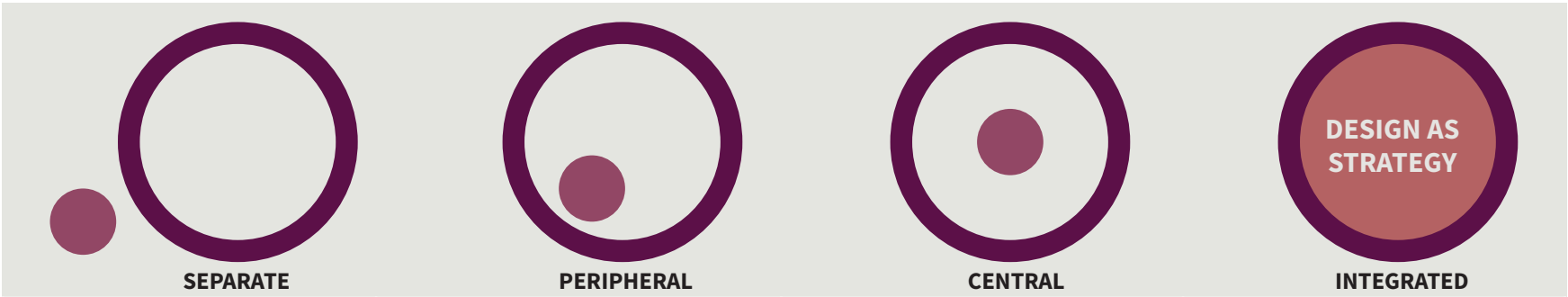
Design has become a strategic asset in brand equity, differentiation, and product quality for many companies. A company that works strategically with design is one that uses design deliberately and systematically as a means of promoting the company's overall goal.

Its products, marketing materials, stationary, website, trade fair stand, services, points of sale and physical setting all have a design that help define the company. The more coherent these aspects are, and the more the design supports a company's goals, the more strategic is its use of design.

Design strategy decisions are made in co-operation with the company's management while the daily work with design is handled by the employees in charge of the relevant areas.

Sabine Junginger[23] has proposed a model illustrating four types of relationship, which a design function may have with the larger organisation that supports it. (Figure 5.7) Junginger's model suggests a progression of states from separate to peripheral to central to integrated.[24]

Figure 5.7: Four ways in which design is metabolised within a company



Separate	Peripheral	Central	Integrated
Design as **external** resource.	Design as **part of** the organisation.	Design at the **core** of the organisation.	Design **permeates** everything the company does.
Design thinking & methods have no continuous presence in the organisation.	Design thinking & methods practices somewhere within the organisation.	Design thinking and methods are highly visible and take a central position.	Design thinking and methods are being applied at an organisation's top level as means to inquire into a wide range of organisational problems with the aim to develop integrated solutions.
They are add-ons, limited to traditional problems: form, communication, function	They apply to specific products and services.	They unify products and services across an organisation; apply to corporate design and brand strategy.	

Source: Sabine Junginger

[23] Sabine Junginger, PhD, is Professor at the New Design University in St. Pölten, visiting professor at Macromedia University of Applied Sciences and Fellow at the Hertie School of Governance, both in Berlin, Germany. In addition, she is Associate Professor at the Designskolen Kolding, Denmark and has been one of the founding members of ImaginationLancaster at Lancaster University in the UK. She is co-editor of The Handbook of Design Management (Berg 2011, with Rachel Cooper) and Designing Business (Bloomsbury 2015, with Jurgen Faust). She has published in Design Issues, The Design Journal and the Journal of Business Strategy, as well as the Design Management Review and the Annual Review of Policy Design. Sabine studies what human-centered design can contribute to address problems of organisations, management and public policy. Her work focuses on organisational change, service design and public sector innovation. Her most recent work focuses on the policy-making as designing.

[24] Junginger, S. Design in the organisation: Parts and wholes. Design Research Journal, 2, 9 (2009), Swedish Design Council (SVID), 23-29.

This model is very similar to the Danish Design Ladder dealt with in Section 7.2.1 as it is a tool for measuring the maturity levels and value of design in a company. Sabine Junginger's representation is more powerful in conveying what exactly each of the four stages means. Apple, while not the only company to have achieved the fourth state, that of creating a design culture and tightly integrating design throughout the organisation, is probably the best known. Design as a core element of a company's corporate strategy is a leadership issue. World-class design does not work from the bottom up. World class design starts at the top.

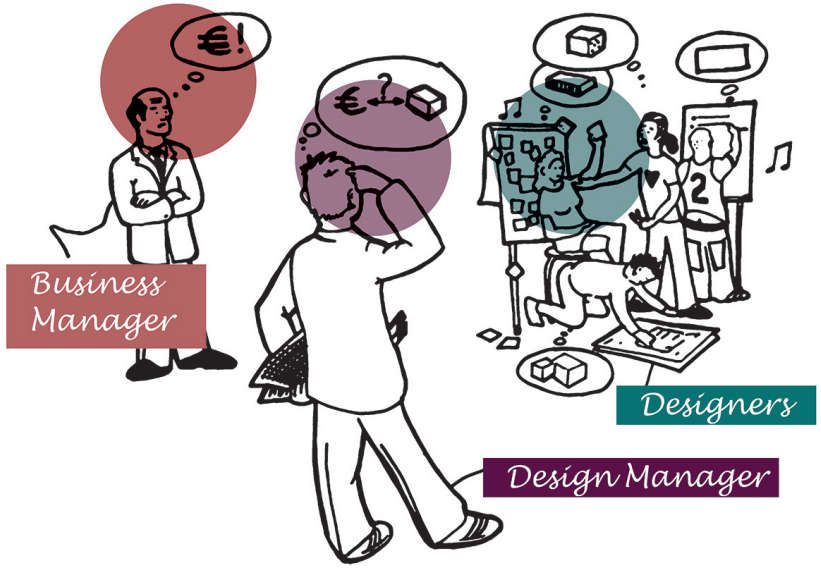
5.7 Design Management

Simply put, design management is the business side of design. It encompasses the ongoing processes, business decisions, and strategies that enable innovation and create effectively-designed products, services, communications, environments, and brands that enhance our quality of life and provide organisational success. It is the function that brings together in a cohesive fashion the three elements of design, namely the technology, aesthetic and the business viability.

Design management is a business discipline that uses project management, design, strategy, and supply chain techniques to control a creative process, support a culture of creativity, and build a structure and organisation for design. The objective of design management is to develop and maintain an efficient business environment in which an organisation can achieve its strategic and mission goals through design. Design management is a comprehensive activity at all levels of business (operational to strategic), from the discovery phase to the execution phase.

Design management encompasses the ongoing processes, business decisions, and strategies that seek to link design, innovation, technology, management and customers and create effectively-designed products and services, to provide competitive advantage and organisational success. The discipline of design management overlaps with marketing management, operations management, and strategic management. More and more organisations apply design management to improve design-relevant activities and to better connect design with corporate strategy.

Figure 5.8: Design Management



Source: Wiki4des at English Wikipedia, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=15410780

5.8 Design Research

"Design research investigates the process of designing in all its many fields with the overall intention of better understanding and improving the processes, products, services and systems being designed. Unlike scientific research, design research, is not concerned with what exists but with what ought to be, with the plausibility and appropriateness of proposals and uses representative images, physical models and 3D prototypes in the design and development of things that do not yet exist, while, on the other hand scientific research is concerned with universal truths and utilizes abstract mathematical explanations to portray them. Research in a design context breaks with the determinisms of the past; it continually challenges, provokes and disrupts the status quo."[25]

Traditionally, design management was seen as limited to the management of design projects, but over time, it evolved to include other aspects of an organisation at the functional and strategic level. It has traditionally used a design thinking approach to develop compelling products and services that resonate with customers, consistently producing financial rewards, and building brand loyalty. But beyond customer-centric empathy, beyond creative iteration, beyond the bias to a maker mentality, design thinking has more to offer the modern organisation as a means to cultivate creativity and innovation in an organisation. A more recent debate concerns the integration of design thinking into strategic management as a cross-disciplinary and human-centred approach to management.

[25] Alex Milton and Paul Rodgers, Product Design, Laurence King, UK 2013.

In recent years, design research has evolved into three distinct forms – research into and about design, research as design and research through design.[26] Despite the inevitable overlap between these three categories, there are key distinctions.

5.8.1 **Research into and about design** (history, theory and context) is the most established and still the most common type of work undertaken in design research circles and employs a method of critical investigation to evaluate and interpret a specific body of art and its signification. The researcher is unlikely to also be the creator of the work in question therefore by reflecting on the work from outside the creative process, the researcher is more objective.

5.8.2 **Research as design** (innovative design methods) is a slightly more contested category. In recent years, a number of design researchers have claimed that making designed objects and services is, in itself, a process of research, i.e., the outcomes of the research are, in some way, embodied entirely in the designed artefacts. The research is likely to involve the gathering and testing of ideas, materials and techniques required to make the artefacts. While research of this type is vital to the production of some original design work, it does not necessarily imply that the artefact makes an 'original contribution to knowledge' in the traditional sense of research. In this category the designer, who is the researcher, is operating almost entirely within the field of interest. The artefacts are unlikely to be interpreted from an external, objective position.

5.8.3 **Research through design** (experimental practice) is considered the taking of 'something' from outside the design work and translating it through the medium of design, commonly termed 'practice-based research'. This is often interdisciplinary in nature and can range from an idea or concept to a new material or process. In this case the researcher will be engaged in making work within a field of interest as well as reflecting on it and contextualizing it. This reflective method engenders a viewpoint that is both internal and external to the subject of the research. In practice-based research new knowledge is generated by a combination of artefacts and the reflection that they engender. In this type of research the uniqueness and/or value will be contained in the nexus between the written text and the designed objects.

[26] Volume 1 Number 1, 1993/4. Research in Art and Design, RCA, Christopher Frayling

6

INNOVATION BY DESIGN

6.1 Innovation – the key to survival for enterprise

Innovation is the key to survival for business. It improves competitiveness through increased productivity with new or improved products, processes, services or business models and new markets for those products and services. Innovation embraces the opportunities that new technologies provide and ensures a company remains current and viable. In a nutshell, without constant innovation a company will not survive as exemplified by the cartoon in Figure 6.1.

Figure 6.1: Innovate or Die

"DON'T BOTHER ME WITH

NEW IDEAS

I GOT A BATTLE TO FIGHT"

http://keywordsuggest.org/gallery/360132.html[27]

There are few examples of a company's staggering inability to innovate, to its detriment, than Kodak. Kodak's senior management failed to see digital technology as a disruptive technology and did not act fast enough to prepare for the disruption this new technology would herald. The particular irony is that Kodak itself invented the digital camera! The inability to see the potential and to move towards digital photography eventually destroyed Kodak's film-based business model. By contrast the company's founder, George Eastman, had avoided this very mistake twice before, when he gave up a profitable dry-plate business to move to film and then again when he invested in colour film even though it was demonstrably inferior to black and white film (which Kodak dominated).

In sharp contrast, Hermès, now a French high fashion luxury goods manufacturer was established in 1837 as a harness workshop serving European noblemen with high-quality wrought harnesses and bridles for the carriage trade. However with the invention and subsequent mass production of the motor car the company recognised this as a disruptive technology and that the saddle industry would go into decline. Building on its expertise of working with leather and catering for the élite, Hermès obtained the exclusive rights to use the zipper for leather goods and clothing and in 1918, introduced the first leather golf jacket with a zipper, made for the then Prince of Wales. Today Hermès is one of the leading global luxury brands with its signature designs a nod to its origins as supplier of saddles and its logo, a Duc carriage with horse.

A more recent example is Nokia which failed to recognise the disruptive nature of the touch screen interface, betting on physical keyboards. The touch screen interface allowed for a simpler, less complex navigation, whilst the QWERTY keyboard limited the functionality of Nokia's devices. Apple, who was nowhere in the phone market, would replace Nokia, a dominant player, with simple navigation and usable apps which have become a billion dollar business.

[27] This cartoon has appeared extensively on LinkedIn and the context has always been that sometimes corporate executives are so busy that they do not take the time to consider new solutions that could improve their situations dramatically. The wording is usually "no, I can't be bothered to see any salesman, I've got a battle to fight" It has been modified here as seen at the IRDG Conference 2016

6.2 The European Innovation Agenda

Europe 2020 is the European Union's ten-year jobs and growth strategy. It was launched in 2010 to create the conditions for a more competitive economy with higher employment and has set ambitious goals in the areas of employment, innovation and education. In order to boost growth and jobs the European Commission has identified 7 flagship initiatives, one of which is the Innovation Union – an action-packed initiative to create an innovation-friendly environment that makes it easier for great ideas to be turned into products and services and that will bring growth and jobs to the economy.

In 2009, the European Year of Creativity and Innovation, the Commission prepared a document, "*Design as a driver of user-centred innovation*"[28] to analyse the importance and potential of design as a driver of innovation and to provide a rationale for making design an integral part of European innovation policy. Design-driven innovation was not then an explicit part of Europe's innovation strategy but 2010 was a milestone for design in Europe because for the first time design was recognised as a key discipline and activity to bring ideas to the market with design becoming one of ten priorities for innovation in the European Commission policy 'Innovation Union': 'Our strengths in design and creativity must be better exploited' (European Commission, p.3).

One of the actions in the Innovation Union was to set up a European Design Leadership Board to identify proposals which would enhance the role of design in innovation policy. These are outlined in its report "*Design for Growth & Prosperity*"[29] which was submitted to the European Design Innovation Initiative (EDII) in September 2012. The EDII was launched in January 2011 by the European Commission to exploit the full potential of design for innovation and to reinforce the link between design, innovation and competitiveness. To implement the Innovation Union policy the European commission funded six projects under the EDII. The total funding for the 6 projects was €4.8 million. The 6 proposals represented 46 organisations from 19 EU Member States.

In 2013 the Commission launched its "*Action Plan for Design-driven Innovation*"[30] stating that: "A more systematic use of design as a tool for user-centred and market-driven innovation in all sectors of the economy, complementary to R&D, would improve European competitiveness".

The "Design for Europe" platform,[31] a key instrument in the implementation of the Action Plan for Design-Driven Innovation, is a consortium of 14 organisations (universities, labs, national agencies, etc.). With a wide public reach it increased awareness and recognition of design as a driver for user-centred innovation among businesses, the public sector and policy makers. In these times of economic uncertainty, there is a growing appetite to learn new ways to deliver products and services efficiently and ensuring a high user satisfaction.

Nevertheless, many EU countries still lack a robust design infrastructure and design capability. The European Commission therefore launched, in late 2015, "Design for Enterprises"[32], a complete range of free training courses to discover how design-driven innovation can become the key to improving European SME's competitiveness, efficiency and sustainability. The training programme focuses on design as the key feature in SME's strategies for the global market of today. Design-driven-innovation is not a veneer to add appeal to products and services, it involves the use of traditional and new materials, of new production tools and processes and of innovative approaches all of which go to better meeting customers' needs. Design is a new point of view about the product or service. It is the key to success for European enterprises.

[28] Commission Staff Working Document – Design as a driver of user-centred innovation; SEC(2009)501 final. Brussels, 7.4.2009

[29] Design for Growth & Prosperity - Report and Recommendations of the European Design Leadership Board

[30] Commission Staff Working Document – Implementing an Action Plan for Design-driven Innovation: SWD (2013) 380 final. Brussels, 23.09.2013

[31] http://designforeurope.eu/

[32] http://www.designforenterprises.eu/

6.3 Design in Innovation Policy

Innovation policy across Europe is undergoing a paradigm shift. Whereas previously innovation policy was technology-focused and R&D-driven, a shift in emphasis from exclusive reliance on 'technology push' to more demand- and user-driven innovation is occurring.

With the scope of innovation policy broadening beyond traditional research and development (R&D) to embrace a broader set of more user-centred drivers, including service and social innovation, design is increasingly considered a strategic tool for user-centred innovation. Design is a holistic and multidisciplinary problem-solving approach that takes user needs, aspirations and abilities as its starting point. It has a crucial role to play in the broader concept of innovation and can act as the bridge between technological, service, user-centred and social innovation because at its core design is a human-centred process.

The link between design and innovation is not new but it has not always been recognised at policy level. Ironically design was a consideration in an address on National Innovation Systems presented to the OECD as far back as in 1982[33] which highlighted the growing importance of design and creativity in the innovation process. Although design and creativity made their debut appearance in this very early conception of innovation systems it has largely been overlooked due to the difficulties in measuring the impact of design. Policy makers require an economic rational to justify policy intervention in favour of design and its integration into innovation policy. (Chapter 7)

However, the past few years, have seen a marked increase in the number of countries and regions including design in their innovation policies. Subsequent to the launch of Innovation Union in 2010, Estonia launched their 'National Action Plan for Design' in 2012 and in 2013, Denmark and Finland both launched strategies for design.

Design as an innovation activity is complementary to R&D in that it aids the transformation of research into commercially viable products and services and brings innovation closer to user needs. An important consideration when considering the role of design in innovation is that there can be considerable differences in the uptake of R&D between companies of different sectors and sizes but design has the potential to be more widely used across all kinds of companies and in particular SMEs, low-tech companies and the service sector. It is the European Commission's ambition that by 2020, design will be a well-recognised component of innovation policy across Europe[34].

6.4 Design - the missing link in Ireland's Innovation system

In his book "*Change by Design, how design thinking transforms organisations and inspires innovation*" Tim Brown, describes the three competing constraints of business viability, technical feasibility and desirability as the foundation of design innovation and that with the harmonious balance between all three a company can be innovative.

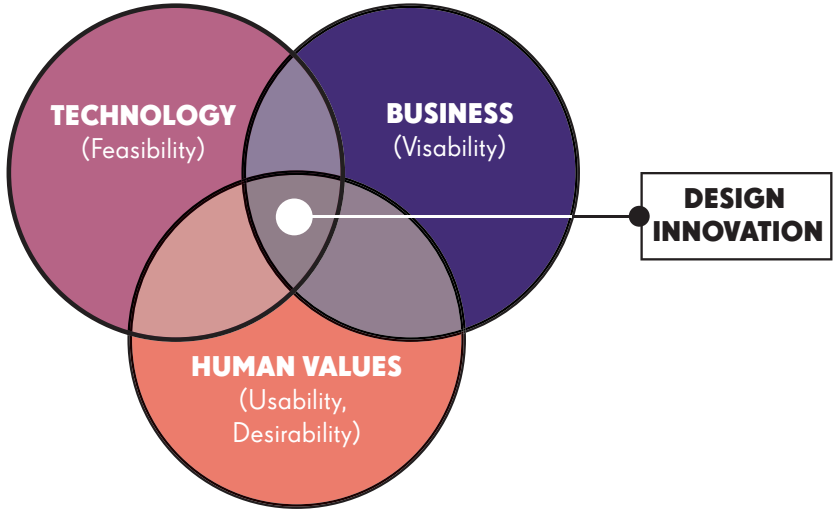
In a nutshell innovation is the confluence of:

- technical feasibility – what is functionally possible within the foreseeable future
- business viability – what is likely to become part of a sustainable business model
- user desirability – what makes sense to people and for people.

[33] Freeman, C. (1982) 'Technological infrastructure and international competitiveness', Paper submitted to the OECD Science, Technology and Competitiveness Group, August 1982.

