

A Study of the Role and Importance of Design in Firms based in Ireland in Non Design- intensive Sectors

An Independent Report for the Department of Jobs, Enterprise and Innovation

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Executive summary

Introduction

This report presents findings from the ‘Study of the Role and Importance of Design in Firms based in Ireland in Non Design-Intensive Sectors’. The study was commissioned by the Department of Jobs, Enterprise and Innovation (DJEI), and supported by the Design and Crafts Council of Ireland as part of the ID2015 initiative. It was undertaken by CM International and PDR¹ – Cardiff Metropolitan University. The aim of the study was to develop a better understanding of design in non design-intensive business sectors. In contrast to the specialist design sector, non design-intensive sectors include businesses whose function is not specifically one of design, but who may make use of it to a greater or lesser extent as part of their business activities. For the purposes of this research the following sectors have been identified to reflect key non design-intensive sectors in Ireland:

- Advanced manufacturing and engineering
- Food and drink
- Medical devices and pharmaceuticals
- ICT hardware and software
- Environment
- Services

These sectors were selected on the basis that businesses in these sectors were unlikely to be undertaking design as their primary activity (i.e. they did not include specialist design companies). The companies in these sector groups were drawn primarily from a cohort of enterprise agency (IDA and Enterprise Ireland) clients. In this respect the research examines a sub-set of the business population in Ireland - agency-client firms - and not the full business population.

The specific objective of the study was to examine the role and importance of design in firms in non design-intensive sectors from the perspective of different company characteristics, including size, sector and ownership (i.e. foreign direct investors [FDI] and indigenous companies).

The study included three main research activities: (i) a literature review of design and its role and importance to businesses; (ii) 12 case studies of companies in non design-intensive sectors. These two activities provided the basis for the research framework adopted in the study, and the development of questions for a firm-level survey; (iii) a survey focused on agency-client companies in non design-intensive sectors in Ireland (n=216).

The research was guided by a Steering Group¹ and culminated in a stakeholder workshop, which captured feedback on draft research findings. Annex 1 provides full details of the study methodology.

A framework for the study of design in Irish businesses

Design has, in recent years, become an increasingly important topic of study, with studies pointing to its impact on innovation and wider economic competitiveness². The evidence reviewed in the

¹ The Steering Group was chaired by the Department of Jobs Enterprise and Innovation (DJEI) and included representatives from (DJEI), Enterprise Ireland, IDA, Science Foundation Ireland and ID 2015 / Design and Craft Council of Ireland.

² See, for example, Whicher, A. (2015) ‘The value of design to businesses’, Design for Europe Economic Impact of Design Briefing. Available at: <http://designforeurope.eu/news-opinion/value-design-business> [accessed 01.09.2015]

literature review (section 2) indicates that there is no ‘off the shelf’ manual for collecting and interpreting data on the role and importance of design. It does, however, highlight a number of features / aspects that can be used as a framework to guide the research on Irish-based companies, and to position the findings:

- *Design as multidimensional concept:* The existing literature sees design as having a broad meaning and uses for companies beyond only that of traditional concerns such as aesthetics and styling of final products or services. This can include other important business processes and stages such as product / service design, business development, branding and marketing, customer services and so on.
- *The role of design in different stages of the innovation process:* The literature views design as an integral part of the wider innovation process, with emerging evidence that it can contribute towards early stage product / service development (e.g. user needs analysis, R&D) as well as later stage aesthetics and styling, marketing, packaging and so on.
- *Organising for design:* Design is an activity that can draw on internal or external sources of expertise; here companies may manage their own in-house design activities or make use of specialist external design services. The literature indicates that they may also collaborate with other partners (companies, universities, colleges etc.).
- *Maturity in design activity:* The Danish Design Maturity Ladder highlights the different roles that design can play in a business, ranging from a limited or no role, through to a role as a strategic process informing a company’s wider activities. The design ladder is well established in international studies and provides the basis for benchmarking.
- *Economic impact of design:* Design is an activity that can strengthen different business processes (R&D, marketing etc.), and ultimately produce economic impacts in areas such as jobs, exports, profitability and so on.
- *Barriers to design:* The framework also acknowledges that companies may face barriers in developing their design activity and capacity.

In addition to these features the framework also included analysis of business responsibility for design, the business functions employing staff with a design role, spending on design, IP and design, and support requirements.

Key Research findings

The results of the research are structured into a number of key research findings, which provide a picture of design’s role and importance in agency-client businesses in Ireland:

Agency-client companies in the non design-intensive sectors in Ireland demonstrate a high rate of engagement in design which spans multiple business activities and modes, and levels of engagement. The evidence indicates the variety of roles that design plays in these firms and the many perspectives companies have on the importance of design.

The results of the research indicate that the majority of agency-client companies that responded to the survey engage in design (94% of survey respondents). While the majority of these companies see design either as a process of product / service development or an enabler of innovation and competitiveness, there were others that also see its importance in the form and function of products. The result of these different conceptions of design is that companies tend to manage design through multiple configurations, reflecting design’s multi-dimensional nature. This can be seen in their mix of

different types of internal and external design expertise, across different business functions (of which product / service development is most important), employee roles, and spending categories.

The agency-client companies in the study tend to undertake design activity internally, with activity and spend spread across a range of business areas and functions. This includes a broad range of internal design activities reported, including: industrial / engineering design, communication / digital / web / software design and service / user design. Companies also make use of external design expertise, particularly where they lack design capacity, or require specialist skills. For the most part, however, companies in both the survey and case studies treated design as both an internal and external activity.

The multidimensional nature of design is further reflected in the diverse range of activities undertaken. The primary business area of employment with a design role, for example, is the product / service development function and specific in-house design functions. Other, less common, areas of design spending include marketing and communication, and business development.

For agency-client firms in the non-design intensive sectors, the role of design as an element of the product / service development process is considered particularly important, with design being employed across multiple stages of the product / service development continuum from concept to implementation.

The findings from the research indicate that the role of design was most evident in the innovation and R&D process. In this respect design is clearly viewed as a key component within the R&D process, helping to add value to innovation and product / service development. It was also reflected in the importance that companies assign to design and their spending and employment in the area of design in product / service development activities. The majority of companies in the research reported that they have introduced products / services with the aid of design in the past two years. Indeed, almost all of these companies maintain that design plays an important part across the different stages of the product / service development process, and not simply in the final phases. These findings therefore confirm the emergence of a wider concept in which design is becoming an important tool across the different stages of the innovation process.

The role of design in the product and service development process can also be seen in the input of design to IP. Here the research indicates that around a half of companies have introduced forms of IP protection with input from design or a designer. These results contrast with a commonly held view that design is difficult to 'pin down', and suggest that companies are able to utilise design inputs and able to codify the results in a way that is suitable to protect their IP.

Design, in Ireland's agency-client companies in the non design-intensive sectors, is characterised by high level strategic commitment, development of internal design capacity, collaboration with external partners in the third level sector, and selective use of external design services.

In terms of managing design activity, the findings demonstrate that design is typically undertaken internally, but that it is commonplace for companies to engage in design collaboration in order to complement their internal activity. For the most part design activity is undertaken either in an in-house design function, or spread across a wider range of business functions. The high level of strategic commitment to design is supported by companies' intentions to maintain spending on design in the coming years, and the belief that it represents a key element in their competitiveness.