[34] Peter Dröll, European Commission SEE conference, 29 March 2011. Dr Peter Dröll is in charge of Innovation Union and European Research Area in the European Commission's Research and Innovation Department. This Directorate is about creating the conditions for excellent research and innovation throughout Europe.

Figure 6.2: Design led Innovation



Source: Tim Brown, IDEO, Change by Design

All three elements must be in play for innovation to occur. A new idea, new product or service is not an innovation if the company cannot sell it and make a profit on it. The technology must make the thing work and it must meet user needs or the user won't buy it and the innovation fails.

This can best be explained by example. The DeLorean[35] car was a beautiful design. John DeLorean had been a very successful car designer with General Motors. Production of the DMC-12 was scheduled to start in 1979 but engineering problems and budget overruns delayed production until early 1981. Significant changes had to be made from the original prototype. New and untested technology, for which DeLorean had purchased patent rights, was eventually found to be unsuitable. The entire car was deemed to require almost complete re-engineering. This reinforces the need for the step in the design process of early and rough prototyping and early testing and continuous iteration until the right model is developed as it can save time and money later. The company went bankrupt in late 1982 with the delay in production being the principle reason combined with the worst slump in the US car market since the 1930's just as the first DeLorean cars rolled off production. This is a classic example of how the three components of innovation didn't coalesce and the company failed.

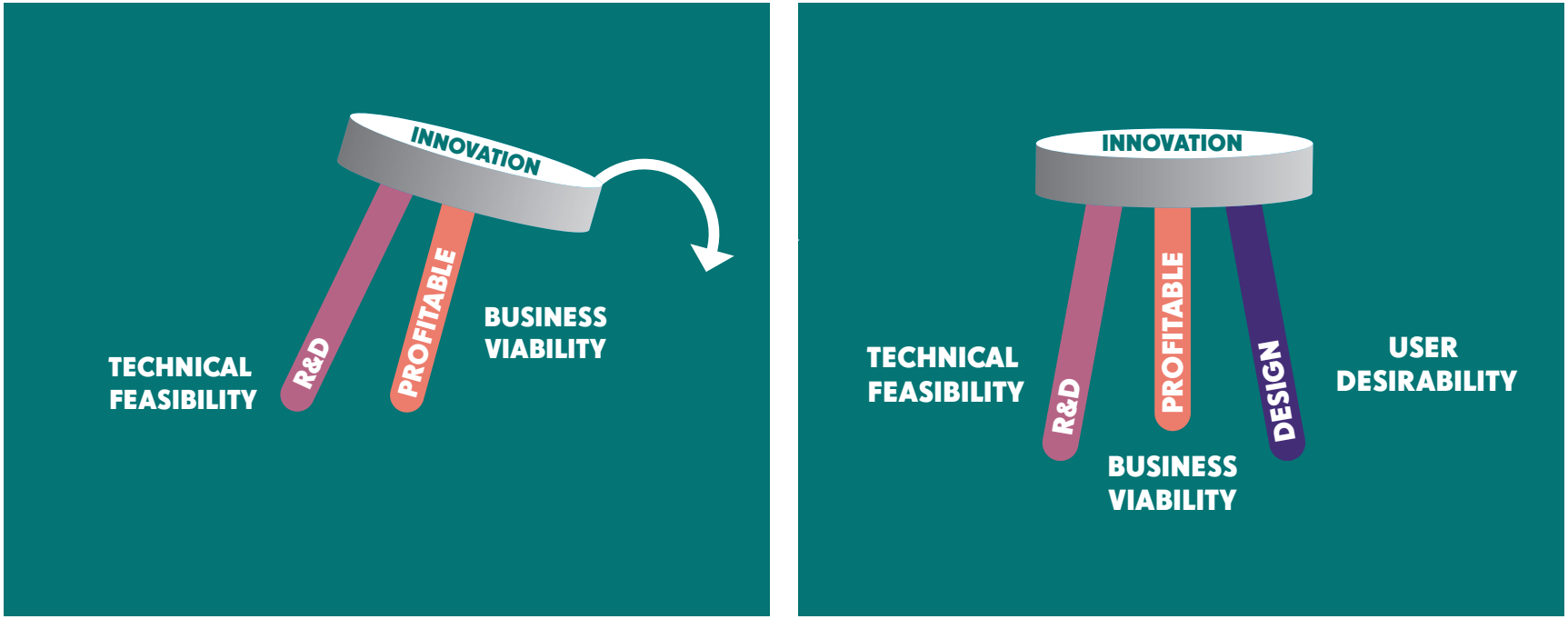
In the example of the DeLorean car, the design was there but the technology, which hadn't been tested on time, and the business environment, by the time the right technology was found, conspired against it being successful.

The Kodak example cited earlier is of a company having a new technology which was a good business proposition but Kodak didn't apply design to see the potential of the technology and the company went into liquidation.

As is the case in most European countries, including Ireland, innovation policy can be portrayed as a three legged stool with only two legs (Figure 6.3). For a strong innovation system the design leg must be added. The design is what breathes life into the technology as it can envisage the possibilities for the technology and the business leg ensures that it will be commercially successful.

[35] The DeLorean DMC-12 (commonly referred to simply as "the DeLorean" as it was the only model ever produced by the company), is a sports car manufactured Belfast, Northern Ireland, by the DeLorean Motor Company for the American market from 1981–83. The car became iconic because of its appearance and was modified as a time machine in the Back to the Future media franchise.

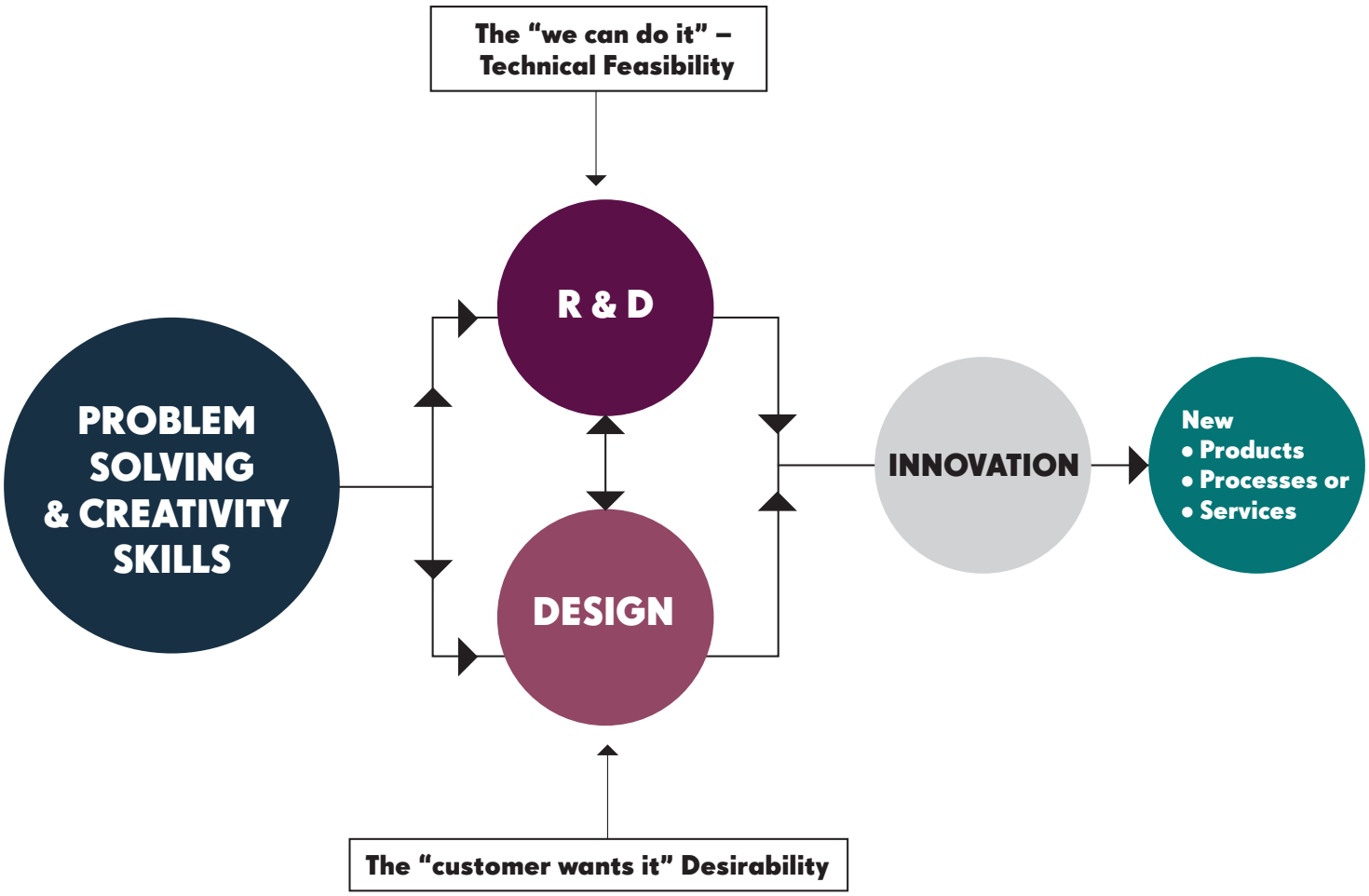
Figure 6.3: Innovation portrayed as 3 legged stool



Source: DBEI

Innovation may not arise from R&D activity but innovation cannot happen without design. That said, however, R&D is an integral part of the innovation process as the demise of the DeLorean company showed. Figure 6.4 depicts the symbiotic nature of R&D with design and how they need to work alongside each other for innovation to really occur. It also shows that creativity is not the preserve of the designer but good scientists need to be creative and ask searching questions.

Figure 6.4: The complete Innovation System Source: DBEI



7

DESIGN BY NUMBERS

Measuring the economic value of design

7.1 The Dark Matter of design: making the value and impact of design more visible

Design can be likened to Dark Matter.[36] [37] Dark Matter has not been directly observed, but its existence and properties are inferred from its effects on visible matter. Likewise the value of good design and the process behind it are not directly observed but perceived by its effect on other things. It is measured by proxy.

Much has been written about the strategic value that design can add to organisations of any scale and type yet the quest to quantify the value of design continues. As there is no agreed definition of design it is therefore difficult to categorise and measure its value because design is hard to isolate as a function and the design function operates differently by industry. This makes benchmarking to standardised measurement metrics difficult.

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[36] The dark matter of design: making the value and impact of design more visible – Stephen Miller, Research and Evaluation Manager, Design Council, UK, 20 January 2017

[37] Dark Matter and Trojan Horses by Dan Hill Designer, Associate Director (Digital Studio), Arup, , London. Visiting professor at UCL Bartlett; Adjunct professor at both RMIT University and the University of Technology, Sydney, Australia. His blog City of Sound covers the intersection between cities, design, culture and technology.

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There are few indicators of design in official statistics. Design as an activity is partly included in the R&D definition of the Frascati Manual[38], partly as research, partly as development. The Oslo Manual[39]treats design as marketing innovation, or as part of other forms of innovation. Some design activities are not covered by either Manual and hence not measured as innovation activities at all, potentially even when they contribute to innovation. Not all designs and design activities are related to innovation.

In her article "*Evidence-based policy for design in Ireland*"[40], Dr Anna Whicher argues that innovation policy, which is often developed by economists, has traditionally been data-driven and evidence-based. The lack of empirical data about the value of design to the innovation process has been a barrier to the inclusion of design in innovation policy. To that end there has been a drive in recent years by both governments and design centres to rectify this by capturing the economic impact of design. There are no internationally statistically comparable established methodological platforms on which to build an analysis of the economic effects of design. Design is such a very wide concept that reservations need to be stated as to the overall feasibility of quantifying the effect of design.

That said a number of studies have been conducted on the importance and value of design, some of them, through the use of surveys, concentrating on the micro-economic effects of design, i.e. on the company performance, with others focusing on the macroeconomic effects. The findings of micro-economic research on design indicate a very clear correlation between the employment of design and the performance of a company, measured in terms of for example profitability, share price, employment or exports. The correlation is so marked that it cannot be ignored.

It is important to point out that what is being discussed here is the value of the role of design in the wider economy, in particular in the non-design intensive sectors, often referred to as the "Design Economy" as opposed to the economic value of the traditional design sectors or the "Design Industry".

[38] The ***Frascati Manual*** is an essential tool for statisticians and science and innovation policy makers worldwide. It was originally written by and for the experts in OECD member countries who collect and issue national data on research and development (R&D). Over the years, it has become the internationally recognised methodology for collecting and using R&D statistics, not only in the OECD and the European Union, but also in several non-member economies, for example, through the science and technology surveys of the UNESCO Institute for Statistics (UIS).

[39] The ***Oslo Manual*** is the foremost international source of guidelines for the collection and use of data on innovation activities in industry. The ability to determine the scale of innovation activities, the characteristics of innovation firms and the internal and systemic factors that can influence innovation is a prerequisite for the pursuit and analysis of policies aimed at fostering innovation. This latest edition takes into account the progress made in understanding the innovation process and its economic impact for the first time investigates the field of non-technological.

[40] The value of design to business, by Dr Anna Whicher, Head of Design Policy, PDR Wales, published on Design for Europe website. http://designforeurope.eu/news-opinion/value-design-business

Innovation policy, which is often developed by economists, has traditionally been data-driven and evidence-based. The lack of empirical data about the value of design to the innovation process has been a barrier to the inclusion of design in innovation policy. To that end there has been a drive in recent years to rectify this by capturing the economic impact of design.

7.2 Methodologies for "measuring" the Value of Design

As technology and the emergence of developing economies increase global competition, design has rapidly grown in importance. Unfortunately many companies do not realise the value of design and, those that do, face difficulty in measuring their design performance.

The importance of design performance in the 21st century cannot be overstated. A key barrier to understanding the importance of design in an economy is the lack of available and reliable data. What research and/or data do exist is fragmented across different design communities. There is a stark need for further research to effectively understand and measure the value of design from both the firm and national perspective.

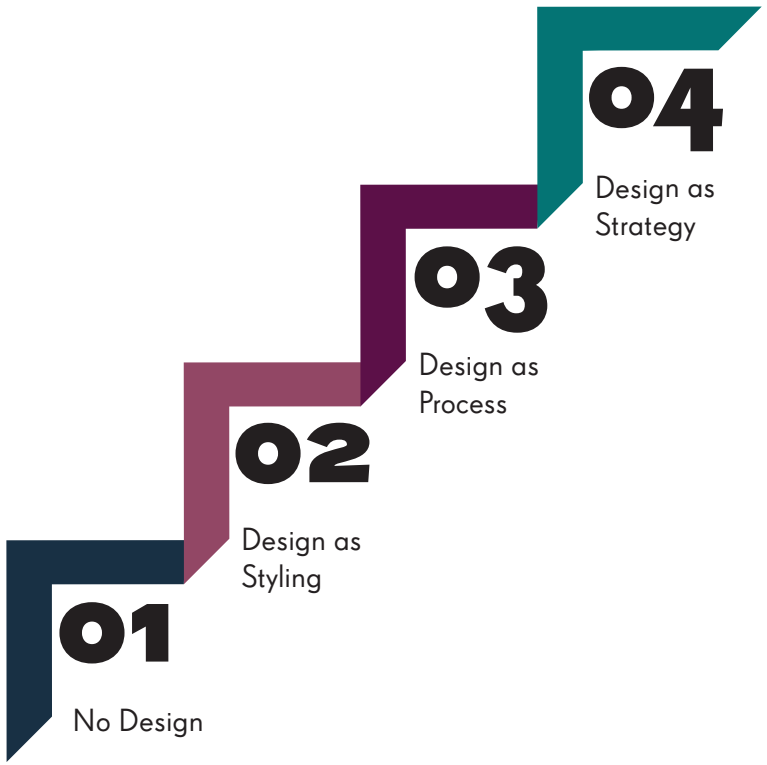
From a firm perspective studies have shown a clear correlation between a company's performance and its strategic use of design. Macro-oriented analysis of the relationship between design use and national competitiveness also shows a strong positive correlation as does research into the relationship between competitiveness and the existence of national design policies and programmes. However, further research is needed to investigate the causality in the macro-economic field.

Following are some examples of different methodologies and research undertaken to measure the economic value of design.

7.2.1 The Danish Design Ladder

The Danish Design Ladder was developed in 2003 as a tool to measure the level of design activity and determine the degree of strategic importance attributed to design in businesses. It is based on the hypothesis that there is a positive link between a company's higher earnings and its placing a greater emphasis on design methods in the early stages of development and giving design a more strategic position in the company's overall business strategy. This measurement system is still considered the best practice model for international comparisons of design in the enterprise base. It is in fact the method used within the EU Innobarometer for measuring the design performance. (Section 7.2.2)

Figure 7.1: The Danish Ladder



Source: Danish Design Centre

The design ladder consists of four steps:

Step 1. No design

Design plays no role in product/service development with development being done by company staff who usually lack expertise in the field of design. The opinions and views of the end-user only play a negligible role in the composition of the end product or service.

Step 2. Design as styling

This is the traditional understanding of design where design is only relevant in terms of style. Companies at this stage are slightly more aware of the role of design in business, but only on a very superficial level, with design being considered only as part of the aesthetics of the final product. Companies may have some engagement with professional designers but the task is typically handled by people with other professional backgrounds.

Step 3. Design as process

Design is integral to the development process. It is not a result but an approach that is integrated at an early stage in the development process. The design process is utilized. The solution is driven by the problem and the users and requires the involvement of a wide variety of skills and capabilities, for example process technicians, materials technicians, marketing experts and administrative staff.

Step 4. Design as strategy

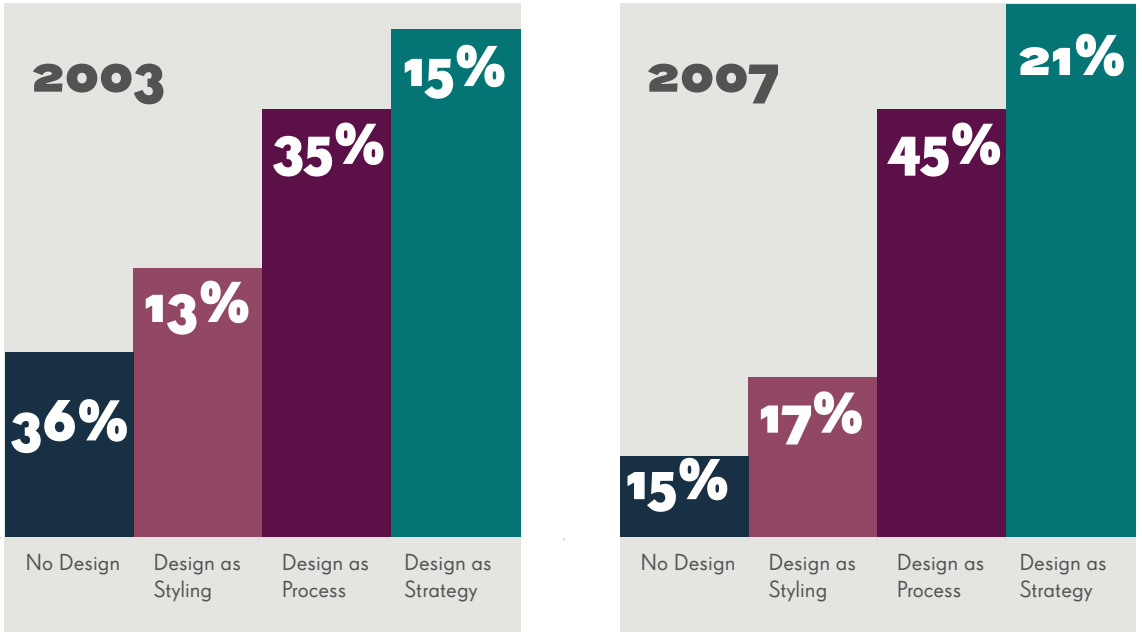
Design is a key strategic means of encouraging innovation. The designer works with the company's owners/management, or in the case of a large company the designer is part of the senior management team, to rethink the business concept completely or in part. Here, the key focus is on the design process in relation to the company's business visions and its desired business areas and future role in the value chain

The first study to measure the economic effects of design was conducted in 2003 by the Danish Design Centre[41] to determine the value a company gains by using design. The survey included an assessment of the participating companies' ranking according to the design ladder.