Companies, on the whole, believe that it is better to recruit and build design capacity internally than it is to use contractors. This appears to be principally linked to reasons of control, cost containment and business understanding. Despite this the research does reveal that for some companies external expertise can be important. For example, the evidence from the case studies highlights a number of

instances where the use of an external design agency has been central to the success of a project. This use of external expertise can be particularly valuable in companies new to design (whose design capacity is limited), and those not wishing to recruit specialised but infrequently used skills such as architects, software products, regulatory support.

While the use of external design expertise (contracted) was comparatively low, evidence from the survey and case studies suggests that a substantial number of companies have engaged in design collaboration to complement their internal design activity. This includes collaboration with other partners such as companies (e.g. suppliers, customers, networking etc.) and third level institutions / public research institutes. This collaboration is illustrated in the case studies.

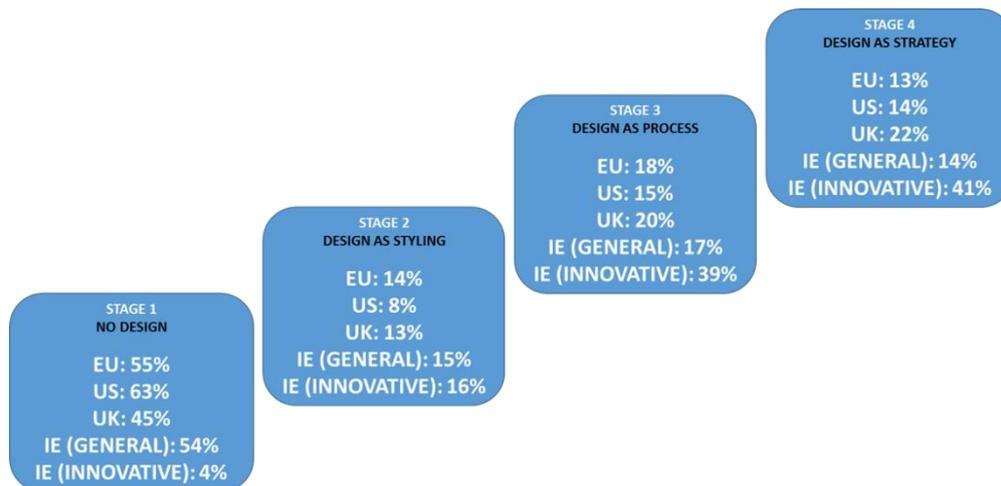
Understandably, the range of these activities, and associated skills, is linked to sectoral characteristics, with design engineers typically found in the Advanced manufacturing & engineering and Medical devices & pharmaceuticals sectors, software engineers in the ICT sector and so on. The diverse spread of skills and activities, however, also emphasises the broad and multidimensional nature of the design processes and competences required by staff.

Most in-house design teams are small in size. However, the case studies also provide evidence of companies developing significant strategic capacity in Ireland (for example, IBM has made a significant investment in its design capacity in Ireland, creating a design studio in Dublin as part of a global network of such studios). The importance of such capacity is not solely in scale but their role in delivering services and disseminating design across business functions.

Agency-client companies in Ireland, in the non design-intensive sectors, tend to adopt a mature approach to design, viewing it as either key to product / service functionality or wider strategy. This contrasts with Ireland's wider business base, which report lower levels of design maturity.

The study findings indicate that Irish-based agency-client companies are primarily at the upper end of the Design Maturity Ladder, with design acting as either a strategic concern (level 4), or key to their product / service functionality (level 3). While there is a strong degree of design maturity found in the agency-client companies examined in this study there is also evidence that this may not be the case for the wider business base in Ireland. Figure 1 (and figure 26 of the main report) provides data from a recent (2015) European survey based on the general business population of all Member States. This data suggests that the agency-client companies in this study are not only more mature in their approach to design than the wider Irish business base, but also above levels found in the EU, US and leading international performers such as the UK.

Figure 1. International design maturity benchmarks³



The economic impacts of design are evident in its role in generating and safeguarding business activity in agency-client firms. Strong links between design and employment growth are evident.

The study results highlight design's role in supporting economic competitiveness through innovation in products, processes and services, generating new business activity, safeguarding existing activities, and supporting customer satisfaction. It is also seen as important for business reputation. The importance of design is also evident in employment terms with the analysis pointing to positive links between employment growth and:

- design activity
- spending on design
- design maturity
- design collaboration
- development of IP with input from design or a designer.

Few agency-client companies in non design-intensive sectors in Ireland report significant barriers to using design in their business. Of those barriers identified the primary barriers are the availability of time and finance, and the difficulty in making the case for design activity internally.

The majority of companies that participated in the research do not perceive there to be specific barriers to using design in their businesses. This is, perhaps, unsurprising given the level of design maturity reflected in the companies that engaged with the study. Despite this a number of challenges were identified in the research. These include financial and time constraints as well as 'understanding how design can add value to the business'. Companies believe there is a role for the state to support design, with the principal areas being business finance and capacity building actions, and skills development. The majority of companies surveyed favour public supports that are financial in nature – tax credits, grants / subsidies etc. (particularly indigenous companies). This is a typical response to such questions when identifying support needs. Other potential roles for the state identified include training, recruitment and capacity building actions (indigenous and FDI). For example, just under half

³ Innobarometer (2015) 'Innobarometer 2015 – The Innovation Trends in EU Enterprises', Brussels, and CMI-PDR survey (2015).

% figures refer to the responses of companies from separate surveys in the EU, US, UK and Ireland (general), plus results of the CMI survey (Innovative).

of companies in the survey would value a design graduate or student internship or funding for an experienced designer to work on placement within the company.

Key findings by Size, Sector and Ownership

The key findings noted above have important nuances according to company characteristics. These are discussed below:

- **FDI and indigenous agency-client companies demonstrate high levels of design activity, with evidence that it is important to their competitiveness and wider innovation activity.**
 - Both FDI and indigenous agency-client companies define design as an enabler of innovation and competitiveness, and key to product / service development. Comparatively few companies view design in the traditional sense of styling and aesthetics.
 - Both FDI and indigenous agency-client companies discuss design at the board level. Indigenous companies, however, are far more likely to have a board member(s) or staff with a specific remit for design. FDI companies were more likely to spread design activity across other business functions and generally had a larger design capacity (in terms of design employees and investment).
 - The majority of FDI and indigenous agency-client companies are at the higher levels of the Design Maturity Ladder. Indigenous companies, however, are more likely to undertake design at a strategic level, relative to FDI companies – who generally see functionality as the main priority for design.
 - Comparatively few FDI and indigenous agency-client companies face barriers to using design (although more indigenous companies report barriers). There is evidence, however, that some companies may face barriers such as time and difficulties in making the case for design activity, and these may be illustrative of wider challenges beyond the design active companies in this research.
 - The majority of FDI and indigenous agency-client companies believe there is a role for the state in increasing the use of design. Financial measures (grants / subsidies and tax credits) are identified as the most important areas for state support by FDI and indigenous companies.
- **While the majority of sectors are design active there are subtle differences in the approaches adopted. Agency-client companies in the Services sector, for example, have a comparatively stronger focus on design as a process of styling and aesthetics, and agency-client companies in the Food and drink sector have a strong focus on external design expertise.**
 - In all sectors design is defined as a process of product and service development, or an enabler of competitiveness and innovation. Agency-client companies in the Services sector, however, are least likely to define design in these terms, and are more likely to define design as a process of styling and aesthetics.
 - Most respondents to the survey in every sector manage their design activity through an in house design function with the exception of Food and drink. More than half of the Medical devices & pharmaceutical sector also spread design activity across other business functions along with around a half of ICT and Advanced manufacturing & engineering sectors. Food and drink companies, on the other hand, are more likely to use external design consultants. In terms of collaborative design activity, most sectors engage in design collaboration with the exception of companies in the Food and drink and Environment sectors.