Using the Danish design ladder the study found that a correlation between the use of design and economic performance is especially marked for companies that adopt a mature and comprehensive approach to design and view it as a process for product/service development (Step 3) or is key to wider business strategy (Step 4). These companies experience an increase in growth that is statistically significant. The conclusion of the survey is that companies that work systematically with design have higher earnings and bigger exports than companies that do not use design. The analysis did not identify design as the sole contributor to higher revenue. The very fact that a company chooses to invest in design and embed design as a strategy in their business presupposes a certain level of economic success, professionalism and competitiveness in the first place.

The 2003 survey was repeated in 2007. A comparison of the figures (Figure 7.2) shows a general move up the ladder. In 2003 a total of 50% of the companies surveyed were on Step 3 or 4 and by 2007 this had increased to 66%.

Figure 7.2: Comparison of 2003 & 2007 survey results showing, by percentage of the total number of companies surveyed, which Step on the Danish Design Ladder they considered themselves to be on.



Source: DDC – Danish Design Centre

[41] *The Economic Effects of Design*, September 2003. The survey was conducted by the Danish Design Centre in collaboration with Advice Analyse, I&A Research (information gathering) as well as Anders Holm and Bella Markmann, Copenhagen University (methodology and computing) for the National Agency for Enterprise and Housing, Denmark.

In 2007 a similar survey was conducted on 405 SMEs by the former Centre for Design Innovation in the Institute of Technology Sligo[42]. The primary finding of the survey was that Irish companies that use design experience more success than those that do not, are less risk averse, more likely to be developing new products and services and less likely to be competing on the basis of price. The research also found that the more strategic the implementation of design within a company the more likely a company is to experience growth in demand for its products and services because design and innovation sharpens a company's competitive edge.

According to Norio Ohga, former Chairman and CEO of Sony his company assumed that all products of their competitors basically had the same technology, price, performance and features and that design was the only thing that differentiated one product from another in the marketplace. Similarly, in an article in Bloomberg Businessweek entitled "*MBAs Learn The Art Of Blue-Skying*"[43] it quotes "design is as important to corporate management today as Six Sigma was in the 90s".

7.2.2 The EU Innobarometer

The European Commission's Innobarometer is a survey of activities and attitudes related to innovation. Each year, it gathers opinions and feedback from the general public and European businesses and provides a unique source of direct information on innovation for policy makers. As of 2015, the survey is based on a standard questionnaire to help monitor change in how companies manage their innovation activities, plan investment to modernise their business, and tackle barriers to the commercialisation of innovation. One questions deals specifically with design as follows:

Design covers a range of applications within companies, providing means to integrate functionality, appearance and user experience, for goods and services. Design can also provide a means to build corporate identity and brand recognition.	
Question: Which of the following statements best describes the activities of your company with regard to design?:	
Design is a central element in the company's strategy; **(Step 4)**	
Design is an integral, but not central element of development work in the company; **(Step 3)**	
Design is used as last finish, enhancing the appearance and attractiveness of the final product; **(Step 2)**	
The company does not work systematically with design; **(Step 1)**	
Design is not used in the company; **(Step 1)**	
Don't know **(Step 1)**	

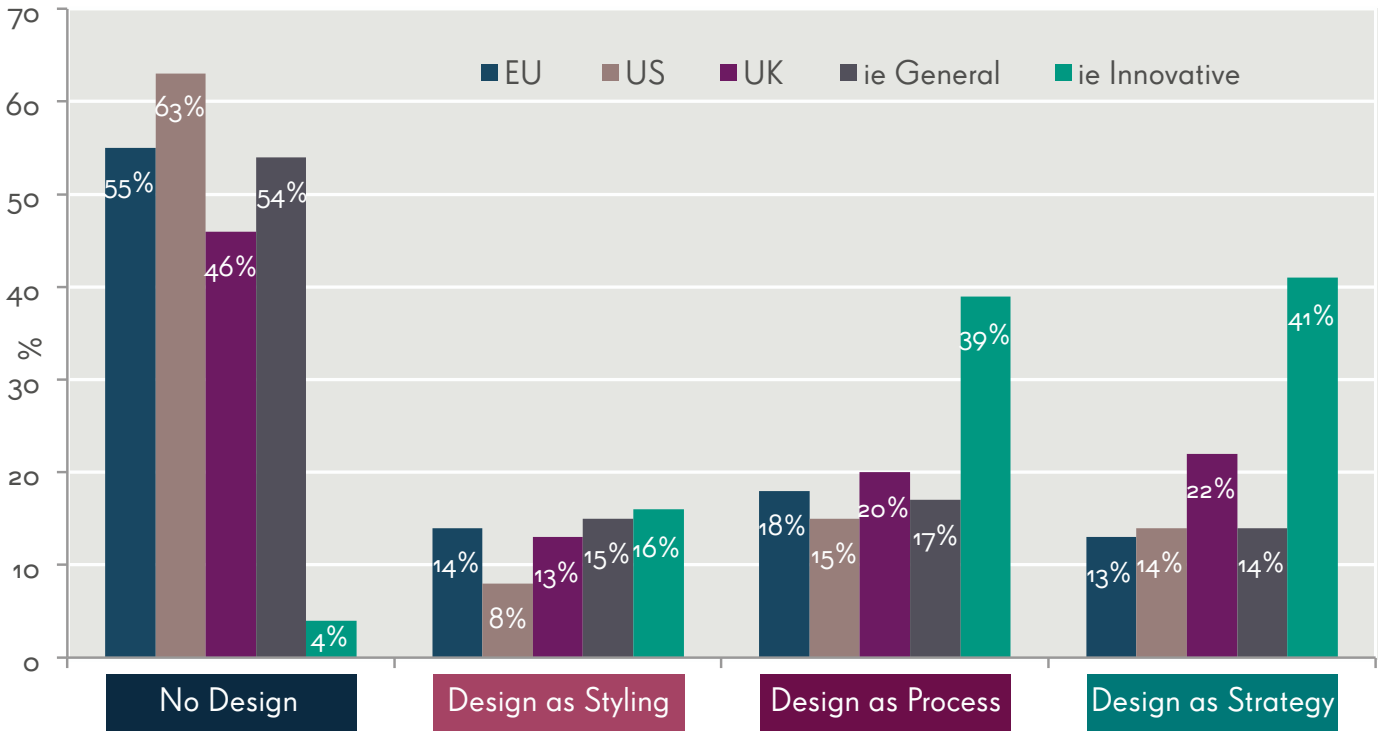
This question is essentially about establishing where on the design ladder a company views itself and how strategic is the company's approach to design. This question has been included in the 2015 and 2016 EU Innobarometer and the results were largely the same for both years. The 2015 results are presented here (Figure 7.3) for comparison purposes to the survey of design-active innovative firms[44] which was also conducted in 2015.

[42] http://www.idi-design.ie/content/files/the_design_difference.pdf - "The design difference – a survey of design and innovation amongst Ireland's SMEs" Centre for Design Innovation, 2007.

[43] https://www.bloomberg.com/news/articles/2005-04-17/where-mbas-learn-the-art-of-blue-skying Bloomberg Business Week, 18 April 2005

[44] https://www.djei.ie/en/Publications/Publication-files/Design-in-Non-Intensive-Design-Sectors.pdf

Figure 7.3: 2015 benchmark of the design maturity of companies in the EU, US, UK and Ireland's total enterprise base (i.e. General ■) and Ireland's design-active innovative firms (i.e. Innovative ■)



Source: Flash Eurobarometer 415: Innobarometer 2015 – The Innovation trends at EU Enterprises, European Commission 2015 and CMI survey of Irish-based firms (IE-Innovative ■)

The EU Innobarometer results show that the design maturity of Ireland's total enterprise base is broadly similar to the EU average. The UK companies are the most strategic in their use of design.

However, when the survey of design-active innovative firms is included the result is markedly different. For the total enterprise base only 31% of Ireland's companies use design strategically whereas 80% of the design-active innovative firms do so.

The Design Value Index tracks how publicly held design-led companies perform relative to the S&P 500 over a 10 year period. In 2015, sixteen design companies were found to have significant stock market advantage, outperforming the S&P by an extraordinary 211%.

7.2.3 The International Design Scoreboard[45]

As part of "Designing for the 21st Century", an initiative was funded by two of the UK's research councils, namely the Engineering & Physical Sciences Research Council (EPSRC) and the Arts & Humanities Research Council (AHRC), both of whom have remits which include design. This initiative was a research project led by the Institute for Manufacturing at the University of Cambridge, (IfM), which was undertaken to develop a "Design Scoreboard" to compare national design capabilities.[46]

It was the first time such an attempt was made and a total of 12 countries were assessed against a series of indicators, such as, numbers of design graduates (both relative, i.e. numbers per million of population and absolute) and the strength of the design consultancy sector. The indicators used reflect the current availability of data and do not, on their own, provide a complete picture. The study found that data is sparse and difficult to compare, meaning that any international comparison needs to be treated with care.

A significant issue in capturing data on design is the inconsistent terminology, as responsibility for design straddles both ministries for industry/innovation and ministries for culture and the arts and in education design straddles both the arts and the sciences. This difficulty in positioning design is a major issue when collecting data through national statistical bodies. This lack of reliable, consistent and up-to-date data prevents the publication of an ongoing International Design Scoreboard.

The IfM study results do suggest, however, that western nations are under increasing threat from emerging east Asian 'powerhouses' as they develop their design sectors, invest in national design promotion and produce skilled design graduates. In his *Design in Tech, 2017 r*eport[47] John Maeda reports that there are now 17 million designers in China with 0.5 million design graduates each year.

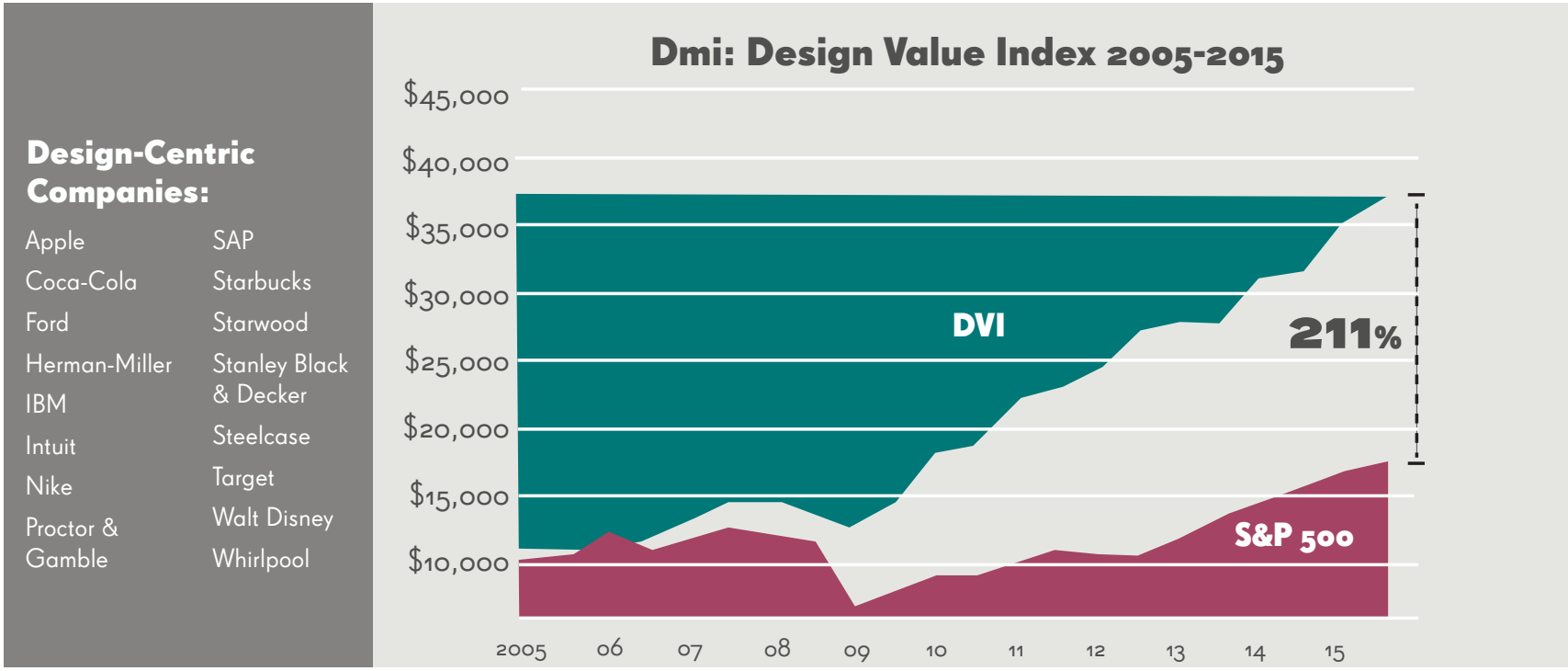
While it is increasingly being recognised that strength in design at a national level is necessary for ongoing economic sustainability, and emerging economies are positioning themselves as sources of creativity and design and not just providers of low-cost production, to date evidence on the role of design at a national level has been lacking thereby making international comparisons difficult and unreliable.

[45] http://www.designcouncil.org.uk/sites/default/files/asset/document/InternationalDesignScoreboard.pdf
[46] http://www.design21.dundee.ac.uk/Phase2/Phase_2_projects/score_board.htm
[47] https://designintechreport.files.wordpress.com/2017/03/dit-2017-1-0-7-compressed.pdf

7.2.4 The Design Value Index

Given that design is difficult to define and measure, the Design Management Institute (DMI)[48] decided to look at the value of design-focused organisations in aggregate. In 2013, DMI and Motiv Strategies[49] collaborated to develop a market index, the dmi:Design Value Index, which tracked how publicly held design-focused (Step 4) companies that met specific design management criteria, perform relative to the S&P 500[50] over a ten-year period. In 2013, 15 publicly traded US companies made the criteria for inclusion and in 2015, 16 companies were included. The 2015 results show that design-led companies have significant stock market advantage, outperforming the S&P by an extraordinary 211%. This again supports a growing body of findings that good design drives shareholder value despite the difficulty associated with defining, measuring, isolating and managing design. Figure 7.4 presents the 2015 results and lists the 16 companies that were included.

Figure 7.4: 2015 Design Value Index Results



Source: Design Management Institute – 2015 Design Value Index Results and Commentary

[48] The Design Management Institute (DMI) is an international membership organisation that connects design to business, to culture, to customers—and to the changing world. Founded in 1975, DMI brings together educators, researchers, designers, and leaders from every design discipline, every industry, and every corner of the planet to facilitate transformational organisational change and design driven innovation.

[49] Motiv Strategies – an innovation strategy firm which has now joined forces with the strategy practice of Monitor Deloitte, the multinational strategy consulting practice of Deloitte Consulting LLP.stock listed on the NYSE or NASDAQ.

[50] The Standard & Poor's 500, often abbreviated as the S&P 500, or just "the S&P", is an American stock market index based on the market capitalizations of 500 large companies having common stock listed on the NYSE or NASDAQ.

It is difficult to measure absolutely the value of design but there are other indicators that point to a value being placed on design such as the venture capital and mergers and acquisitions activities which combined point to a significant interest in design and therefore an acceptance of the added value that design is bringing to these corporations. Since 2004 a total 42 design firms have been acquired of which approximately 50% of were acquired in 2015, with Accenture, Deloitte, IBM, Google and Facebook as the most acquisitive.

7.2.5 The European Innovation Scoreboard

The European Innovation Scoreboard (EIS), previously known as the Innovation Union Scoreboard (2010 - 2015) provides a comparative analysis of innovation performance in EU Member States and other countries. Performance is measured against 25 indicators including R&D expenditure, patent production and business innovation. While a link between design and innovation is well established the current innovation scoreboard is a weak proxy for the measurement of design as the emphasis is still largely on R&D and technology. Only 7 of the 25 indicators could arguably give any information about design and of those only one specifically mentions design, namely "Community designs per billion GDP". That said, however, other studies have shown that companies that value design innovate more often and more successfully and if this is extrapolated to country level one might inversely deduce that if a country scores well on the innovation scoreboard it is likely that it values design. However, measuring the component of design within the innovation is not possible in this survey as it is currently formulated.

7.2.6 €Design – Measuring Design Value

Two of the 6 projects funded under the EDII were about finding a methodology for measuring the value of design. One of these was the €Design project which set out to develop a framework to characterise design so that data could be collected and the value of design, at a macro-economic level, be measured.

The outcomes of the study were:

- A set of guidelines for collecting, analysing and interpreting design data and measuring the economic impact of design. The guidelines could be incorporated into the Frascati family of Manuals or used in the creation of a new Barcelona Manual on Design;
- A set of questions to be included in the *Community Innovation Survey, the Eurobarometer* or in a specific *Design Survey*;
- A communication toolkit to help users develop the skills to measure and manage design.

7.2.7 DeEp – Design in European Policies

The second EDII funded project was DeEP – Design in European Policies which set out to develop an indicator-based approach and a web tool to evaluate design innovation policies. The project aims were to create an understanding of the impact of design innovation policies by building frameworks and indicators to evaluate actions both at a macro (regional, national, European) and micro (specific initiative) level. Currently there are difficulties in evaluating the impact of design innovation policies owing to lack of frameworks. The resultant lack of evaluation then leads to less effective design innovation policies which are disconnected from firms' activities.

The resulting DeEP Evaluation Tool could become an instrument for policy makers, enterprises and other stakeholders involved in design in the policy making cycle to allow the strategic development of new design innovation policies across Europe.

7.3 Follow the Money – International Trends on Investments in Design

As has been demonstrated in the earlier sections it is difficult to measure absolutely the value of design but only by inference and comparison. There are other "indicators" that seem also to imply that design delivers value.

7.3.1 Venture Capital & Funding

One such indicator is venture capital. Innovation has become synonymous with start-ups and with design firms partnering with new start-ups so it was only a matter of time before the VC (Venture Capital) community took notice and began to seek start-ups with a product designer as one of the principals, like AirBnB and Tumblr. The success of these start-ups cemented the role of design as a core ingredient to the VC model. Designers are working at VC firms in a variety of capacities, from operating support roles to investing roles to founding their own venture capital funds. More designers entered VC over the two years 2014 – 2015 than the previous four years combined.

Designer co-founded companies continue to raise billions of dollars in capital with 36% (9 out of 25) of the top venture-backed start-ups having designer co-founders in 2015 which is a significant increase on 20% (5 out of 25) from the previous year.