- Most sectors are at the higher level of the Design Maturity Ladder (with the Environment sector reporting the highest level of maturity). The Service sector and Food and drink sector, however, are more likely to have agency-client companies at the lower levels of the Design Maturity Ladder (level 2).
- The majority of agency-client businesses do not report barriers to design activity, with the exception of the Food and drink sector. However, given that the companies who engaged in the study tend to be innovation active with a high propensity to engage in design, their assessment of barriers to engaging in design may not be fully reflective of the wider business base. All sectors would value State support to undertake more design activity.
- **Agency-client companies of all sizes report design as being key to product / service development, and the presence of an in-house design function. Large companies, however, are more likely to spread design activity across several business functions.**
 - Agency-client companies of all sizes view design as being central to their product / service development process. Smaller companies are more likely to associate design with the traditional definition of styling and aesthetics while larger companies are more likely to view it as part of their company's innovation and competitiveness.
 - The majority of agency-client companies in all size groups are likely to have an in-house design function. Large companies have a greater tendency (than their smaller counterparts) to spread their design activity across other business functions, and collaborate with third level institutions.
 - Agency-client companies in all size groups tend to be at the upper levels of the Design Maturity Ladder. The majority of large companies, however, are at level 3.
 - The majority of agency-client firms across all size groups do not face barriers to using design, but would value grants, subsidies and tax credit support from the State.

Implications from the research

This research has sampled a cohort of agency-client companies. Of the 216 survey respondents, 94% report being design active. These results are not reflective of the total enterprise base in Ireland as demonstrated by European Innobarometer study, but provide an indication of good practices that could be developed.

The evidence presented in this report is that there is strong agreement amongst agency-client companies that design is key to Irish competitiveness and innovation, customer satisfaction and important to Ireland's business reputation. These findings are broadly consistent across companies of different size, sector and ownership. There is also evidence that companies are backing their views on the importance of design with existing and future investment plans. This points to the growing future importance of design and potential strengthening of capacity.

The research indicates that while Ireland has a group of agency-client businesses in the non design-intensive sector that are performing strongly in relation to design activity and capacity, the evidence from this research indicates that these businesses are further advanced than the business base is more generally in Ireland. The majority of the companies in this research, for example, were experienced in conducting R&D and use design as part of their efforts to secure competitiveness and strategic differentiation from their competitors, and represent the leading edge of design active companies.

The challenges revealed by the research findings are to both raise the level of design activity within the wider general non design-intensive business base of Ireland, and; to strengthen the elements of the existing non design-intensive business base that are already actively using design within their companies.

In broad terms the findings indicate that there is potential for the State to support the development of design by raising awareness of design and its potential impact. This is principally applicable to businesses in the non design-intensive sector who are not undertaking design currently. The results of the survey also suggest that the FDI sector may see difficulties in making the case for design and this may suggest a role for awareness raising and other intervention.

The main barriers cited by companies in the research were financial-related (grants, subsidies, tax credits) and time related. In light of the link between R&D and innovation the findings imply that there may be potential, in the first instance, to review whether design is capable of being supported through existing programmes, rather than developing new support programmes.

These areas for development will require further exploration and should be considered alongside those of parallel research on the design-intensive sector⁴.

⁴Profile of Business in the Traditional Design Sectors, January 2016, A Report for the Design and Craft Council of Ireland, by Con Kennedy

1 Introduction

This report sets out findings from CM International and PDR's 'Study of the Role and Importance of Design in Firms based in Ireland in Non design-intensive sectors'. The study was commissioned by the Department of Jobs, Enterprise and Innovation (DJEI) and supported by the Design and Crafts Council of Ireland as part of the ID2015 initiative. It was undertaken with the intention of better understanding design in the wider enterprise base, beyond the specialist ('intensive') design sector. The non design-intensive sector includes businesses whose function is not specifically one of design, but who may make use of it to a greater or lesser extent as part of their business activities. It can be contrasted with the more design-intensive sectors (which are not a focus of the study) which includes interior design, fashion design, industrial / product design, textile design and activities associated with graphic design, visual communications, architectural, and craft sectors⁵.

The study builds on recent research evidence⁶ which indicates that Irish businesses report similar levels of design 'maturity' relative to international benchmarks, with the majority of businesses said to be undertaking no design, or viewing it narrowly as a process of styling and aesthetics. The focus of this study is on developing an understanding of the role and importance of design in agency-client firms in non-design intensive sectors in Ireland.

The context for the study is the growing policy attention being given to design across Europe, and the emergence of international evidence highlighting the innovation and economic benefits associated with companies undertaking design. In Ireland, research, development and innovation policy primarily target traditional technological R&D and product and process innovation, with less emphasis on design. It is in this context that the study has been commissioned to better inform policy thinking and potential policy developments.

1.1 Research questions

The aims of this study were:

- To develop a profile across a range of sectors of the importance of design in firms in the non design-intensive sectors in Ireland and to determine how this differs by sector, firm size and firm ownership.
- To determine what challenges firms in the non design-intensive sectors in Ireland face in engaging in design and how this differs by sector, firm size and firm ownership.

The key objectives of the study were to:

- Describe what 'design' means and develop a categorisation / taxonomy to be used in probing the multi-faceted nature of design in firms.
- Identify a selection of non design-intensive sectors present in the Irish economy (and the rationale for selection) to be reviewed in the study.

⁵ Indecon International Economic Consultants (2010) 'Economic significance and potential of the crafts sector in Ireland'.

⁶ Innobarometer (2015) 'Innobarometer 2015 – The Innovation Trends in EU Enterprises', Brussels, and CMI-PDR survey (2015).

- Determine for each of the selected non design-intensive sectors and according to firm size and ownership:
 - What is the role of design in firms in Ireland?
 - What is the importance of design activities relative to other R&D and innovation activities?
 - Why do firms engage in design?
 - How do they engage in design?
 - Do firms utilise IP associated with design?
 - Who works in design, and what are the skills required?
 - Are there barriers / issues inhibiting increased level of design activity in firms in Ireland?
 - How does Irish firm level design activity compare internationally?
- Develop a report, setting out the research and analysis undertaken and a series of key findings, which identifies:
 - the importance attributed to design for firms in the non design-intensive sectors according to sector, firm size and firm ownership.
 - challenges that exist for firms in the non design-intensive sectors in engaging in design, according to sector, firm size and firm ownership.

1.2 Methodology

The study has been based around five work stages and included a detailed literature review of design and its role and importance in businesses and their competitiveness, company case studies, and a survey of companies in the non design-intensive businesses in Ireland.

The literature review and case studies provided a basis for the development of a framework for the study. This framework guided the development of the questions for inclusion in a survey of agency-client firms, and provided a structure around which to position the study findings (developed based on analysis of the survey and case studies).

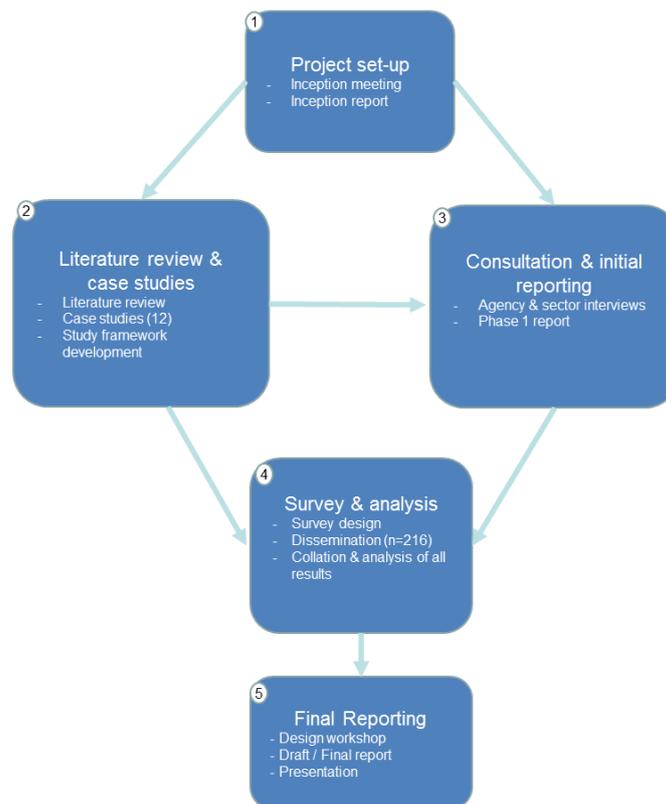
A workshop was held as part of the study, and provided stakeholders with the opportunity to validate the findings and contribute towards defining the opportunities for design to contribute further to economic development in Ireland.

The study was guided by a Steering Group⁷, and a set of draft findings from the study were discussed at a workshop with a group of stakeholders comprising companies, policy, industry associations and academics.

A summary of the approach adopted can be found in figure 2 below detailing the focus and scale of the fieldwork undertaken for the study. More detail on the methodology can be found in Annexes 1 (study methodology) and 2 (selection of the sectors).

⁷ The Steering Group was chaired by the Department of Jobs Enterprise and Innovation (DJEI) and members were made up of representatives from (DJEI), Enterprise Ireland, IDA, Science Foundation Ireland and ID 2015 / Design and Craft Council of Ireland.

Figure 2. Study methodology



1.3 Structure of the report

The report begins with a definition of design, the development of concepts and typologies of design activity and an outline of the role and importance of design in companies (section 2). This section sets out the framework (informed by insights from the literature and the case studies undertaken) used to guide the research and analysis for the study. It also identifies the non design-intensive sectors on which this study is to focus.

Section 3 of the report presents the results from a survey of design activity and intensity in agency-client firms in non design-intensive business sectors. Results are presented in aggregate and according to sector, size and ownership of business.

Section 4, sets out a series of key findings on design in agency-client companies which were identified based on an analysis of the survey and case study research, and Section 5 identifies some potential opportunities for development of design activity in the company base in Ireland.

Annexes (1-4) to the report provide full details of the study methodology, the rationale for selection of the industry sectors included in this research, the survey questionnaire and full details of the case studies.

2 Defining design: a framework for the study

Definitions of design have evolved in recent years, away from an aesthetic view of design associated with the end product, towards a more process oriented perspective in which design and design thinking can play an important role across all stages of a product, process or service's development. This has given way to extensive research seeking to examine the nature of design in businesses in many countries.

While the role and importance of design in the speciality design intensive sectors is comparatively clear, this is not necessarily the case in non design-intensive sectors (see section 1). While design in the non design-intensive sector is not the primary function of companies, it can contribute (to a greater or lesser extent) to a range of business processes.

The following section begins by examining existing literature on design in business (2.1). It then considers available evidence on the non design-intensive sectors, alongside existing research on company size and use of design (2.2). The section concludes by drawing out an analytical framework which is based on the results of the literature reviewed and the insights developed from the case studies (2.3).

2.1 The role and importance of design

Design is an approach to problem-solving that can be used across the private and public sectors to drive innovation in products, processes, services and systems by putting people first⁸. There is a growing body of evidence that demonstrates the value and impact of design at the micro and macro levels, with studies indicating its importance to business revenues, exports and gross value added (GVA).

Since 2010, for example, 27 companies that were co-founded by designers have been acquired by companies like Google, Facebook, Adobe and Yahoo⁹. Leading companies are building their design capacity by acquiring design agencies, hiring tens or hundreds of designers, appointing Chief Design Officers or training staff in design methods. Other global trends reveal the mounting importance of design to enterprises. Nevertheless, design can still be a complex process for small to medium-sized enterprises (SMEs) and the route to effectively encouraging design-led innovation is not always clear for government.

Researchers and policy makers have begun to turn their attention towards supporting design activity. This has seen activity at the European and country level, with a focus on understanding the role of design in the innovation process and the potential for policy to provide specific support to businesses beyond the specialist design-intensive sector.

⁸ Whicher, A and Walters, A. (2014) 'Mapping design for innovation in Wales and Scotland', PDR/Cardiff Metropolitan University, p. 4. Available at: <http://www.seeplatform.eu/docs/PDR%20-%20Mapping%20Design%20for%20Innovation%2028.11.14%20LR.pdf> [accessed 18.11.2015]

⁹ Maeda, J. (2015) '#DesignInTech Report', Kleiner Perkind Caufield & Byers. Available at: <http://www.kpcb.com/blog/design-in-tech-report-2015> [accessed 04.09.2015]

2.1.1 Role of design in business

It is widely asserted that there is no commonly agreed definition of design. Nevertheless, it is broadly agreed that the notion of design is evolving and has expanded from a narrow focus on physical objects to a broad set of people-centred methods across social and business life. Since the early 2000s, design has been repositioned as a tool for competitive innovation advantage in business and transformation in the public sector, taking account of business, technological and human values.

Design is understood differently by individuals and organisations to cover a broad range of activities and outputs. As such, the research carried out in this study will pay particular attention to examining how Irish-based firms perceive and apply design: probing for example whether design is considered narrowly in terms of styling and aesthetics, as form and function or more broadly as an approach to creative problem-solving. Design can encompass a broad range of well-established activities including, but not limited to:

- graphic design
- digital and web design
- industrial and product design
- packaging design
- interior and fashion design
- software design
- service design

In addition to these activities, design is also found in emerging disciplines such as ‘universal design’ (the application of design to the needs of user groups regardless of age, gender, ability¹⁰), ‘eco-design’ (designing products and services with special consideration for the environmental impacts of the product during its whole lifecycle¹¹), and ‘design management’ (the ongoing processes, business decisions, and strategies that enable effectively-designed products, services and organisational success¹²). Conventionally, activities relating to architecture and crafts are considered separate from mainstream design activities, but increasingly the boundaries between disciplines are blurring.

A limited amount of evidence exists on how companies manage their design capabilities, whether design activities are performed in-house or whether design expertise is procured externally. Of those studies available, research by the UK’s Design Council on leading international companies points towards the importance of companies using both in-house design, allied to the procurement of external design expertise to refine concepts, develop product designs and so on.¹³ This highlights the recognition that external design can provide both specialist expertise and ‘fresh thinking’ on design challenges faced by companies.