In his *Design in Tech, 2017* report John Maeda reports that China is now also considered a major force in designer co-founded companies as evidenced by the fact that three such companies, namely Alibaba with 2 designers of its 18 co-founders, Visual China with 4 designers of its 7 co-founders and Xiaomi with 2 designers of its 8 co-founders. These three companies between them have a combined market capitalisation of over $300billion.

7.3.2 Mergers and Acquisitions - multinationals invest in design

Another indicator is the dollars invested by major corporations in design talent through M&A (mergers & acquisitions) activity. Figure 7.8 shows the M&A activity by company type since 2004. A shift started occurring in 2013 with large global consulting firms acquiring design companies.

According to John Maeda in the *Design-in-Tech, 2016* report[51], design firm acquisitions continue unabated. Since 2004 a total 42 design firms have been acquired of which approximately 50% of were acquired in the year previous to the report publication, with Accenture, Deloitte, IBM, Google and Facebook as the most acquisitive.

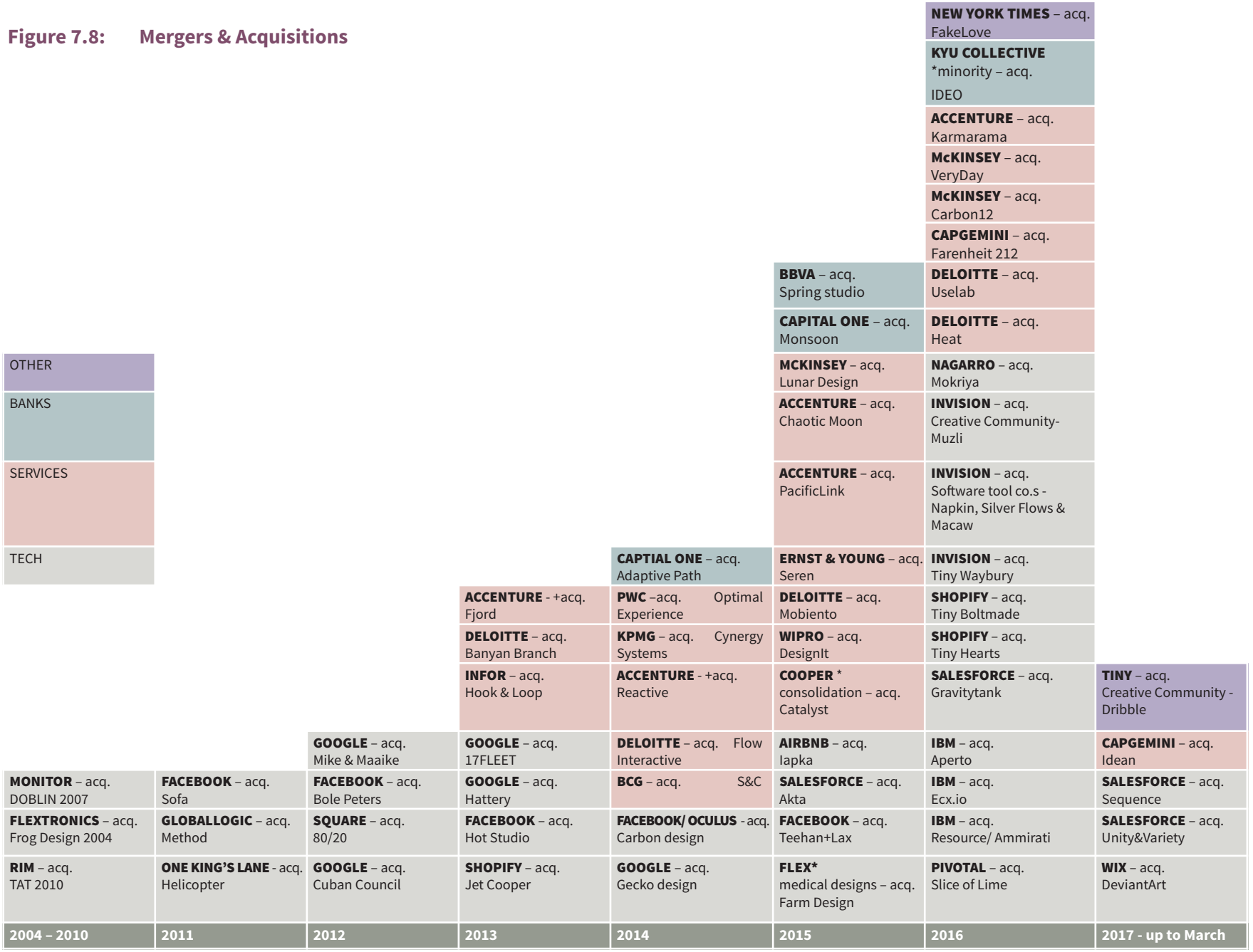
Many of the corporations setting up in-house design capability have offices here in Ireland. In September 2015, Accenture following its global acquisition of Fjord, a global design company, announced that it would be hiring 200 people at its Irish operations as part of a €25m investment into a new Centre for Innovation, based at "Silicon Docks"[52] with specialisations in design expertise, cognitive computing, Internet of Things, advanced analytics, security and digital marketing. Accenture has said that it needs people who think differently, radically and out of the box. It is looking for different approaches to how Accenture has traditionally solved problems and is taking concepts from the likes of the d.school in California.

IBM internationally has taken a very strategic position in building design into its core capabilities. IBM is one of the largest design firms in the world with design studios in approximately 30 countries world-wide including Ireland, on its Mulhuddart campus.

[51] These are the figures in the Design-in-Tech report for 2016. The 2017 report had not been released at the time of completion of this report.

[52] "Silicon Docks" is a nickname for the area around Grand Canal Dock, stretching to the IFSC and is a reference to Silicon Valley. The name was adopted because of the concentration of European headquarters of high-tech companies such as Google, Facebook, Twitter, Linkedin and startups in the area. The number of tech professionals working in technology firms in the area is about 7,000.

Figure 7.8: Mergers & Acquisitions



Source: Taken for Design-in-Tech Reports, 2016 & 2017

> Research has also found that the more strategic the implementation of design within a company the more likely a company is to experience growth in demand for its products and services because design and innovation sharpens a company's competitive edge.

The venture capital and mergers and acquisitions activities combined point to a significant interest in design and therefore an acceptance of the added value that design is bringing to these corporations.

7.4 The Value of the "Design Economy" in the UK and Ireland

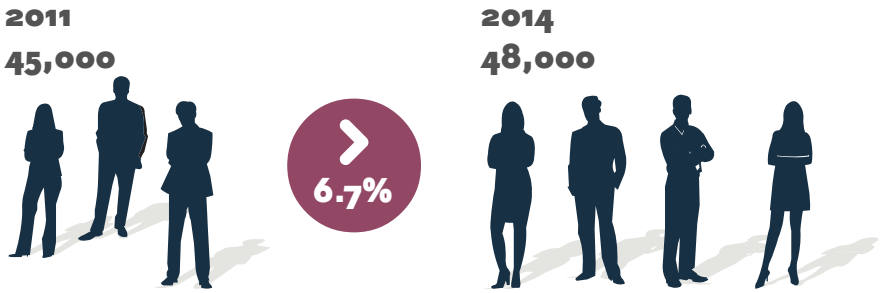
Section 7.2 deals with the value of design from a micro-economic perspective. The data is largely gathered by company surveys and is subject to many vagaries owing to the subjective nature of the topic. That said, the results, in their totality, do point to a positive correlation between the performance of a company and its strategic adoption of design.

It is more difficult to measure the macro-economic value of design. Two recent studies using national statistics and standard occupational and industrial classifications were undertaken in the UK and Ireland. As for the Danish Design Ladder and EU Innobarometer survey results these macro-economic studies also come with caveats as current economic statistics are not good at capturing output and productivity accurately in a modern, dynamic economy.

7.4.1 Ireland

Based on a broad definition of design, the *Irish Design Footprint*, which was developed to measure the economic contribution of design to the Irish economy, as far as is feasible, based on available data, the research found that design has a significant economic impact on the Irish design economy. The Irish Design Footprint is represented by six Design Groups with business sectors, based on NACE Rev2 and occupations based on SOC 2010, assigned to each group. The impact of design is measured by the contribution of designers to total employment in the economy and the contribution of the "Design Sectors" to total exports from Ireland.

Figure 7.5: Employment in Design Occupations



Source: Policy Framework for Design in Enterprise in Ireland, Jan 2016, DJEI

Employment in design occupations accounted for 2.48% of total employment in the years 2001 – 2014, and the numbers employed grew from 45,000 in 2011 to 48,000 in 2014, a growth of 6.7%, broadly in line with overall employment growth in the same period. Important to note is that 48% of employment of design occupations was in the digital design group, which reinforces the importance and significance of this design area. Workers were also found to be employed in design roles right across the economy in both design and non-design intensive sectors.

Figure 7.6: Exports from IDA and Enterprise Ireland (Agency) client companies in the Design Sectors

Source: Policy Framework for design in Enterprise in Ireland, Jan 2016, DJEI

Total design exports were valued at €38bn in 2012 which amounted to almost 21% of total exports in the Irish economy with exports from the Digital Design sector accounting for 97% of the €38bn predominantly from the FDI cohort of IDA client companies.

7.4.2 UK

The Design Council in the UK published in October 2015 a report entitled *The Design Economy*[53] which was the first piece of research in the UK to measure the contribution and value of design across the entire economy as opposed to design as a single economy, usually referred to as the design industry. The UK design economy in 2013 contributed £71.7bn in gross value added (GVA) which is equivalent to 7.2% of UK total GVA. Design's impact cuts across the entire economy with £52.5bn (~ 75%) of the total design GVA generated by designers working in non-design industries while £19.1bn in GVA is generated by design industries, and is relatively evenly split between that generated by designers and those working in other roles, supporting the design function.

Digital design makes a significant contribution to the design GVA footprint, delivering £30bn (42% of design GVA). The 'architecture and built environment' and 'product and industrial design' sectors are also key contributors, accounting for another £29.5bn in GVA collectively. These three sectors alone delivered 83% of total design economy GVA in 2013.

Design's contribution to the economy has grown at a faster rate than the UK average. Over the period 2009- 2013, GVA increased by 27.9% compared to 18.1% across the UK as a whole. This means the design economy created an additional £15.7bn in output in 2013 compared to 2009. GVA contributed by digital design increased by 39.3% over the same period.

Design is a vital ingredient for any UK business wanting to export more. Evaluation of the Design Council's "Designing Demand" programme, demonstrated that for every £1 companies invest in design to support their growth, they can expect to return £5 in exports. As part of the research for *The Design Economy*, the contribution of design to the export of goods and services was assessed. The total value of exports, in 2013, where design had made a contribution was £34bn which was 7.3% of total UK exports that year. (The equivalent figures for Ireland were €38m in value for design exports which amounted to 21% of total Irish exports in Ireland). Between 2009 & 2013, design influenced exports in the UK increased by 51.4%; slightly higher than the UK average of 48.9%. which means the design economy created an additional £11.5bn in exports in 2013 compared to 2009. (In Ireland the design economy created an additional €11.8m between 2008 & 2013).

In the UK whilst each design subsector has contributed to this growth in exporting, the research shows that some subsectors made a more substantial contribution than others with digital design delivering £12bn, which is 35% of design-influenced exports. (By contrast the digital contribution of the design exports in Ireland is 97% of total design exports).

[53] http://www.designcouncil.org.uk/sites/default/files/asset/document/Design%20Economy%20report%20web%20Final%20-%20140217%20Yea%201.pdf

Employing 1.6 million people (48,000 in Ireland), the design economy is the ninth biggest employment sector in the UK. This includes fewer than 580,000 people directly employed in the UK's design industries, and a further one million designers working in other sectors. This emphasises how embedded design is across the economy.

Demand for design is high and growing. Between 2010 and 2014 design employment grew by 21.7% compared to 6.1% for the UK economy as a whole. (Design employment grew by 6.7% in Ireland, in line with overall employment growth.)

The share of the total workforce employed in design is also increasing, up from 4.6% in 2009 to 5.2% in 2013. (Share of the work force in design in Ireland was 2.5% in 2013).

7.4.3 A Profile of the "Design Industry" in the UK and Ireland

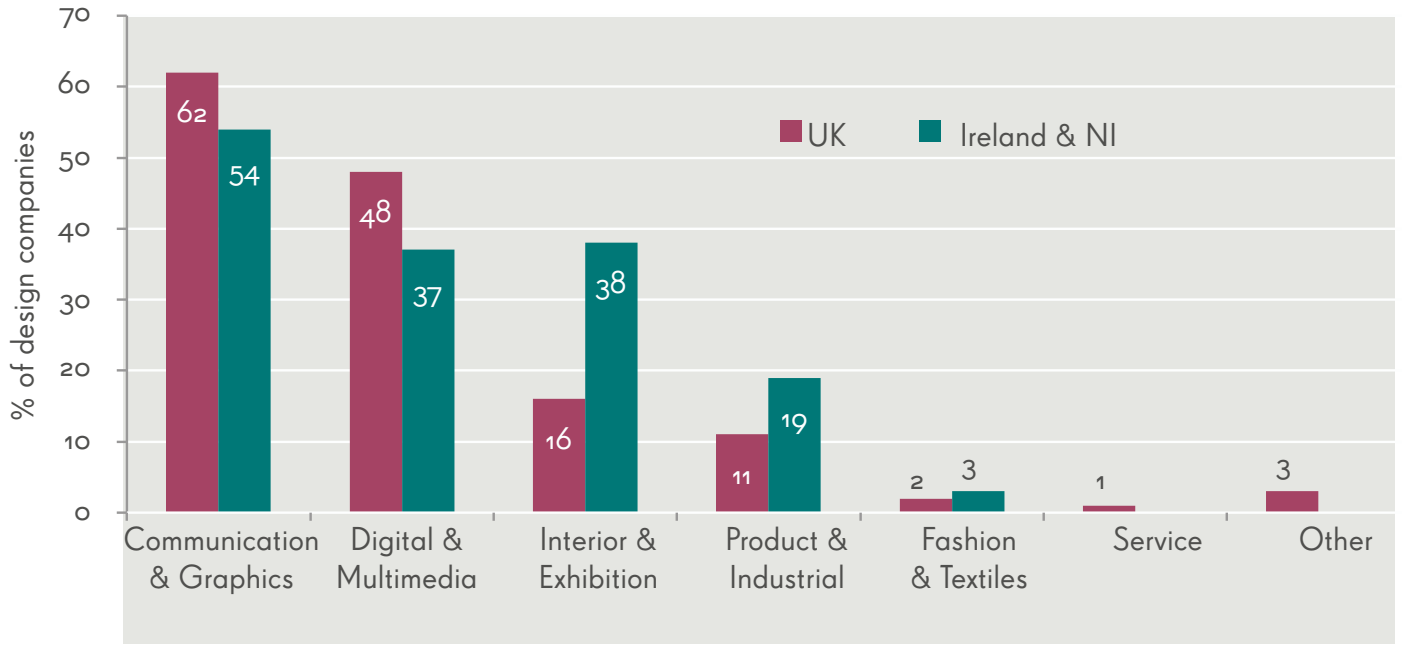
In autumn 2009 the Design Council in the UK conducted its second comprehensive survey of the UK design industry which covered 2,200 design businesses including in-house design teams, design consultancies and freelance designers working across communications, digital and multimedia, interiors and exhibition, product and industrial, fashion and service design disciplines.[54] Design businesses were asked about the profile and size of their businesses, their clients and the competition they face, their business practices and the education, training and skills of their employees.

In 2009 Inter Trade Ireland also conducted a survey of the design services sector on the Island of Ireland.[55] Figure 7.7 presents the types of design services the design businesses offer as a percentage of the total number of business. Some companies offer more than one service, in particular Communications and Graphics and Digital and Media which accounts for the total being greater that 100%.

[54] The Overall Executive Summary of the survey report is available on the Design Council Website at: http://www.designcouncil.org.uk/sites/default/files/asset/document/DesignIndustryResearch2010_FactSheets_Design_Council.pdf

[55] A Study of the Design Services Sector on the Island of Ireland, InterTradeIreland, 2009. Available at: http://www.intertradeireland.com/media/intertradeirelandcom/researchandstatistics/publications/innovation/AStudyoftheDesignServicesSectorontheIslandofIreland.pdf

Figure 7.7: **Design services provided by design companies in UK & Island of Ireland in 2009 as a % of the total no. of design companies, showing that many companies offer more than one design service.**



Source: Composite for results in UK Design Council Survey of the UK Design Industry and InterTrade Ireland's Study of the Design Services Sector on the Island of Ireland

It is interesting to note that in 2009 Communications and Graphics was still the most predominant design service, yet the key finding in this study has been a shift away from traditional designing such as communications and graphics and towards designing for a digital economy.

The measuring of the value of design has also shifted. It has moved away from the 'design industry' and focusing more on the contribution of design across the whole of an economy, or the 'design economy'.

8

THE DESIGNER'S SKILLS

From the definition of design combining the aesthetic, functionality and user need and the process used by designers a picture begins to emerge of the skills a designer must have – the ones automatically associated with design such as creativity and problem solving ability.

A study conducted by the Design Council (UK) "*Study of the Design Process*"[56] in which the design processes used in 11 global brands were studied gave real insights into the way design operates in these firms. An interesting finding in the study was that while the 11 companies employed designers in different design disciplines – such as visual communication and graphic design, product and industrial design and human interface expertise –there was a clear and strategic requirement from the heads of design in each of the 11 organisations to recruit and train designers who possessed a wider skill set such as multi-disciplinary working, business acumen and strategic thinking.

[56] http://www.designcouncil.org.uk/sites/default/files/asset/document/ElevenLessons_Design_Council%20(2).pdf

8.1 The T-shaped designer

T-shaped people possess a deep competency in one particular field, as well as a breadth of complementary skills or characteristics. Typically the horizontal bar of the 'T' denotes the range of skills possessed by an individual that allow them to work effectively in a team and across different fields. The vertical bar indicates their particular specialisation or expertise.

While originally developed in the 1970s in reference to the professional development of engineers to develop skills in areas such as design, marketing and management to complement their particular specialisations. Tim Brown of IDEO later employed the concept of the T-shape but with a slightly different interpretation, with the horizontal bar representing a designer's capacity for collaboration and the vertical bar denotes their practical specialisation through which they contribute to the creative process. This approach enables the building of disciplinary skills and interdisciplinary empathy and understanding required for the complex creative design processes and methodologies required for design innovation today. Having T-shaped skills is critical for a designer given the nature of their work which requires them to work closely with people of other disciplines and professions, such as engineers, marketing specialists, ICT professionals, project managers, business managers and psychologists, to name just a few.

Section 8.2 below identifies specific skills that the designer must have. Some of these are related to the vertical skills which are core to a designer and others relate to the horizontal part of the T-shape designer.

8.2 What are the skills necessary in a designer?

The key skills required in a designer today are outlined below:

✶ Creativity

Creativity is an essential skill in a designer. Creativity is the **coming up with ideas**. It generally has little to do with the 'flash of inspiration out of the blue' but more about **relating a concept to a particular body of knowledge**.

The existing body of knowledge is as vital as the novel idea. Really creative people spend years acquiring and refining their knowledge base[57], hence also the need for domain specialisation.

Leaders in the field of design and innovation, brothers David Kelley (Founder of IDEO[58] and the Stanford d-school[59]) and Tom Kelley (author of the *Art of Innovation*), hold that everyone is potentially creative and that it is about unlocking that potential as articulated in their book "Creative Confidence".[60] Creativity can be stimulated and supported through training and by creating the right work environment and atmosphere.