¹⁰ <http://universaldesign.ie/>

¹¹ http://ec.europa.eu/growth/industry/sustainability/ecodesign/index_en.htm

¹² http://www.dmi.org/?What_is_Design_Manag

¹³ Design Council (2007) ‘Eleven lessons: managing design in 11 global brands’. Available at: [http://www.designcouncil.org.uk/sites/default/files/asset/document/ElevenLessons_Design_Council%20\(2\).pdf](http://www.designcouncil.org.uk/sites/default/files/asset/document/ElevenLessons_Design_Council%20(2).pdf) [accessed 24.11.2015]

2.1.2 Importance of design in business

There is a growing body of evidence that demonstrates the importance and impact of design on *economic competitiveness*. According to findings from Denmark, companies that invest strategically in design register a growth in gross revenues almost 22% higher compared to companies that do not use design. For companies that participated in the UK Design Council's design support programme, every £1 invested in design resulted in over £20 in increased revenue and £5 in increased exports. Based on a broad range of design-related activities, the Design Economy report estimates that design contributes £71.7 (€97.9) billion to the UK economy (7.7% of GVA).

The importance of design can also be seen at the level of share prices. Here research in the UK has tracked share prices of 62 design-led firms over a decade and has found that design-led firms outperformed the FTSE 100 by over 200%¹⁴ (figure 3).

Figure 3. Share price performance of 62 design-led firms against the FTSE 1995-2004¹⁵



2.2 Design and company characteristics: sector, size and maturity

There has been comparatively little attention given to the role and importance of design in different *company sectors*. One of the few studies in this area has been conducted in the UK¹⁶. This found that manufacturing was the most design-aware sector in the UK with 50% of manufacturing companies seeing design as being integral or significant to their business (compared to a UK average of 37%) and

¹⁴ Design Council (2007). 'The Value of Design Factfinder Report'. Available at: http://www.designcouncil.org.uk/sites/default/files/asset/document/TheValueOfDesignFactfinder_Design_Council.pdf [accessed 20.08.2015], p. 14.

¹⁵ Design Council (2007). 'The Value of Design Factfinder Report'. Available at: http://www.designcouncil.org.uk/sites/default/files/asset/document/TheValueOfDesignFactfinder_Design_Council.pdf [accessed 20.08.2015], p. 14.

¹⁶ Ibid., pp. 43-58

over three quarters recognising the link between design and profitability. At the opposite end of the scale was the primary industry, construction, utilities and communication sectors with just one in 20 businesses recognising design as crucial to their success and 58% not investing in design at all. Four out of five companies in the property, finance and business services sector were seeing at least some role for design in their operations (17% integral, 22% significant and 39% limited); almost 40% have increased their investment in design and 81% were of the opinion that design is integral to the UK's future economic performance. The retail, wholesale and leisure services sectors reflected the UK average attitude towards design – 72% of businesses in this sector saw some role for design to play in their operations. Companies in this sector were using design most often to support externally facing functions, such as communications, branding and marketing, however half of the sector's businesses have not invested in design at all.

The role / importance of design according to *company size* is a further area where there is limited but emerging evidence. Here, the EU Innobarometer series has indicated that small and micro enterprises are more likely than other size groups to consider design as styling, large companies are more likely to invest in design, companies that have recently introduced an innovation are more likely to use design and young start-ups are more likely to consider design as integral to company strategy. Elsewhere, spending on design in 358 British companies has been examined¹⁷. This work found that micro companies have the highest rate of no design spend (25%) but also the highest percentage of design spend above 10% of turnover (13%), while a third of the companies with between 10 to 249 employees spent between 0.5% and 1% of turnover on design. Big companies tend to spend much more on technical design (above 3% of turnover) than on non-technical (0.25% of turnover). In smaller companies these two numbers are more even, ranging between 1-1.5% for technical design and 0.3-1.2% for non-technical design.

One of the areas that has received more substantial attention in recent years has been *design maturity*. Here the Design Maturity Ladder, developed by the Danish Design Centre and Danish Government, has been well used in assessing the importance of design from the perspective of how companies use and invest in it. By linking performance data with investment in design, the Design Ladder reveals a correlation between design spending and economic growth. According to findings from the Danish Design Ladder, companies that invest strategically in design register a growth in gross revenues almost 22% higher compared to companies that do not use design. The higher a company is ranked on the Design Ladder, the greater strategic importance is attributed to design and the greater the return. At the first stage, design is an inconspicuous part of product development and is not performed by design professionals. As such, at this stage, the firm is perceived as not using design. At the second stage, design is considered as the final aesthetic finishing touch on a product. Therefore companies are categorised as viewing design as styling. At the third stage, design features at certain stages within the product / service development process but does not permeate through the whole process or organisation. At this stage, design is considered as a process. At the highest level of the Design Maturity Ladder, design is recognised as an enabler of innovation and the designer or design team collaborates with management and all components of the enterprise. At stage four, design is considered as strategy.

¹⁷ Moultrie, J., Livesey, F. (2009). 'Company spending on design: Exploratory survey of UK firms 2008'. Cambridge: Institute for Manufacturing.

2.3 A framework for examining design activity in Irish companies

Despite the metrics presented above on the role and importance of design there is no manual for systematically collecting and interpreting data on design. The absence of a common definition of design has repercussions for measuring the importance of design. The literature review does, however, suggest a number of different features and characteristics of design within businesses.

Based on findings from the literature and the case studies undertaken (see Annexes 1 and 3 for details), the following sets out a framework for examining the role and importance of design in Irish-based companies:

- *Design as multidimensional concept:* The existing literature sees design as having a broad meaning and uses for companies beyond only that of traditional concerns such as aesthetics and styling of final products or services. This can include other important business processes and stages such as product / service design, business development, branding and marketing, customer services and so on.
- *The role of design in different stages of the innovation process:* The literature views design as an integral part of the wider innovation process, with emerging evidence that it can contribute towards early stage product / service development (e.g. user needs analysis, R&D) as well as later stage aesthetics and styling, marketing, packaging and so on.
- *Organising for design:* Design is an activity that can draw on internal or external sources of expertise. Here companies can manage their own in-house design activities or make use of specialist external design services. The literature indicates that they can also collaborate with other partners (companies, universities, colleges etc.).
- *Maturity in design activity:* The Danish Maturity Design Ladder highlights the different roles that design can play in a business, ranging from limited or no role, through to its role as a strategic process informing a company's wider activities. The design ladder is well established in international studies and provides the basis for benchmarking.
- *Economic impact of design:* Design is an activity that can strengthen different business processes (R&D, marketing etc.), and ultimately produce economic impacts. This can be measured through jobs, exports, profitability and so on.
- *Barriers to design:* The framework also acknowledges that companies may face barriers in developing their design activity and capacity.

In order to supplement this framework the research also considers a number of activities / features that are less well developed in the literature, including: an analysis of business responsibility for design, the business functions employing staff with a design role, spending on design, IP and design, and support requirements.

The final component of the research framework was the selected focus sectors. These were selected to include:

- Sectors that were unlikely to undertake design as their principal activity, but reflecting broad areas of business activity in Ireland.
- Sectors that were economically and/or strategically important to Ireland.

Table 1 provides details of the sectors that were the focus in the research, alongside indicative sub sectors. It should be noted, however, that the sector analysis contained in this report is at the level of the sector, rather than ‘sub-sector’.

Table 1. Focus sectors for the study

Sector	Indicative sub-sectors
Food and drink	Food Drink
Advanced manufacturing and engineering	Automotive and aerospace Agricultural machinery Materials handling
Medical devices and pharmaceuticals	Medical devices Pharmaceuticals
ICT hardware and software	Hardware Software Telecommunications Internet
Environment	Construction Energy efficiency
Services	Business services (excluding design services) Financial services Entertainment and leisure Retail and wholesales

Further details of the sectors and the selection rationale can be found in Annex 2 of this report.

3 Design activity and intensity in non design-intensive Irish business sectors: survey results

The following section provides details of findings from a survey of agency-client firms in non design-intensive businesses in Ireland. The survey formed a key research activity for the study, and represents the first time that design in firms in Ireland in non design-intensive sectors in has been examined explicitly.

The results presented below are examined from the perspective of their ownership (FDI and indigenous), size (micro, small, medium and large), and sector (see section 2.2). In a number of cases the results are also analysed according to employment growth characteristics.

The results are presented as follows:

- Profile of the survey sample
- Definitions & use of design
- Design expertise: internal / external
- Design and human resources
- Spending on design activity & type of design activity engaged
- Maturity and role of design
- Design and IP
- Barriers to using design
- Role of the State in supporting design

3.1 Profile of the survey sample

A copy of the survey questionnaire issued is provided in Annex 4. The survey was issued to firms in the non design-intensive sectors and was disseminated with the assistance of IDA Ireland and Enterprise Ireland, IBEC, a number of Local Enterprise Offices (LEOs), and Engineers Ireland. A total of 1,371 IDA Ireland and Enterprise Ireland businesses were surveyed, with a number of additional responses received from IBEC members, LEO clients and Engineers Ireland members. The survey achieved 216 responses, and were predominantly agency-client firms

The breakdown of responses, by sector, is shown in the table below, indicating that at least ten responses from each of the six target sectors was achieved.

Table 2. Survey sample, by sector (n=216)¹⁸

Sector	No.	%
Advanced manufacturing & engineering	58	27%
Environment	10	5%
Food and drink	15	7%
ICT - Hardware & Software	32	15%
Medical devices & pharmaceuticals	38	18%
Services	61	28%
Other	2	1%

The sample consists of a relatively equal split of indigenous (46%) and FDI (54%) companies as well as companies of different sizes (see table 3 and 4 below).

Table 3. Company ownership (n=215)

Ownership	No.	%
Indigenous	99	46%
FDI	116	54%

Table 4. Company size (n=213)

Size	No.	%
Micro	58	27%
Small	63	30%
Medium	53	25%
Large	39	18%

Some 131 of the respondents (62%) had experienced an increase in employment in the last two years and thus can be categorised as companies experiencing growth. 81 respondents reported their employment had either stayed more or less the same (30%) or had decreased (8%) which means that 38% of the sample did not experience growth in the last two years.

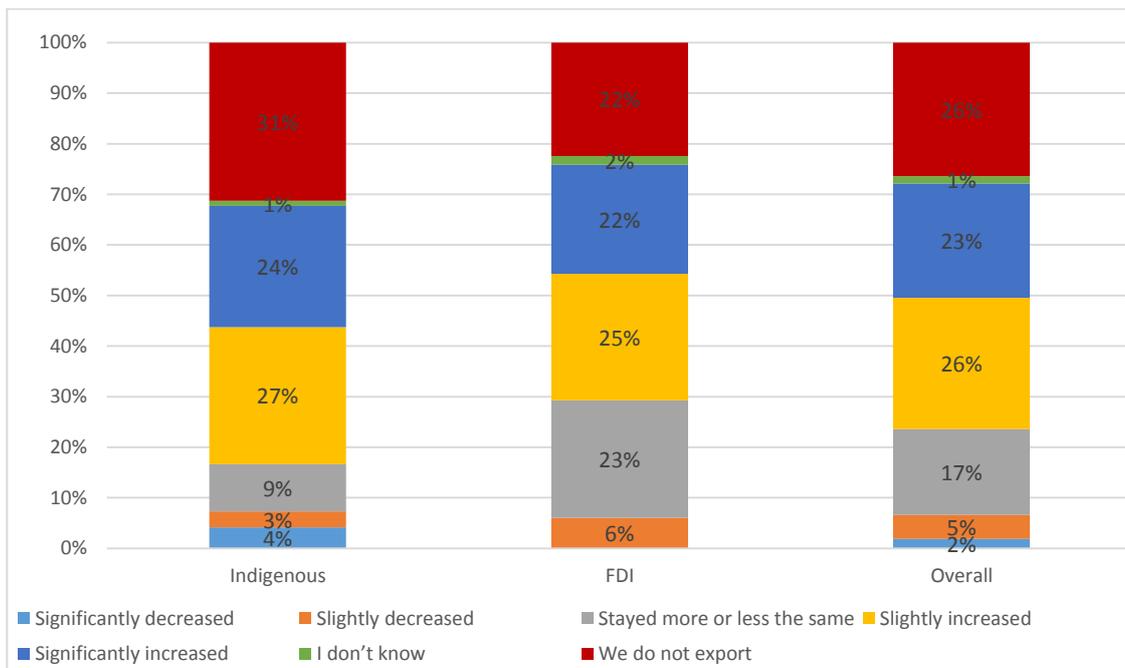
¹⁸ The sectors selected for the study include both manufacturing and services sectors. In the survey conducted for the study companies were asked to select their primary area of business activity *only*. Manufacturing sector companies were given the opportunity to identify themselves as either an Advanced manufacturing & engineering company, or as one of the main manufacturing sub-sectors: Food and drink, Medical devices and pharmaceuticals, ICT hardware and software constitute manufacturing activities. The use of a separate category for Advanced manufacturing was used to allow companies operating outside the manufacturing sub-sectors (or in multiple sub-sectors) to be categorised.

Table 5. Company sector (n=212)

Employment growth characteristics	No.	%
Growth	131	62%
No growth	81	38%

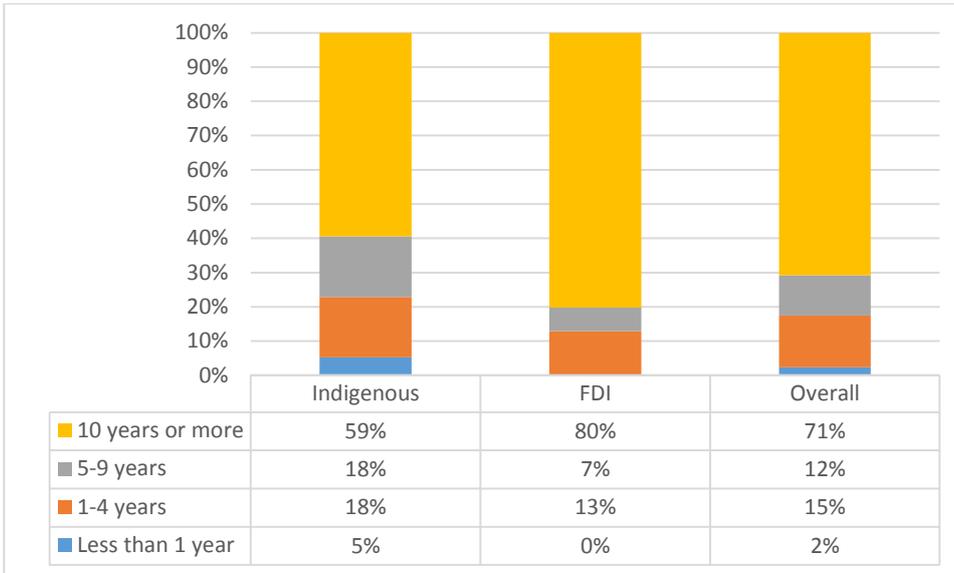
Figure 4 shows that around three quarters of the sample export their products / services with only 26% reporting that they do not export. Around a half reported that the value of their exports had increased in the last two years with 23% reporting exports had increased significantly and 23% reporting it had increased slightly.