Anthony Jay's[61] quotation: *The uncreative mind can spot wrong answers but it takes a very creative mind to **spot wrong questions*** is insightful when overlaid on the design process where the first step is to define the problem, i.e. what is the correct question, hence the Design Council's "Double Diamond" design process which include defining the right problem as the first part of the process.

A key attribute of creative designers is that they are **comfortable in chaos** and operate well in the unknown. They are equipped with the ability to make sense of the chaos and unknown and learn

57 John Hunt, former Visiting Professor for Organisational Behaviour at London Business School

58 IDEO is an international design and consulting firm founded in Palo Alto, California, in 1991. IDEO is a pioneer of human-centred design—putting people at the centre of our work an approach which has come to be known as design thinking.

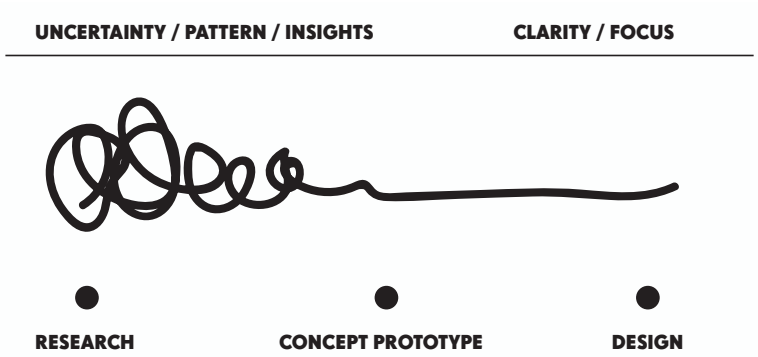
59 The Hasso Plattner Institute of Design at Stanford, commonly known as the d.school, is a design thinking institute based in Stanford University. The Institute was founded by Stanford mechanical engineering professor David M. Kelley, along with six other professors. It integrates business, law, medicine, the social sciences and humanities into more traditional engineering and product design education.

60 "Creative Confidence – Unleashing the creative potential within us all" by David and Tom Kelley, Oct 2013

61 Sir Anthony Jay - English writer, broadcaster, and director, famous for co-authoring, with Jonathan Lynn, the British political comedies Yes Minister and Yes, Prime Minister.

to **see the patterns and connections and relationships** where others cannot. Designers do not operate linearly but iteratively and revise the solutions as more information comes to light. To those observing a designer at work Figure 8.1 portrays how it might appear to an observer, however within the "squiggles" or the chaos and uncertainty systematic processes are going on as shown in the design process (Figure 3.2), which combined with the creative designer's ability to see patterns results in a clarity or focus and final design solution.

Figure 8.1: The Squiggle - How Design Looks to an observer



Source: Damien Newman from Central Office of Design, 2006. CC BY

This ability to see patterns in chaos is a key skill that designers bring to companies today as they try to navigate a very uncertain world.

✴ Empathy

One of the key components of design in the 21st century and which has arguably transformed and revolutionised design to what it has become today is the emphasis on the user needs. It has even made it presence felt in the terminology used to describe some design categories such as User Experience Design (UX) and Human–computer Interaction (HCI) which researches the design and use of computer technology, focused on the interfaces between people (users) and computers. The skill needed to understand a user's need is empathy. Empathy is the capacity to understand or feel what another person is experiencing from within the other being's frame of reference, i.e., the capacity to place oneself in another's position. It's the ability **to see with the eyes of another**, **to listen with the ears of another** and **to feel with the heart of another**.

✴ Multi- disciplinary Skills

Given the complexity of what design is, technology combined with an aesthetic and something a user wants already points to a multi-disciplinary skills requirement. A designer must be creative, have empathy and understand the technology/materials that are used to develop the design output. Whether it's an understanding of software programming, materials development, higher levels of technology or use research methodology, designers are expected to actively and effectively engage with other disciplines. The purpose is for them to understand the touch-points that design has and its effects on, other parts of the business and to learn how to work with these in practice. This involves learning different 'languages' and using appropriate communication tools to achieve cross functional and cross departmental project management.

✴ Technical Capability

Technology has been the driving force behind the changing nature of design and it is therefore important for a designer to at least have a basic understanding of the technology that is being used to build their design. Designers today, particularly designers in the digital world will also need to have knowledge of coding. They do not need to be the experts but they need to know how to do it otherwise they won't be able to "converse" with the back-end coders.

✴ Team Worker

The design process requires a multidisciplinary team with each member bringing a different strength. The creative process is more effective when there are many heads involved which is why brainstorming is a common technique used in the design process. Ideas are generated by the interaction of the team members and the ability to work in a team is a key skill for a designer.

✴ Problem Solving Ability

Problem solving is the process of working through details of a problem or complex issue to find a solution. Problem solving is a process using steps in an orderly manner. This sounds like a design process. There are four basic steps in solving a problem:

1. Defining the problem.
2. Generating alternatives.
3. Evaluating and selecting alternatives.
4. Implementing solutions.

These steps are identical to the 4 basic steps of the Design process shown in Section 3.2. This might explain why many people describe Design as Problem Solving because the techniques/ processes used are identical.

The key to good problem definition is ensuring that one deals with the real problem – not its symptoms or an incorrect interpretation the problem. At this stage, it's also important to ensure that one looks at the issue from a variety of perspectives (Divergent Thinking phase). If one commits too early, one can end up with a problem statement that's really a solution instead.

✴ Design Management Skills

Simply put, design management is the business side of design. It is dealt with in more detail in Section 5.7. This is closely linked to Business Acumen.

✴ Business Acumen

An understanding of the business and the ability to put design solutions through the test of business objectives and priorities is key for most businesses. All designs need to be commercially viable and it is important for designers to understand the business and commercial constraints when they are designing.

✴ A 'go—getter' attitude, curious

One of the skills identified in the Design Council report is a 'go-getter' attitude which is described as; "the need to be inquisitive, daring and take initiatives to 'move beyond the drawing board' and act strategically." The designer needs to "seek opportunities to engage with the wider business and use their design expertise to spot areas for innovation and improvement".

While all the skills listed in this section (including the four below) could be described as transversal skills[61] and are not necessarily specific to design the ones described above are skills germane to design and need to be honed around what is needed as a designer. The four skills below, which speak for themselves, are of a slightly different type and in the work place today are required by all companies hiring almost any employee.

Communication Skills – Written & Oral

Networking skills

Research & Planning Skills

Flexibility and Time Management

[62] Transversal skills and competences are relevant to a broad range of occupations and sectors. They are often referred to as core skills, basic skills or soft skills, the cornerstone for the personal development of a person. Transversal skills and competences are the building blocks for the development of the "hard" skills and competences required to succeed on the labour market.

9

PROVISION OF DESIGN EDUCATION IN IRELAND

9.1 The development of Design Education in Ireland[63]

The origins of design education in Ireland can be dated back to the mid-19th century and the foundation of the Government Schools of Design, which sought to improve the education of designers and in turn improve the output of industry.

Dublin had seen a private drawing school established in 1746, which was taken over by the Dublin Society (later the Royal Dublin Society). This in turn was placed under the control of the Department of Science and Art in 1854. Under the leadership of designer and educator Henry Cole (1808–1882) a team of experts developed formal guidelines for a new design education for these new metropolitan schools located in major cities across the British and Irish Isles. In 1877 the institution was renamed the Dublin Metropolitan School of Art, and the curriculum slowly evolved and expanded to include emerging design and craft disciplines. The Department of Education took control in 1924, and twelve years later it became the National College of Art, with teaching faculties of painting, sculpture and design.

[63] Milton, A., The development of Design Education in Ireland, www.alexmiltondesign.com

The publication of *Design in Ireland: Report of the Scandinavian Design Group in Ireland* in 1962 proved to be the catalyst for the next significant step in the development of Irish design education.

At a symposium organised by the Arts Council in 1968, Sir Robin Darwin, the Director of the Royal College of Art London, called for the radical modernisation of the National College of Art and for a new university faculty of industrial design engineering, science and mathematics. In the same year major student disturbances at the National College of Art led to a long running public controversy over teaching methods and standards at the College. Córas Tráchtála kept up the pressure for educational reform and organised an industrial design seminar in Killarney in 1970 urging the establishment of postgraduate studies in industrial design. In 1971, following further controversy over teaching methods and standards at the College, the National College of Art and Design was established by act of the Oireachtas.

By the late 1970s the college's Faculty of Design provided courses in graphic design, fashion and textiles, craft design and industrial design. This latter course was run in conjunction with the National Institute for Higher Education Limerick, which was to become the University of Limerick in 1989. Throughout the 1980s all courses in the National College of Art and Design attained degree status under the authority of the National Council for Educational Awards.

Independently, but simultaneously, design education developed in the many new Regional Technical Colleges throughout Ireland, which were built with support from the European Community. The transformation of the Regional Technical Colleges into Institutes of Technology in the 1990's saw a dramatic expansion in the range of design courses taught in Ireland, and the introduction of new digital design disciplines and a focus on vocational design for business that complemented the traditional art school model still prevalent at NCAD and the regional art schools in Limerick and Cork.[64] In 1998, the National College of Art and Design awarded its first PhD, and design research training was established through all-Ireland initiatives such as GradCAM helping develop a practice-based doctoral model.

The last decade has seen a number of private institutions enter the marketplace such as the Dublin Institute of Design, reflecting the increasing demand for design education provision. The quality of provision continues to improve, with NCAD ranked within the global top 100 art and design colleges by the QS World Rankings.

[64] King, L., Irish Design : History, Context, Possibilities 1900-2011, in PIVOT Dublin WDC2014 bid book, DCC 2011

The growing number of Masters Courses in design offered by third level institutions have helped stem a design diaspora of graduates undertaking postgraduate education in the UK and beyond. This has enabled the maturation of a design education landscape that can meet the demands of contemporary industry.

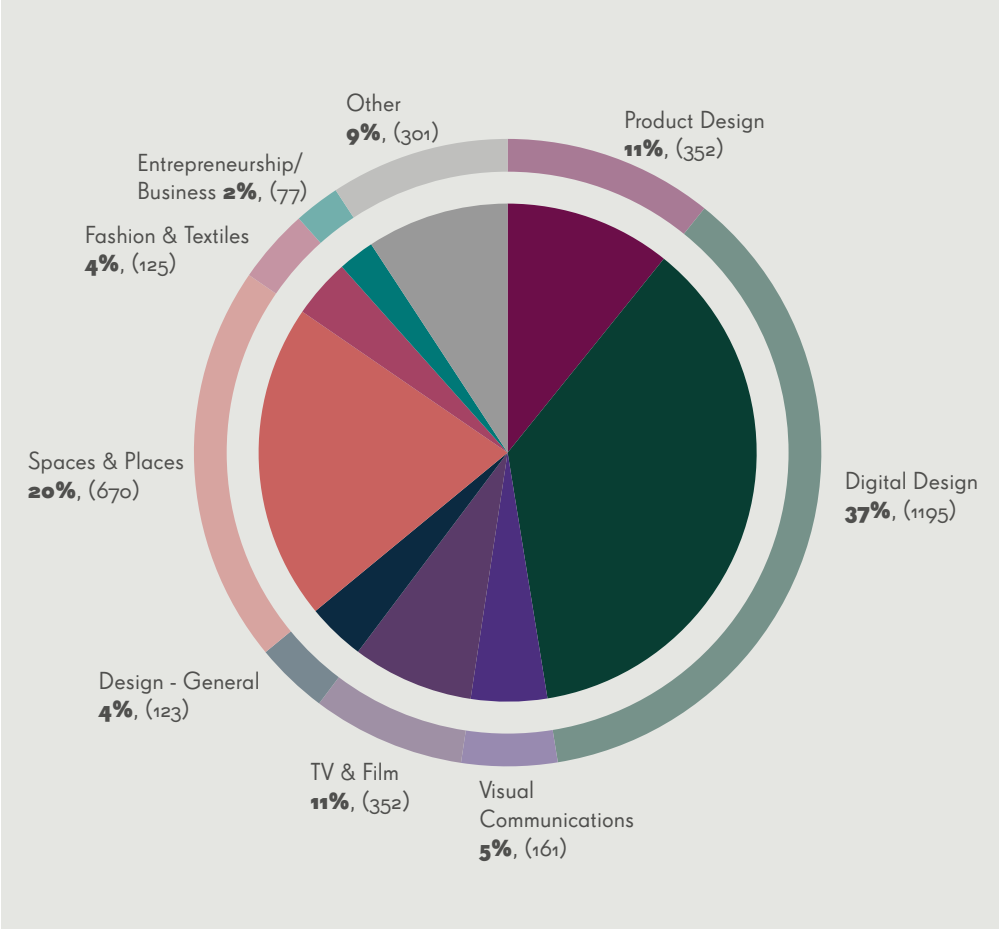
Leading design academics in Ireland have recently established a new organisation entitled *Design Educators Ireland*. The organisation aims to provide a voice for and on behalf of third level design education in Ireland. It aims to contribute to the development of the design education community, enhancing its standing and stature as well as supporting its engagement with industry, government and wider society and acting as a conduit for dialogue between education, creative industries and government.

9.2 Design course provision in Higher Education (HE)

The provision of all Higher Education design courses are listed in Appendix 1. They have been grouped by the design categories identified in Section 4.1, and within each category by HEI and by NFQ level and the numbers of graduates in 2015 (numbers provided by the HEA).

In 2015 a total of over 3,200 students in design related courses, out of a total of 64,283 students, (equivalent to 5% of student body), graduated from a HEI with NFQ Levels 6-10. The breakdown of the numbers by design category is shown in Figure 9.1.

Figure 9.1: 2015 HE Design Graduates by Category of Design Course



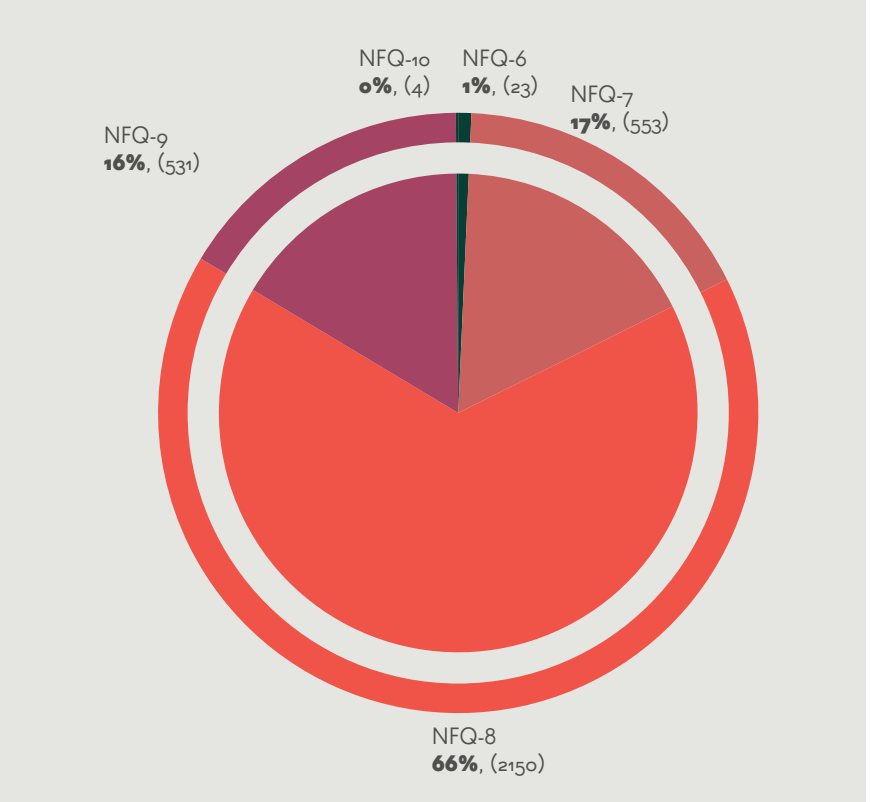
Source: DBEI (categorisation) & HEA (numbers)

The largest cohort of students is from digital design at 37% (1,195 students). This is not surprising and is in line with the evidence presented throughout this report about the dominance of digital on the world of design in the 21st century. What is interesting to note is that the second largest group is the Spaces and Places category at 20% (670 students). This is a discrete sector, one of the traditional design sectors, and has not been explored in this study as it is specific to the built environment, and not directly relevant to the wider enterprise base. Product design graduates (one of the three categories of design deemed important for Ireland's enterprise base, Section 3.2) are the third largest group at 11% (352 students) which is less than one third the output from digital design. Design Thinking or design management does not feature but that is not to say it is not taught. There is an MSc in Design Innovation in Maynooth University and elective modules on design thinking are available in many other degrees (e.g. Innovation Academy in UCD provides such modules to students across all degrees).

The awards were also analysed by NFQ Level (Figure 9.2). Two thirds of the design courses (66%) are awarded at honours degree level (NFQ Level 8) while no PhDs were awarded in 2015. Only 1% of awards in the HEIs are at NFQ Level 6 which is unsurprising as the majority of Level 6s are awarded by the FET (Further Education and Training) colleges.

What is not as developed as it might be is design research as an academic discipline across the full spectrum up to and including post doc and fellowship positions and an R&D agenda shared between academia and industry, within which large scale projects take place that are delivered through coordinated and structured PhD projects. The traditional academic model of PhD is not the most appropriate for design and a preferred model is practice based, which are offered both in NCAD and SMARTlab in UCD. Ideally a model of doctoral study in relation to design would be developed which better reflects a relationship to design as a profession.

Figure 9.2: 2015 HE Design Graduates by NFQ Level



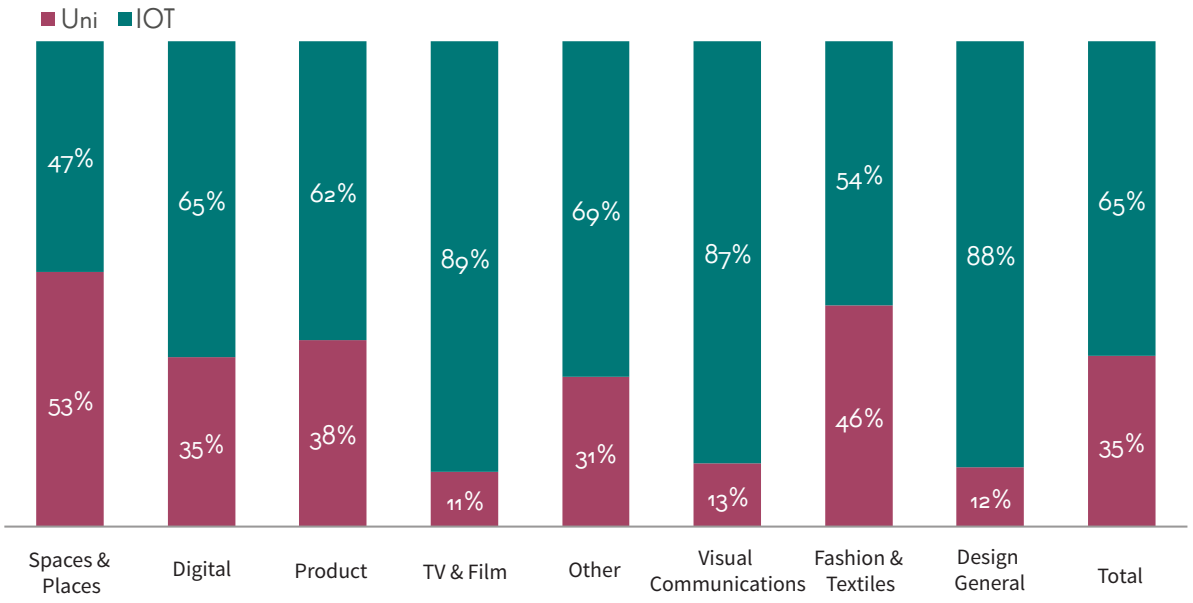
Source: DBEI (categorisation) & HEA (numbers)

The Higher Education Institutes comprise the Universities and the Institutes of Technology and the category of design courses mapped against the type of HEI is illustrated in Figure 9.3.

Just over one third (35%) of courses are provided by a University with the remaining 65% provided by the Institutes of Technology. Architecture is the oldest design discipline and has traditionally been taught in the universities but in recent years is being taught in the Institutes of Technology. With NCAD a recognised college of UCD it has changed the balance of design offerings from being predominantly in the Institutes of Technology to a broader design offering from the universities. For example 46% of the fashion and textile design courses and 13% of the communication design courses are from a university but they are all in NCAD. With the exception of architecture the only other two universities involved in the design environment are University of Limerick (UL) and Maynooth University, both of whom teach product design.

All of the design schools who were consulted during this study were found to have an active engagement with enterprise and many student projects, particularly in final year, were conducted with those companies that hired designers, in particular product designers.

Figure 9.3: 2015 Design Graduates by HEI type – Institute of Technology (IoT) or University



Source: DBEI (categorisation) & HEA (numbers)

The Central Applications Office (CAO), which provides a single point of application for all year 1 undergraduate courses in Ireland, is currently engaged in a project to update the coding of courses. Once completed the CAO course coding will be aligned with the HEA in using the ISCED[65] coding system. To complement this system the CAO has agreed to adopt a more detailed mapping for the specialist group Art, Design and Media, the detail of which would otherwise be lost in the broader ISCED codes. This new mapping for this specialist group will be rolled out for 2018 and will provide more accurate data on this field. The preliminary list for this level 8 grouping is attached with the overall finding for 2017 applications given in the chart below.

Table 1: Number of Level 8 Mentions and First Preferences, Total and by ADM Category

	2017		2016		Difference		Percentage Change	
Category	Total Mentions	First Preferences	Total Mentions	First Preferences	Total Mentions	First Preferences	Total Mentions	First Preferences
Total Applications	350,521	65,294	353,556	650,30	-3,035	264	-1%	0%
(007) Art, Design and Media (techniques and production)	10,951	2,795	10,980	2,731	-29	64	0%	2%

Source: CAO 2017

Applications to Art, Design & Media in 2017 are on par with applications in 2016. Level 6 & 7 courses in this specialist group have yet to be finalised.

With this mapping process it will be possible in future to scope very accurately the size of the design undergraduate sector, the scope and uptake of design courses in total and by sector (university / IOT) and course type and to measure interest by applicants in the area.

Based on currently available data the following information is available:

- The number of applicants accepting a Design course offer increased between 2011 and 2016 by 17% (from 698 to 818).
- The number of students accepting a place on a Design course within the University sector has increased by 58% (194 to 306).

Table 2: Difference in take up of Design Courses between 2011 and 2016

Design - CAO Accepts	2011	% of Total 2011	Total 2016	% of Total 2016	Difference	% Change
Design Total	698		818		120	17%
University - Design	194	28%	306	37%	112	58%
IOT- Design	499	71%	546	67%	47	10%

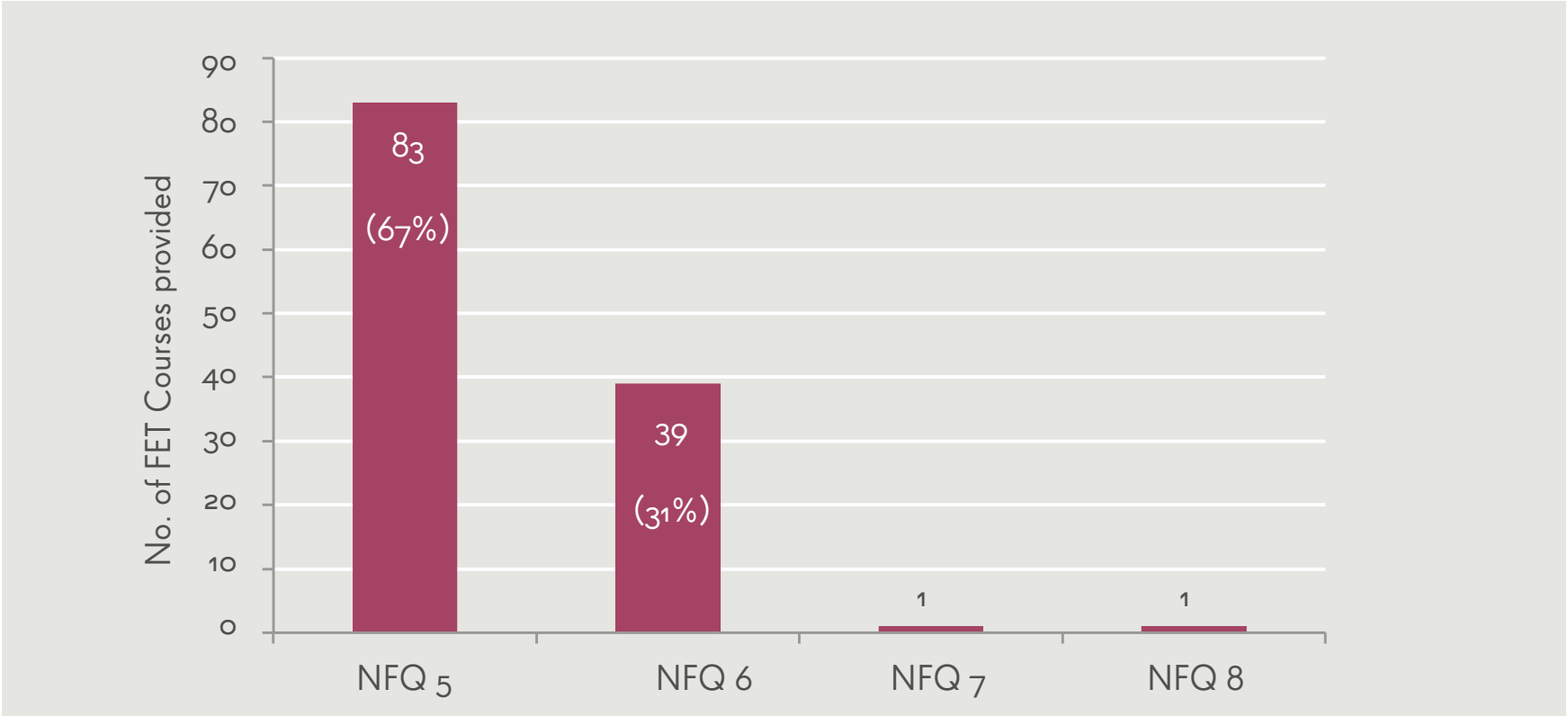
Source: McCarthy, C. Design Applications report for CAO, NCAD 2017

[65] The International Standard Classification of Education (ISCED) is a statistical framework for organizing information on education maintained by the United Nations Educational, Scientific and Cultural Organization (UNESCO). It is a member of the international family of economic and social classifications of the United Nations.

9.3 Design course provision in Further Education & Training (FET)

The design courses provided by the Further Education & Training Colleges are listed in Appendix 2. While the numbers of students attending the courses in any given year was not provided in the 2016 report for the DCCoI "*Profile of Business in the Traditional Design Sectors*" and is not readily available from a central source, an analysis of the types of courses at the NFQ level presents some interesting findings. Two thirds (67%) of the courses provided are at NFQ level 5 while only 31% are at Level 6. NFQ Level 6 is the cross over point between FET and Higher Education (HE) and only 17% of the courses in the HEIs (Higher Education Institutes) were at level 6 while 66% were at Level 8. Levels 5 & 8 are the two most popular NFQ Levels at which students are undertaking design courses with small numbers progressing from Level 5 to 6 and Level 8 to 9 in the respective institutes.

Figure 9.4: Breakdown of Further Education and Training courses in design by NFQ level



Source: Con Kennedy, *Profile of Business in the Traditional Design Sectors*, Jan 2016

The only FET on the list at Level 8 is the Degree in Animation at the Irish School of Animation at the Ballyfermot College of Further Education which is validated by the University of Dundee.

The number and variety of courses on offer in FET is different to HE in a number of ways. Under product design the FET courses are almost all in Furniture design and are at Level 5 with a one year add on option to progress to Level 6. By contrast in the HEIs, more specifically the Institutes of Technology with the exception of University of Limerick and Maynooth University, there is only one HEI offering a degree in Furniture Design. This is at GMIT (Galway-Mayo Institute of Technology) at Letterfrack. Students from the Colleges of Further of Education have the option of progressing from a CFE Level 6 to GMIT to continue a Level 8.

Regarding Product/Industrial Design there is only one FET industrial design course on offer and that is at level 5 whereas in the HEIs the predominance of courses are in Product/Industrial design and are at Levels 7 & 8. The entry point for industrial/product design is to the HEIs and unlike furniture design there isn't an entry point lower on the NFQ Framework with the possibility of progression to degree level.

From the list of FET courses provided the Spaces & Places FET courses seem structured like the Product Design course in that many of them are at Level 5 with a one year add on for a level 6. The courses are predominantly in Architectural Technology which are also available in the HEIs and the possibility is therefore there for students from the FET schools to progress to degree level if they so wish.

The FET Digital Design course appear less structured when compared to the Product and Spaces & Places courses. This could have arisen because of the new and revolutionary nature of the rise in design for the digital world. There are a number of interactive/creative media course that are offered at Level 5 with a progression option to Level 6 which gives students the option of moving on to an IoT and obtaining a degree. However given the significance and recent rapid growth in this sector it appears less developed in the FET side than in the HE side.

9.4 Design Apprenticeships & Traineeships

Historically the Design sector has had little involvement with apprenticeships and traineeships. Despite the "hands-on", practical and studio based nature of design and the revised industry-led apprenticeship model that was developed in 2014, at the time of writing, there are no Design Apprenticeships available in Ireland. There is one new career Traineeships in development in the area of visual effects for animation and post-production.

Likewise in the UK, as recently as 2008 there were no design apprenticeships but with the increasing focus in the UK's vocational education and training system on apprenticeships this is now changing. There has been more than a doubling of digital and creative apprenticeship starts in 2008 from 9,050 to 20,010 in 2010.[66] "Creative Skillset", the Sector Skills Council[67], for the UK's screen-based creative industries has worked with industry to develop a suite of apprenticeship frameworks and has accredited apprenticeship provision in a number of areas including Creative and Digital Media, Interactive Design and Development and Fashion and Textiles.

Like the UK, which has an ambitious target to deliver three million apprenticeships by 2020, Ireland has also set an ambitious target of 50,000 new apprenticeship and traineeship places by

[66] UKCES (UK Commission for Employment and Skills), *Sector Skills Insights: Digital and Creative*. Evidence report 49, July 2012

[67] Sector Skills Councils (SSCs) are employer-led organisations that cover specific industries in the United Kingdom. They have four key goals:

- to support employers in developing and managing apprenticeship standards
- to reduce skills gaps and shortages and improve productivity
- to boost the skills of their sector workforces
- to improve learning supply

SSCs aim to achieve these goals by developing an understanding of the future skills needs in their industry, and contributing to the development of National Occupational Standards, the design and approval of apprenticeship frameworks and the New Apprenticeship Standards and creating Sector Qualification Strategies. There are currently 21 SSCs, covering about 90 per cent of the British workforce. SSCs are licensed by the government through the UK Commission for Employment and Skills (UKCES).

2020 as set out in the *National Skills Strategy 2025*[68] and further elaborated in *the Action Plan to Expand Apprenticeship and Traineeship in Ireland 2016 – 2020*.[69]

HEIs are currently one of the main suppliers of professionals to the digital and creative sector.[70] However greater structured on-the-job learning would be desirable and the possibility of developing apprenticeships or traineeships with FET or HE providers should be explored.

9.5 Design Education – Models of Delivery

The nature and status of design education is under review internationally. The traditional institutional mode of delivery for design education has been the art school or studio model with teaching undertaken within a studio and workshop culture, and this model has continued to be the preferred and dominant global pedagogical and organisational model.

The 'studio' model supports cross-pollination, promoting discourse across disciplines, and the leading international providers of design education such as the Royal College of Art, UK; Design Academy Eindhoven, the Netherlands and New School Parsons, US, exemplify the benefits of this creative framework.

The importance of making and doing, rather than just theorising and visualising on screen, is a crucial element of this model. The model's ongoing relevance was recently highlighted by Apple's Chief Design Officer, Jonathan Ive, who publically denounced some design educators for failing to teach students how to make physical products and relying too heavily on computers. "So many of the designers that we interview don't know how to make stuff, because workshops in design schools are expensive and computers are cheaper," said Ive.

The studio model of design education has been reinforced recently through increased collaboration with other pedagogical models such as social sciences (New School Parsons), engineering (RCA/Imperial College London) and computing (Design Informatics at Edinburgh college of Art/University of Edinburgh). These new collaborations and perspectives help ignite new ways of thinking and spark innovation as students are able to move between media and materials, and contexts and cultures to create new forms of design.

The studio model for design and the importance of making and doing has implications on funding design schools as it is a more costly model of education, more akin to the architectural and medical school model than the traditional lecture hall model of teaching.

[68] Ireland's National Skills Strategy 2025, Department of Education and Skills, Jan 2016

[69] Action Plan to Expand Apprenticeship and Traineeship in Ireland, 2016-2020, Department of Education and Skills, Jan 2017

[70] UKCES (UK Commission for Employment and Skills), Sector Skills Insights: Digital and Creative. Evidence report 49, July 2012

10

FINDINGS

10.1 Findings

In order to develop and enhance our ability to harness the value of design to grow our economy and compete successfully in new markets the findings from this research are best summarised under three key headings, namely;

- **Design education provision**
- **Design training for businesses and designer upskilling**
- **Funding of design**

Design Education Provision

Higher & Further Education

Design has undergone a revolution in the 21st century. Boundaries between the different disciplines of design have broken down and between design and other disciplines, most notably ICT and engineering. Technology in particular has driven much of this change. This rapid and continuing change will have an impact on the provision of design education and its ability to ensure that graduates are equipped to deal with the 21st century demands on a designer. Arising from this rapid change research is being undertaken internationally on the future of the design school. In order for Ireland to reach its design potential and be a recognised player in this domain it is timely that the provision of design education is reviewed to determine what measures are needed so that our design schools are recognised internationally as being world class.

There is a move internationally towards making Further Education & Training (FET) a more attractive and viable option for school leavers to embark on a career. In Ireland the FET sector has been transformed with the formation of the Education and Training Boards, Solas and the first FET strategy. A recurring theme in many sectors is the need to make the pathway from FET to Higher Education (HE) more visible and this applies also to design. In order to encourage more students to consider a career in design all avenues need to be open to them.

Apprenticeships and Traineeships

The “learning by doing” method is often a more suitable educational model for some students. As design is a practical discipline it lends itself to this mode of learning very easily. An action plan has been put in place to expand Apprenticeships and Traineeships in both FET and HE which could provide further routes to design careers. While traditionally design education has been provided by Higher Education Institutes there is now an opportunity to explore alternate models and possibly learn from the experience in the UK who are trying to do the same.

Design Research

Given the increasing recognition of the importance of design to our economy it is imperative that design becomes a core component of Ireland’s knowledge infrastructure. Design needs to be an increasing part of our fourth post graduate level of education up to level 10. Internationally design is increasingly being pursued as an academic discipline and design research is gaining momentum. Given its impact on society, as a country we need to better understand how design can deliver value from a social, economic, cultural and technical perspective.

Design training for businesses and designer upskilling

Training in design for Ireland's non-design businesses

Although the value of design is difficult to measure directly there have been multiple studies conducted to demonstrate that the strategic adoption of design by a company increases its economic output, makes it more innovative and more productive, and enables it to compete more competitively in new markets, all of which will become more crucial for a business's survival as we enter the reality of Brexit. Many of the large foreign multi-national companies have already acted on this as evidenced by the mergers and acquisitions and the establishment of design studios in companies here in Dublin such as IBM, Accenture and EY and some businesses such as Bank of Ireland and AIB. However, for many, usually smaller companies, accessing the training necessary to learn how best to utilise the value of design thinking and adopt design as a strategy can be difficult as they do not know where to turn and it can also be expensive. Therefore a number of different options need to be explored in order for the Irish non-design enterprise base to access training in design.

Upskilling of designers

Additionally given the rapid pace of change in the nature of design it has become essential for designers themselves to keep pace with the changes and to upskill, otherwise their value to business will decrease. Like many other professions such as architecture, engineering and medicine to maintain their registration they must participate in recognised continuous professional development. This is an option that should be considered for designers so that they can remain current as to what is happening in design and it will have the added value of professionalising their sector.

Funding of Design

Two different aspects to the funding of design emerged as necessary in order to enhance our ability to harness the value of design. One is the funding for business to access design and the other is funding of design education provision.

Design Funding for Businesses

In this study design was identified as a key component of Ireland's innovation ecosystem. Research and Development (R&D) is the component of innovation that is long recognised and has established funding mechanisms. Some elements of design fall under the funding for R&D innovation. Thus it is worth putting an increased focus on communicating this to companies. This is already beginning with Enterprise Ireland's Innovation supports which in the future will be communicated specifically in relation to design as well as R&D.

Two other key devices used to either help companies access R&D or to incentivise a company to spend on research are the Innovation Vouchers and the R&D Tax Credit system. Similarly, elements of design fall under the remit of these and it could be examined as to how to better communicate this so that companies can more readily and easily avail of these incentives.

Funding for Design Education Provision

The funding necessary to deliver the required design education is more complicated, difficult and costly to work out. With the complete revolution in design driven by technology, pressure is on the education institutes to be properly equipped with the necessary machinery, tools and technology in order for students to be educated and trained to the standard required of them by industry so that they can progress to employment. A review of the design education provision would help provide a clearer picture as to what investment may be necessary in order to make Ireland's design education world class.

Next Steps

An immediate set of actions are set out in an Action Plan in Appendix 5. The primary action is to commission a review of enterprise demand for design skills and the provision of those design skills by the education system. When this work is complete it should provide more granular recommendations for the education system to respond to. Implementation of the other actions in the Action Plan can commence immediately.