Figure 4. If your company exports, how has the value of exports changed in the last two years? n=212



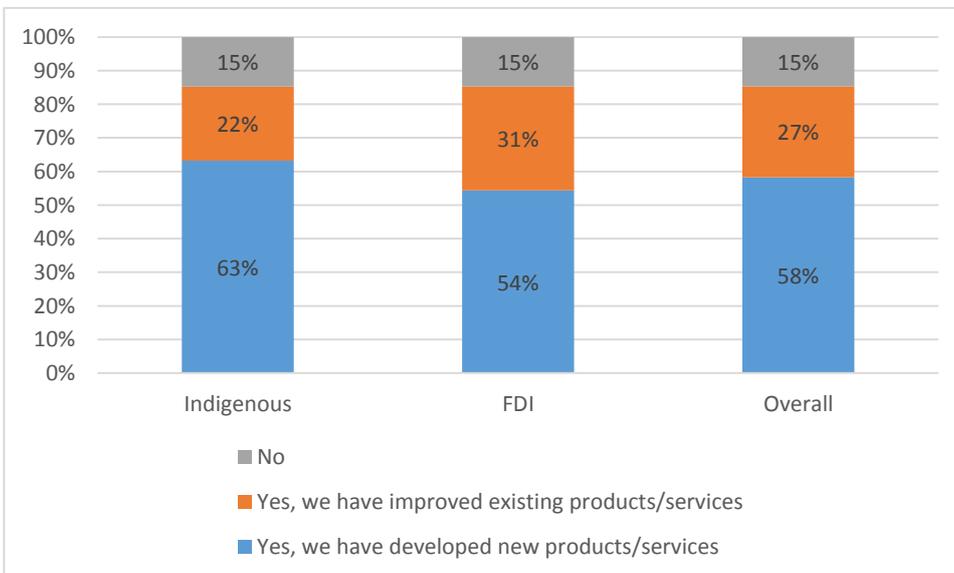
The vast majority of respondents were companies that were well established in Ireland with 71% reporting they had been operating in Ireland for 10 years or more compared to only 2% reporting they had been operating in Ireland for less than a year. FDI respondents had generally been operating in Ireland for longer with 80% operating in Ireland for more than ten years compared to 59% of indigenous companies, and none operating in Ireland for less than a year compared to 5% of indigenous companies. This implies that the indigenous sample is generally younger than their FDI counterparts.

Figure 5. How many years has your company been operating in Ireland? n=212



In addition to being well established companies, and with the vast majority experiencing growth, figure 6 shows that innovation activity has been similarly strong with 85% reporting new or improved product / services in the last two years. FDI companies have a slightly stronger focus on product and service improvement in comparison to indigenous companies, which have a slightly stronger focus on new products / service development. This breakdown between FDI and indigenous companies is likely to reflect the organisational arrangements for research, development and innovation in many multinationals, with new products and services often developed by headquarter sites outside of Ireland.

Figure 6. Has your company developed a new or improved product or service in the past two years? n=213



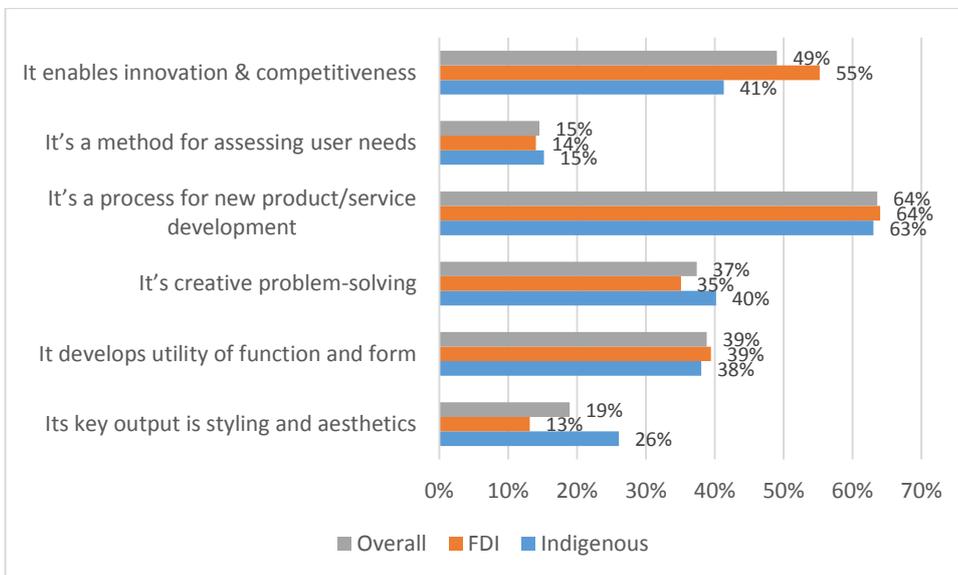
3.2 Definitions & use of design

- **More than six out of every ten companies viewed design as a process for product / service development.**

Survey respondents were asked to define what design meant to them. The findings in figure 7 suggest that most agency-client companies surveyed view design as a process for product / service development (64%)¹⁹. Nearly half (49%) of respondents defined design as a means to enable innovation and competitiveness. In addition to the importance of design to innovation, a substantial proportion thought of design as a way of developing utility of function and form (39%) and as creative problem-solving (37%). Interestingly, only 19% linked design with the traditional concerns of styling and aesthetics, while only 15% defined it as a method for assessing user needs.

The main difference between the way in which FDI and indigenous companies defined design was that more FDI respondents viewed it as an enabler of innovation and competitiveness (55% of FDI respondents reported this compared to only 41% of indigenous respondents). Conversely, indigenous respondents (26%) were more likely to define design in the traditional sense of styling and aesthetics than FDI respondents (13%). However, both FDI (63%) and indigenous (62%) were most likely to consider design as part of their development process.

Figure 7. What does design mean to your company? n=206



Sector analysis

The results show some variance in sectors' definition of design. Most of the respondents in the Medical devices & pharmaceuticals (76%) and Environment (60%) sectors defined design as an enabler of innovation and competitiveness compared to just 34% and 40% of ICT and Advanced manufacturing & engineering companies respectively. Just under half of Medical devices & pharmaceuticals companies (49%) defined design as creative problem solving compared to just 20% of Food and drink companies.

¹⁹ It is likely that respondents selecting this option would have included companies defining design as a process for either new or improved product/service development: it should be noted that the option for differentiating was not available.

Design was defined as a process for product / service development by only 48% of Services companies, compared to 60% or more of every other sector (including 87% of Food and drink companies). However, relative to other sectors, a far greater proportion of Services companies (30%) defined design as an instrument for styling and aesthetics while relatively few Medical devices & pharmaceuticals companies (5%) defined design in these terms.