APPENDICES

Appendix 1: List of design and design related courses in Republic of Ireland's HEIs (Higher Education Institutes) and number of graduates in 2015

Institution	Type	Programme	Award	NFQ	2015
Design Thinking					
Maynooth University	University	Design Innovation	MSc	9	
Maynooth University	University	Structured PhD in Design Innovation	PhD	10	
Product Design					
AIT	IoT	Polymer Technology for Medical Devices	Certificate	6	8
DIT	IoT	Timber Product Technology	BTech	7	
DIT	IoT	Product Design	BSc	8	34
DIT	IoT	Manufacturing & Design Engineering	BE	8	25
DIT	IoT	Medical Device Innovation	BSc	8	3
DIT	IoT	Medical Device Innovation	BSc	8	15
GMIT	IoT	Furniture Design & Manufacture	Higher Cert	6	2
GMIT	IoT	Furniture Design & Manufacture	BSc	7	22
GMIT	IoT	Furniture Design & Manufacture	BSc (Hons)	8	18
GMIT	IoT	Furniture Design & Wood Technology	BSc	7	17
GMIT	IoT	Furniture Design & Wood Technology	BSc (Hons)	8	9
IADT	IoT	3D Design, Model-Making & Digital Art	BA (Hons)	8	27
IT Carlow	IoT	Industrial Design	BA	7	10
IT Carlow	IoT	Product Design Innovation	BA	7	2
IT Carlow	IoT	Product Design Innovation	BA (Hons)	8	25
Letterkenny IT	IoT	Product Design	BA	7	5
Maynooth University	University	Product Design (Marketing & Innovation)	BSc	8	39
NCAD	University	Product Design	BA	8	23
NCAD	University	Medical Device Design	MSc	9	10
NCAD	University	Product Design	MFA	9	1
Sligo IT	IoT	Precision Engineering & Design	Higher Cert	6	
Sligo IT	IoT	Industrial Design	BA	7	1

Institution	Type	Programme	Award	NFQ	2015
Product Design					
Sligo IT	IoT	Precision Engineering & Design	BEng	7	
UL	University	Product Design & Technology	BSc (Hons)	8	41
UL	University	Design & Manufacture	BEng	8	
UL	University	Computer Aided Engineering Product Design	Grad Dip	9	15
UL	University	Research Masters in Product Design	MSc	9	5
UL	University	PhD by Research in Product Design	PhD	10	12
UL	University	Design Post-Doctoral/Research Fellowships/Research Assistants	Post Doc/RF	11	4
UL	University	Structured PhD in Design & Manufacturing	PhD	10	
Digital Design					
AIT	IoT	Design in Digital Media	BA (Hons)	8	8
AIT	IoT	Software Design (Game Development)	BSc	7	1
AIT	IoT	Software Design (Game Development)	BSc (Hons)	8	21
AIT	IoT	Software Design (Web Development)	BSc	7	1
AIT	IoT	Software Design (Web Development)	BSc (Hons)	8	9
Blanchardstown	IoT	Creative Digital Media	BA	7	22
Blanchardstown	IoT	Creative Digital Media	BA	8	11
CIT	IoT	Digital Media Design & Development	Certificate	8	
CIT	IoT	Media Production	Certificate	8	
CIT	IoT	Multimedia	BA	8	12
CIT	IoT	E-learning Design & Development	MA	9	15
CIT	IoT	Web Development	BSc (Hons)	8	12
DCU	University	Multimedia	BSc	8	53
DCU	University	Multimedia	MSc	9	21
DCU	University	Computer Applications (Inf.Sys.)	BSc	8	1
DCU	University	Computer Applications (Sft.Eng.)	BSc	8	55
DIT	IoT	Computer Games Development	BSc	7	1

Institution	Type	Programme	Award	NFQ	2015
DIT	IoT	Game Design	BA	8	
DIT	IoT	Print & Digital Media Technology Management	BA	8	6
DIT	IoT	Creative Digital Media	MSc	9	10
DIT	IoT	Digital Games	MSc	9	
DIT	IoT	Digital Technology, Design & Innovation	BSc (Hons)	8	141
DIT	IoT	Computer Game Development	BSc (Hons)	8	21
Dundalk IT	IoT	Communications (Creative Multimedia)	BA	7	20
Dundalk IT	IoT	Communications in Creative Media	BA	8	19
Dundalk IT	IoT	Multimedia Web Development	BSc	8	
Dundalk IT	IoT	Creative Media	Research MA	8	19
Dundalk IT	IoT	Computing in Games Development	BSc (Hons)	8	8
GMIT	IoT	Computing & Digital Media	Higher Cert	6	1
GMIT	IoT	Computing & Digital Media	BSc	7	18
GMIT	IoT	Computing & Digital Media	BSc (Hons)	8	
GMIT	IoT	Digital Media & Society	BSc (Hons)	8	
IADT	IoT	Audio-visual Media Technology	BEng	7	25
IADT	IoT	Computing in Multimedia Programming	BSc	7	10
IADT	IoT	Creative Media Technologies	BSc (Hons)	8	
IADT	IoT	Creative Computing	BSc (Hons)	8	
IADT	IoT	New Media Studies	BA (Hons)	8	
IADT	IoT	User Experience Design	MSc	9	
IADT	IoT	Computing in Multimedia Systems/ Web Engineering	BSc (Hons)	8	8
IADT	IoT	Computing in Multimedia Systems/ Web Engineering	BSc (Hons)	8	14
IT Carlow	IoT	Digital Media Design - Higher Diploma	HND	8	10
IT Carlow	IoT	Computer Games Development	BSc (Hons)	8	22
IT Carlow	IoT	Interaction Design	MA	9	
IT Tallaght	IoT	Creative Digital Media	BA	8	25

Institution	Type	Programme	Award	NFQ	2015
Letterkenny IT	IoT	Digital Media Design	BA	7	13
Letterkenny IT	IoT	Digital Media Design	BSc	8	6
Letterkenny IT	IoT	Computer Games Development	BA	7	24
Letterkenny IT	IoT	Computing & Computer Games Development	BSc (Hons)	8	2
Letterkenny IT	IoT	Computing with Multimedia & Digital Entertainment Technology	BSc	7	2
Letterkenny IT	IoT	Computing with Multimedia & Digital Entertainment Technology	BSc (Hons)	8	3
Letterkenny IT	IoT	Computing in Applied Computing	BSc	8	23
Limerick IT	IoT	Creative Multimedia	Higher Cert	6	
Limerick IT	IoT	Creative Multimedia	BSc	7	8
Limerick IT	IoT	Creative Multimedia	BSc (Hons)	8	14
Limerick IT	IoT	Digital Animation Production	Higher Cert	6	
Limerick IT	IoT	Digital Animation Production	BSc (Hons)	8	
Limerick IT	IoT	Multimedia Programming & Design	BSc (Hons)	8	5
Limerick IT	IoT	Creative Multimedia Programming	Higher Dip	8	15
Limerick IT	IoT	Games Design & Development	BSc (Hons)	8	13
Limerick IT	IoT	Game Art & Design	BSc (Hons)	8	
Limerick IT	IoT	Data Visualisation	Certificate	8	
Limerick IT	IoT	Fundamentals in UX Design	Certificate	9	
Limerick IT	IoT	Animation & Motion Design	BA (Hons)		
Maynooth University	University	Digital Media (40 Credit) International		8	2
Maynooth University	University	Digital Media (60 Credit) International		8	8
Maynooth University	University	Digital Media (40 Credit) Major, Minor		8	5
Maynooth University	University	Digital Media (30 Credit) Honours		8	6
Maynooth University	University	Digital Media (60 Credit) Single Honours		8	11
Maynooth University	University	Multimedia, Mobile + Web Development	BSc	8	3
NCAD	University	Interaction Design	BA	8	
NCAD	University	Interaction Design	MA	9	

Institution	Type	Programme	Award	NFQ	2015
NUIG	University	Software Design & Development	HDip Appl Sc	8	37
NUIG	University	Software Design & Development-(Industry Stream)	HDip Appl Sc	8	20
NUIG	University	Software Design & Development (Stream I)	M.Sc.	9	18
NUIG	University	Software Design & Development (Stream II)	M.Sc.	9	7
NUIG	University	Master of Arts Digital Media	MA	9	13
NUIG	University	Digital Media	PGD	9	1
Sligo IT	IoT	Computing in Games Development	BSc	7	10
Sligo IT	IoT	Computing in Web Development & Creative Media	BSc	7	4
TCD	University	Digital Humanities & Culture	MA	9	10
TCD	University	Interactive Digital Media	MA	9	20
TCD	University	Computer Science-Interactive Entertainment Tech	MSc	9	9
UCC	University	Digital Humanities & Information Technology	BA	8	
UCC	University	Digital Arts & Humanities	MA	9	12
UCC	University	Postgraduate Diploma in Interactive Media	PGD	9	10
UCC	University	Interactive Media	MSc	9	13
UCC	University	Interactive Media- Part Time	MSc	9	6
UL	University	Digital Media Design	BSc (Hons)	8	19
UL	University	Interactive Media	MA / MSc	9	9
WIT	IoT	Multimedia Applications Development	BSc	7	13
WIT	IoT	Multimedia Applications Development	BSc (Hons)	8	7
WIT	IoT	Marketing & Digital Media	BA	8	
Visual Communications					
AIT	IoT	Graphic Design	BA	7	24
AIT	IoT	Visual Communications	BA (Hons)	8	10
CIT	IoT	Visual Communications	BA	8	29
DID	Private	Graphic Design	BA	7	
DIT	IoT	Visual Communication	BA	8	31

Institution	Type	Programme	Award	NFQ	2015
IADT	IoT	Visual Communication Design	BA (Hons)	8	23
IT Carlow	IoT	Visual Communications & Design	Higher Cert	6	1
IT Carlow	IoT	Visual Communications & Design	BA	7	
IT Carlow	IoT	Visual Communications & Design	BA (Hons)	8	11
Letterkenny IT	IoT	Visual Communication & Graphic Design	BSc	8	15
Letterkenny IT	IoT	Design in Visual Communications	BA (Hons)	8	1
Limerick	IoT	Visual Communications	BA (Hons)	8	30
NCAD	University	Visual Communication – Graphic Design	BA (Hons)	8	21
NCAD	University	Visual Communication - Illustration	BA (Hons)	8	
NCAD	University	Communication Design	MA	9	
WIT	IoT	Design (Visual Communications)	BA (Hons)	8	34
TV & Film					
DCU	University	Film & Television Studies	MA	9	15
DIT	IoT	Film & Broadcasting	BA	8	23
DIT	IoT	Film & Broadcasting with a Language	BA (Hons)	8	24
Dundalk IT	IoT	Video & Film Production	BA	7	25
GMIT	IoT	Film & Television	BA	7	1
GMIT	IoT	Film & Documentary	BA (Hons)	8	29
IADT	IoT	Animation	BA(Hons)	8	23
IADT	IoT	Film & Television Production	BA (Hons)	8	29
IADT	IoT	Screenwriting for Film & Television	MA	9	9
IADT	IoT	Creative Production & Screen Finance	MA		
IT Carlow	IoT	TV & Media Production	BSc	7	21
IT Carlow	IoT	TV & Media Production	BSc (Hons)	8	13
IT Tralee	IoT	TV, Radio & New Media Broadcasting	BA (Hons)	8	18
Letterkenny IT	IoT	Animation	BA	7	10
Letterkenny IT	IoT	Motion Graphics	MA	9	1

Institution	Type	Programme	Award	NFQ	2015
NUIG	University	Film Studies with Arts	BA	8	
NUIG	University	Film & Theatre	MA	9	
NUIG	University	Film Studies: Theory & Practice	MA	9	
TCD	University	Film Studies - Theory History Practice	MA	9	11
TCD	University	Stage Design	MA	9	3
UCC	University	Film & Screen Media	BA	8	0
WIT	IoT	Arts TV Production	Higher Dip	8	
Spaces & Places					
CIT	IoT	Interior Architecture	BSc	7	5
CIT	IoT	Interior Architecture	BSc	8	11
CIT	IoT	Interior Architecture	MSc	9	
CIT	IoT	Architectural Technology	BSc	7	7
CIT	IoT	Architectural Technology	BSc (Hons)	8	15
CIT	IoT	Architectural Technology	MSc	9	13
CIT	IoT	Architecture	BSc	8	36
CIT	IoT	Architecture	MSc	9	13
CIT	IoT	Architectural Studies	PhD	10	
DID	Private	Interior Design	BA	7	
DIT	IoT	Visual Merchandising & Design Display	BA	7	19
DIT	IoT	Architecture	BA	8	46
DIT	IoT	Architectural Technology	BSc	8	24
DIT	IoT	Interior & Furniture Design	BA	8	23
GMIT	IoT	Architectural Technology	BSc	7	12
GMIT	IoT	Architectural Technology	BSc (Hons)	8	16
Griffith College	Private	Interior Architecture	BA	8	

Institution	Type	Programme	Award	NFQ	2015
Griffith College	Private	Interior Architecture	MA	9	
IADT	IoT	Design for Stage & Screen - Production Design	BA (Hons)	8	7
IT Carlow	IoT	Architectural Technology	Higher Cert	6	1
IT Carlow	IoT	Architectural Technology	BSc	7	3
IT Carlow	IoT	Architectural Technology	BSc (Hons)	8	8
IT Carlow	IoT	Management in the Built Environment	MSc	9	
Letterkenny IT	IoT	Architectural Technology	BSc	7	5
Limerick	IoT	Interior Design & Technology	Higher Cert	6	
Limerick	IoT	Interior Design & Technology	BA	7	
Sligo IT	IoT	Interior Architecture & Design	BA	7	5
Sligo IT	IoT	Architectural Design	BA (Hons)	8	8
Sligo IT	IoT	Interior Architecture	MA	9	
UCC	University	Architecture	BArch	7	36
UCC	University	Architecture	MArch	9	13
UCD	University	Architecture	BSc (Hons)	8	40
UCD	University	Architecture	March	9	54
UCD	University	ProfDip Architecture PT	Prof. Dip	9	18
UCD	University	ProfDip Architecture (O/L) PT	Prof. Dip	9	11
UCD	University	Landscape Architecture	BSc (Hons)	8	10
UCD	University	Landscape Architecture	MLA	9	
UCD	University	Structural Engineering w/ Arch	BSc (Hons)	8	8
UCD	University	Structural Engineering w/ Arch	ME	9	12
UCD	University	Planning, Geography & Environment	BA (Hons)	8	17
UCD	University	Planning, Geography & Environment	MA	9	
UCD	University	Sustainable Building Design & Performance	MArchSc	9	5

Institution	Type	Programme	Award	NFQ	2015
UCD	University	Architectural Science in Urban Design	MArchSc	9	3
UCD	University	Architectural Science in Landscape Studies	MArchSc	9	
UCD	University	Regional & Urban Planning	MA	9	5
UCD	University	Environmental Policy	MSc	9	21
UCD	University	PhD Architecture PT	PhD	10	1
UL	University	Architecture	BArch	8	17
UL	University	Materials & Architectural Technology	BSc	8	60
WIT	IoT	Architecture	BA (Hons)	8	5
WIT	IoT	Architectural Technology	BSc	7	
WIT	IoT	Architectural Technology	BSc (Hons)	8	3
WIT	IoT	Architectural & Building Information Modelling	BSc (Hons)	8	12
Fashion & Textiles					
GMIT	IoT	Design in Textiles	BA (Hons)	8	11
IADT	IoT	Design for Stage & Screen - Costume Design	BA (Hons)	8	5
Limerick	IoT	Fashion Knitwear & Textiles	Higher Cert	6	6
Limerick	IoT	Fashion Knitwear & Textiles	BA Hons	8	
Limerick	IoT	Fashion	BA Hons	8	28
NCAD	University	Fine Art- Textile Art & Artefact	BA	8	23
NCAD	University	Fashion Design	BA	8	14
NCAD	University	Textile & Surface Design	BA	8	12
NCAD	University	Jewellery & Metalwork	BA	8	7
NCAD	University	Textile & Surface Design	MFA	9	
NCAD	University	Jewellery & Objects	MFA	9	
NCAD	University	Fashion Design	MFA	9	
St. Angela's, Sligo	University	Fashion Design	BA	8	
St. Angela's, Sligo	University	Designing for Fashion & Textiles	Diploma	7	

Institution	Type	Programme	Award	NFQ	2015
Design - General					
DIT	IoT	Design Practice	MA	9	3
DIT	IoT	Prof Design Practice	MA	9	9
GMIT	IoT	Design	BA	7	77
GMIT	IoT	Design	BA (Hons)	8	
Limerick	IoT	MA & PhD by Research in Art & Design	MA/PhD		
NCAD	University	Education & Fine Art or Design	BA	8	15
Sligo IT	IoT	Creative Design	BA	7	6
Sligo IT	IoT	Creative Design	BA (Hons)	8	11
Other					
CIT	IoT	Education (Art & Design)	Prof Master	9	3
DIT	IoT	Critical Art Practice	MA	9	
GMIT	IoT	Creative Practice	MA	9	
GMIT	IoT	Arts in Creative Practice	PG	9	
IT Carlow	IoT	PhD by Research	PhD	10	
Limerick IT	IoT	Cyber-psychology	Certificate	8	
Maynooth	University	PhD by Research	PhD	10	
NCAD	University	Professional Masters in Art & Design Education	MEd	9	1
NCAD	University	PhD through Practice in Design	PhD	10	
WIT	IoT	Service Design and Innovation	Higher Dip	8	1

Rows shaded in the Digital Design category are more likely to be computer science degrees with some design components as opposed to digital design degrees. This again reinforces the idea of the overlap of the two disciplines.

Appendix 2: List of design and design related courses in Private Third Level Colleges in Republic of Ireland.

Institution	Programme	Award	NFQ	Awarded by
Digital Design				
Dublin Institute of Design	Web Design (Interactive Media) (2yrs)	HND	6	BTEC
Dublin Institute of Design	Web Design (Interactive Media) (1yr)	HNC	6	BTEC
Griffith College	Applied Digital Media	MSc	9	QQI
Griffith College	Applied Digital Media	PG Dip. Sc	9	QQI
Visual Design				
Dublin Institute of Design	Graphic Design (3yrs)	BA	7	QQI
Dublin Institute of Design	Graphic Design (2yrs)	HND	6	BTEC
Dublin Institute of Design	Graphic Design (1yr)	HNC		BTEC
Griffith College	Design Communications (3yrs)	BA	8	QQI
TV & Film				
Griffith College	Animation (3yrs)	BA	8	Pending
Spaces & Places				
Dublin Institute of Design	Interior Design (3yrs)	BA	7	QQI
Dublin Institute of Design	Interior Design (2yrs)	HND	6	BTEC
Dublin Institute of Design	Interior Design (1yr)	HNC	6	BTEC
Griffith College	Interior Design (3yrs)	BA	7	QQI
Griffith College	Interior Design (2yrs)	Dip		QQI
Griffith College	Interior Architecture (4yrs)	BA	8	QQI
Griffith College	Interior Architecture (1yr)	MA	9	QQI
Fashion & Textiles				
Dublin Institute of Design	Fashion Design (2yrs)	HND	6	BTEC
Dublin Institute of Design	Fashion Design (1yr)	HNC	6	BTEC
Dublin Institute of Design	Fashion Buying (1yr p/t)	HNC	6	BTEC
Grafton Academy of Fashion Design (GAoFD)	Fashion Design (3yrs)	Diploma	-	GAoFD
Griffith College	Fashion Design (3yrs)	BA	8	QQI
Other				
Griffith College	Art & Design Foundation Studies (1yr)	Cert	6	pending

Appendix 3: List of Further Education & Training (FET) Design and design related courses in Republic of Ireland

Institution	Programme	Award	NFQ	Yrs
Product Design				
Blackrock FEI	Industrial Design	QQI	5	1
Bray Institute of FE	Furniture Design	QQI	5	1
Bray Institute of FE	Furniture Making & Restoration	QQI	6	1
Cavan Institute	Furniture Design & Making	QQI	5	1
Cavan Institute	Furniture Design	QQI	6	1
Coláiste Dhulaigh	Craft Production	QQI	5	1
Coláiste Stiofáin Naofa	Furniture Design & Making 1	QQI	5	1
Coláiste Stiofáin Naofa	Furniture Design & Making 2	QQI	6	1
Dún Laoghaire FEI	Furniture Design & Making	QQI	5	1
Dún Laoghaire FEI	Furniture Design & Making	QQI	6	1
Dún Laoghaire FEI	Advanced Cert in Furniture Making & Restoration	QQI	5	1
Dún Laoghaire FEI	Advanced Cert in Furniture Making & Restoration	QQI	6	1
Galway Technical Inst	Furniture Making & Design	QQI	5	1
Galway Technical Inst	Illustration & Model Making	QQI	5	1
Monaghan Institute	Furniture Design	QQI	5	1
St. John's Central CFE	Design for 3D Printing	QQI	6	1
Digital Design				
Ballsbridge College	Web Authoring & Multimedia	QQI	5	1
Ballsbridge College	Interactive Digital Media Production	Certificate	5	1
Ballsbridge College	Interactive Media	HND	6	2
Ballsbridge College	Computer Games & Interactive Entertainment Dvpt	Certificate	5	1
Ballsbridge College	Creative Media Production (Computer Game Design)	HND	6	2
Ballyfermot CFE	Classical & Computer Animation	HND	6	
Ballyfermot CFE	Creative Media Production (Computer Game Design)	HND	6	
Ballyfermot CFE	*Visual Media in Animation / Game Design*	*BA (Hons)*	*8*	
Blackrock FEI	Creative Multimedia Course	QQI	5	1
Blackrock FEI	Creative Multimedia & App Development	QQI	6	+1 yr
Blackrock FEI	Games Design & Development	QQI	5	1
Bray Institute of FE	3D Game Design	QQI	5	1
Cavan Institute	3D Design & Graphics	QQI	5	1
Coláiste Stiofáin Naofa	Digital Media	HND	6	2

Institution	Programme	Award	NFQ	Yrs
Dorset College	Science in Computing & Multimedia	QQI	6	1
Dorset College	Computing & Multimedia	QQI	6	2
Dorset College	*Computing & Multimedia*	*QQI*	*7*	*3*
Dún Laoghaire FEI	Multimedia	QQI	5	1
Galway Technical Inst	App Design & Development	QQI	5	1
Kerry CFE	Computer Science (with Programming & Web Design)	QQI	5	1
Kerry CFE	Multimedia with Graphic Design	QQI	5	1
Limerick CFE	App & Software Development	QQI	5	1
Limerick CFE	Game Design	QQI	5	1
Limerick CFE	Advanced Multimedia & Web Development	QQI	6	1
Moate Business College	Media Studies (Creative Media)	QQI	5	1
Monaghan Institute	Computer Games Design & Programming	QQI	5	1
Monaghan Institute	Multimedia Production	QQI	5	1
Monaghan Institute	Advanced Cert in Multimedia & Web Development	QQI	5	1
Pearse CFE	Computer Aided Design	QQI	5	1
Pearse CFE	Creative Media Production	QQI	5	1
Castlebar CFE	Graphic & Web Design with Portfolio Preparation	QQI	5	1
Castlebar CFE	Gaming Animation & Motion Graphics	QQI	5	1
Visual Communications				
Ballsbridge College	Art, Graphics & Printmaking - Visual Communications	Certificate	5	1
Ballsbridge College	Visual Communications (Graphic Design)	HND	6	2
Ballsbridge College	Illustration	HND	6	2
Blackrock FEI	Graphic Design	QQI	5	1
Bray Institute of FE	Graphic Design	QQI	5	1
Bray Institute of FE	Graphic Design	QQI	6	+1 yr
Bridgetown Vocational College	Desktop Publishing	QQI	5	1
Coláiste Dhúlaigh	Graphic Design	Certificate	5	1
Coláiste Dhúlaigh	Graphic Design	HND	6	2
Galway Technical Inst	Visual Communications	QQI	5	1
Marino College	Graphic Design & Illustration	QQI	5	1
Blackrock FEI	Landscape Design	HND	6	2

Institution	Programme	Award	NFQ	Yrs
Spaces & Places				
Blackrock FEI	Interior Design	QQI	6	1+1
Bray Institute of FE	Architectural Design & Technology	QQI	5	1
Cavan Institute	Architectural Design & Technology (Year 1)	QQI	5	1
Cavan Institute	Architectural Technology & Design (Year 2)	QQI	6	1
Cavan Institute	Interior Architecture	QQI	5	1
Cavan Institute	Sustainable Energy & Construction Technology	QQI	5	1
Coláiste Dhúlaigh	Architectural Design & Technology Foundation	Certificate	5	1
Coláiste Dhúlaigh	Interior Design	QQI	6	1
Coláiste Dhúlaigh	Renewable Energy & Sustainable Construction	QQI	6	2
Coláiste Ide	Architectural and Renewable Energy	QQI	6	2
Dún Laoghaire FEI	Architectural Technology & Design	QQI	5	1
Dún Laoghaire FEI	Architectural Technology & Design	QQI	6	1
Dún Laoghaire FEI	Advanced Cert in Architectural Technology & Design	QQI	5	1
Dún Laoghaire FEI	Advanced Cert in Architectural Technology & Design	QQI	6	1
Galway Technical Inst	Construction Technology: Renewable Energies & Eng	QQI	5	1
Galway Technical Inst	Computer Aided Design & Architectural Technology	QQI	5	1
Galway Technical Inst	Advanced Certificate in Architectural Technology	QQI	6	1
Monaghan Institute	Construction Technology & Renewable Energy Systems	QQI	5	1
Pearse CFE	Sustainable Design & Innovation	QQI	5	1
Pearse CFE	Sustainable Construction Technologies	QQI	5	1
Pearse CFE	Architectural Technology & Design 1	QQI	5	1
Pearse CFE	Architectural Technology & Design 2	QQI	6	1
Pearse CFE	Landscape Design	QQI	5	1
Pearse CFE	Sustainable Landscapes	QQI	6	1
Fashion & Textiles				
Ballsbridge College	Fibre Art (Textile/Fine Applied Arts)	HND	6	2
Bray Institute of FE	Fashion Design	QQI	5	1
Bray Institute of FE	Fashion & Textiles	QQI	5	1
Bray Institute of FE	Fashion Theatre & Media Make-Up	QQI	5	1
Cavan Institute	Fashion Design	QQI	5	1
Coláiste Dhúlaigh	Fashion Design	Certificate	5	1
Coláiste Ide	Portfolio Preparation in Fashion & Textiles	QQI	5	1
Limerick CFE	Fashion Design & Retail Studies	QQI	5	1
Limerick CFE	Fashion Design & Textile Studies	QQI	5	1

Institution	Programme	Award	NFQ	Yrs
Limerick CFE	Advanced Fashion & Textile Studies	QQI	6	1
Coláiste Ide	Advanced Certificate in Art & Fashion Design	QQI	6	1
Galway Technical Inst	Fashion Design	QQI	5	1
Galway Technical Inst	Fashion Design & Dress Making	QQI	5	1
Galway Technical Inst	Fashion Retail	QQI	5	1
Galway Technical Inst	Advanced Cert: Fashion Buying, Styling & Visual Merchandising	QQI	6	1
Inchicore College	Costume Design & Make-Up	QQI	6	2
Limerick CFE	Costume Design for Theatre & Film	QQI	5	1
Sallynoggin CFE	Fashion Design	QQI	5	1
Sallynoggin CFE	Fashion Design - Advanced Certificate	QQI	6	1
Sallynoggin CFE	Fashion Industry Practice	QQI	6	1
St. John's Central CFE	Fashion Design	QQI	5	1
St. John's Central CFE	Fashion Design	QQI	6	1
Design - General				
Ballsbridge College	Art, Design & Mixed Media	Certificate	5	1
Bray Institute of FE	Art, Craft & Design	QQI	5	1
Coláiste Dhúlaigh	Art & Design Portfolio Preparation	Certificate	5	1
Coláiste Ide	Portfolio Preparation in Graphics	QQI	5	1
Coláiste Stiofáin Naofa	Art, Craft & Design	QQI	5	1
CTI Clonmel	Art Portfolio Preparation	QQI	5	1
CTI Clonmel	Creative Craft & Design	QQI	5	1
Inchicore College	Art & Design	QQI	5	1
Kerry CFE	Art, Craft & Design with Digital Photography	QQI	5	1
Liberties College	Portfolio Preparation in Art, Craft & Design	QQI	5	1
Liberties College	Art & Craft Professional Practice	QQI	6	1
Limerick CFE	Art & Design Portfolio	QQI	5	1
Limerick CFE	Art & Design Portfolio with Animation & Illustration	QQI	5	1
Limerick CFE	Art & Design Portfolio with Graphic Design	QQI	5	1
Moate Business College	Art & Design	QQI	5	1
Monaghan Institute	Art, Craft & Design	QQI	5	1
Sallynoggin CFE	Art, Craft & Design	QQI	5	1
St. John's Central CFE	Art, Craft & Design	QQI	5	1

Source: List of courses: Con Kennedy, Profile of Business in the Traditional Design Sectors, 2016

Categorisation: DBEI

Rows shaded are at NFQ Level 7 & 8 and are not therefore technically FET, but have been left in this list as the colleges that provide them are FET colleges.

Appendix 4: Consultation

A4.1 Stakeholders consulted

Name	Organisation
Dr. Adam DeEyto	University of Limerick (UL)
Ailish Delaney	Design + IT Carlow
Barbara Diehl	UCD Innovation Academy
Barry Sheehan	Dublin Institute of Technology (DIT)
Bill Kearney	IBM
Brian Stephens	Design Partners
Con Kennedy	Dublin Institute of Technology (DIT)
David Nevin	UCD Innovation Academy
David Smith	IADT – Institute of Art, Design & Technology
Enda O'Dowd	NCAD – Medical Device Design
Frank Devitt	Maynooth University
Frank Long	Frontend.com
Fred Raguillat	IBM Design Studios
Hilary Kenna	Institute of Art, Design & Technology – IADT
Karen Hennessy	DCCoI (Design & Craft Council of Ireland)
Leo Clancy	IDA
Dr. Marc O'Riain	Cork Institute of Technology (CIT) & President of IDI during ID2015
Marcus Hanratty	NCAD – Interaction Design
Martin Ryan	Maynooth University Department of Design and Innovation
Dr Muireann McMahon	University of Limerick
Dorothy Ryan	Asavie
Peter Robbins	Maynooth University
Sam Russell	NCAD – Product Design
Seán Lyons	APT – Athlone IT
Sean McNulty	Dolmen
Stephen Hughes	Enterprise Ireland
Trevor Vaugh	Maynooth University

A4.2 List of consultees at stakeholders validation workshop held on 29th November 2016

Name	Organisation
Dr. Adam de Eyto - Rapporteur	University of Limerick – School of Design
Alan McGrath	HEA
Barbara Diehl	UCD Innovation Academy
Brian Kelly	Pramerica
Brian Stephens - Rapporteur	Design Partners
Con Kennedy - Rapporteur	DIT
Connor Upton	Accenture/Fjord
David Smith	IADT
Denis Hayes	IRDG
Derek Blackweir	LIT
Don O'Connor - Notetaker	DJEI
Enda O'Dowd	NCAD
Fergal Brophy	UCD Innovation Academy
Frank Devitt - Rapporteur	Maynooth University
Frank Long	Frontend.com
Fred Raguillat	IBM Design Studios
Gary Granville	Consultant for HEA on Creative Arts Education Provision
Gerard Walker - Notetaker	DJEI
Hilary Dempsey	IT Carlow
Hilary Kenna	IADT

Name	Organisation
Jemma Lee - Notetaker	DBEI
Karen Hennessy	DCCoI
Kim Mackenzie-Doyle	President elect IDI
Dr. Marc O'Riain	CIT & President of IDI during ID2015
Marcus Hanratty	NCAD – Interaction Design
Martin Ryan	Maynooth University – Department of Design Innovation
Ned Costello	IUA
Noreen FitzPatrick	Skillnets
Peter Robbins	Maynooth University
Dr.PJ White	IT Carlow
Rohan Perera	Lean Disruptor
Ruth Morrissy - Notetaker	DBEI
Sam Russell	NCAD
Sean McNulty - Rapporteur	Dolmen
Trevor Vaugh	Maynooth University
Wesley Kelly	IDA
Alan Nuzum	Facilitator
Catherine MacEnri	Organiser
Niamh Martin	Organiser

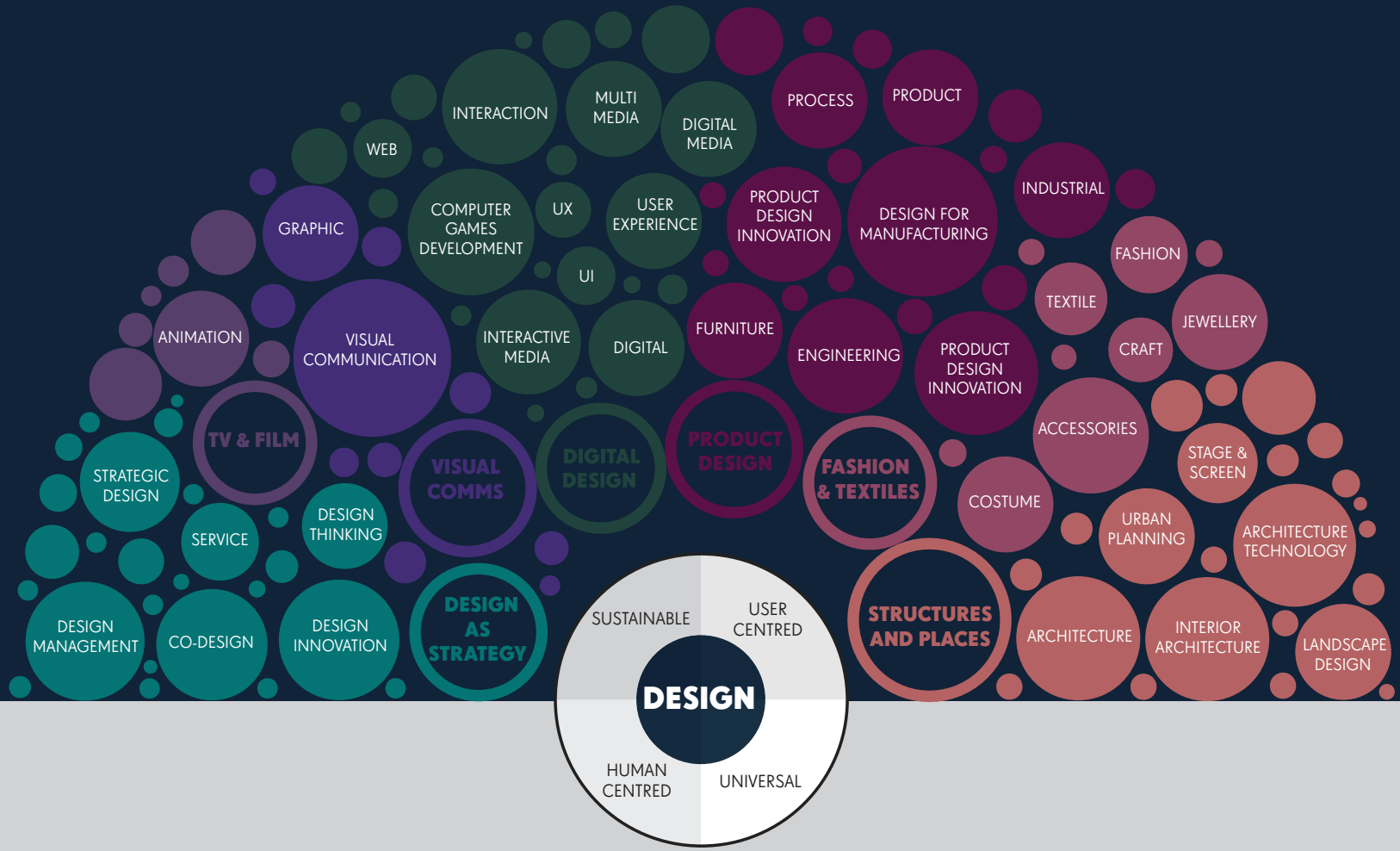
A4.3 Membership of EGFSN

Name	Organisation
Margaret Cox	Director I.C.E. Group and Pitman Training
Bill Doherty	Managing Director, Cook Medical
Liz Carroll	Training and Development Manager, ISME
Ned Costello	Chief Executive, Irish Universities Association
Dr Brendan Murphy	President, Cork Institute of Technology
Paul Healy	CEO, Skillnets
Inez Bailey	Director, National Adult Literacy Agency
Peter Baldwin	Assistant Secretary, DES
John Burke	Education Expenditure & Policy, DPER
John Magrath	SLMRU, Solas
William Parnell – to Aug 2016	PO, Education & Skills Policy Unit, DBEI, Head of EGFSN Secretariat
Tony Donohoe	Head of Education, Social and Innovation Policy IBEC
Mark Christal	Enterprise Ireland
Ray Bowe	IDA Ireland
Dr Bryan Fields	Director, Strategy, Research and Evaluation, SOLAS
Dr Vivienne Patterson	Head of Skills and Engagement, HEA
Kathleen Gavin	PO, Skills, Planning & Enterprise Engagement Unit, DES
Dr Peter Rigney	Industrial Officer, ICTU
Declan Hughes	Assistant Secretary, DBEI
Kevin Daly – from Feb 2017	PO, Education & Skills Policy Unit, DBEI, Head of EGFSN Secretariat

Names in rows shaded have been reappointed to the reconstituted EGFSN from Feb 2017.

Appendix 5: Design Skills Report Action Plan

Design Skills Enterprise Demand	
1.	Commission a review of enterprise demand and the provision of higher and further education design courses across all education institutions. Areas for investigation would include, but not necessarily be limited to, a determination of the following:
1.1.	to quantify the design skills demand by the enterprise base in Ireland including interdisciplinary and transdisciplinary skills, to ensure that the provision of design education and training meets the future needs of both the design sector and wider enterprise;
1.2.	the extent to which our design education and training provision covers the new and emerging areas of design and reflects the career opportunities that now exist for graduates;
1.3.	the quality and relevance of design graduates to the design needs of the enterprise base in Ireland; **DBEI/DES**
Apprenticeships/Traineeships	
2.	Investigate with industry the possibility of establishing a design apprenticeship or traineeship under the new apprenticeship/traineeship model. **DCCoI/IDI**
Training in design for Ireland's non-design businesses	
3.	Examine how best to make available design skills training for microenterprises. **EI/DCCoI**
4.	Investigate the possibility of forming a panel of Design Experts and Consultants as part of the design offering for SMEs so that they can avail of in-house design consultation tailored to their specific business. **EI**
Creating a professional structure for designers	
5.	Explore how to create a structured designer profession through a nationally recognised system of CPD for designers and how this might be developed, introduced and rolled out. **DCCoI/IDI**
Communication	
6.	Explore how awareness raising on the value and the importance of design and access to design for innovation and growth could be increased. **DCCoI/IDI/IRDG with administration by DCCoI**
7.	Communicate to firms the applicability of the R&D tax credit regarding design so that they can more readily and easily claim a tax refund for applicable design activities. **DoF/EI/IDA/IDI to ensure companies are aware of this.**
8.	Communicate to enterprise how Innovation Vouchers can be used for purchasing design feasibility/advisory/services from registered knowledge providers. **EI**



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