A half of ICT companies defined it as an instrument to develop utility of function and form followed by 44% and 41% of Advanced manufacturing & engineering and Medical devices & pharmaceuticals companies respectively. These can be compared to just 13% of Food and drink companies who defined design in these terms.

Company size analysis

The results show a significant difference between larger and smaller companies in their definition of design.

Larger companies were more likely to view design as an enabler of innovation and competitiveness (71%) compared to 35% of small, and 43% of micro enterprises. Larger companies were also more likely to define design as a process for product / service development with 74% of large and medium companies reporting this compared to 52% of small and 61% of micro enterprises.

Conversely, microenterprises (30%) were far more likely to define design as a tool for styling and aesthetics compared to large enterprises (11%).

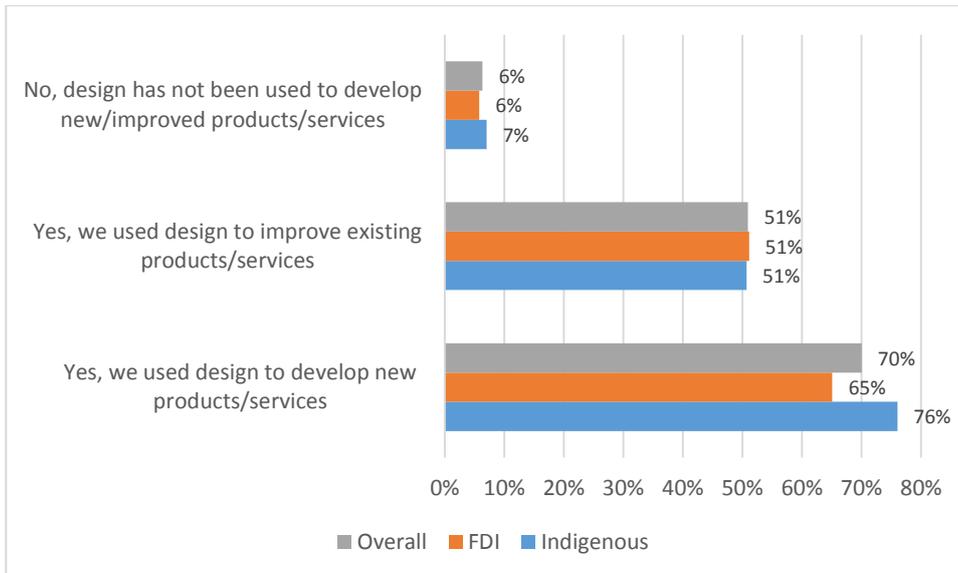
These results suggest that larger companies place more strategic importance on design by defining it as part of innovation and competitiveness, as well as part of their development process. Most micro and small companies also considered design as part of their development process, if not to the same extent. However, smaller companies are comparatively more likely to think of design in terms of styling and aesthetics.

- **Nearly all companies who had developed a new or improved product / service in the past two years reported using design in their development process.**

Figure 8 illustrates the importance of design to product / service development, with only 6% reporting that they did not use design to develop new / improved products / services. This corresponds with the vast majority of respondents' definition of design as a process for new product / service development (see figure 7 above).

The results also shows that the majority of respondents use design to develop new products / services (70%) and/or to improve existing products / services (51%). Additionally, the chart also shows that design was especially important for indigenous companies in developing new products / services with 76% reporting this compared to 65% of FDI respondents.

Figure 8. Has your company used design to develop a new / improved product or service in the past two years?
n=157²⁰



Sector analysis

The vast majority of respondents in the ICT, Medical devices & pharmaceuticals (both 77%), Advanced manufacturing & engineering (73%), Services (68%), and Food and drink (63%) sectors that had responded to this question reported using design to develop new products / services in the past two years, while only 14% of Environment sector respondents reported this. However, nearly all Environment sector respondents used design to improve their existing products / services compared to only 25% of Food and drink respondents reporting this.

Company size analysis

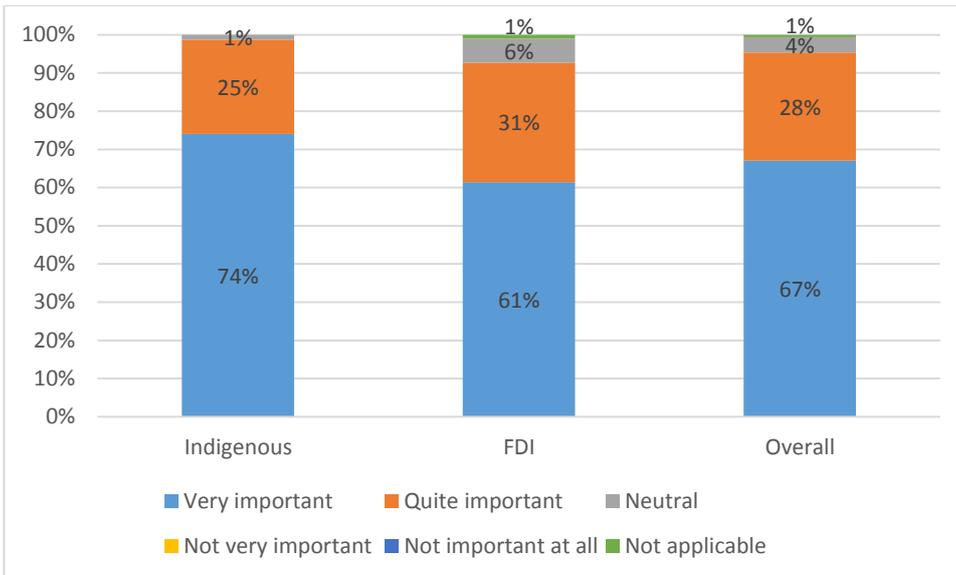
While microenterprises were just as likely as large companies to use design to develop new products / services (73% and 72% respectively) they were far less likely to use design to improve their existing products / services, with 44% reporting this compared to 59% of large companies.

- **Nearly all companies who had developed a new or improved product / service in the past two years reported design is an important part of the process.**

Companies who had developed a new or improved product or service in the past two years were asked how important design is in their company's product / service development process. Here, figure 9 shows that 95% reported it was either important or very important. Marginally more indigenous respondents believed that it was important / very important (99%) than FDI respondents (93%).

²⁰ This chart only includes data from the respondents who reported undertaking design activity (see Figure 11) and have developed new or improved products/services (see Figure 6).

Figure 9. How important is design for the development of new / improved products or services in your company?
n=173²¹



Sector analysis

Only half of respondents in the Services sector reported that design was very important for the development of new / improved products or services compared to between 67%-75% in every other sector.

Company size analysis

Generally, companies of all sizes reported that design is a very important part of their development process. However, larger companies were slightly more likely to report this (69%) than microenterprises (61%).

- **Design is discussed at Board level or part of the business planning process of almost eight out of ten companies.**

78% of FDI and 77% of indigenous respondents who responded to this question (n=207) reported that design is discussed at Board level or part of their business planning process. Of those companies, 61% of indigenous members reported that a member of the Board had a specific responsibility for design. This was far greater than in the case of FDI respondents, where only 36% reported having a Board member with specific responsibility.

Fifteen respondents reported that their CEO / MD had a specific responsibility for design while nine reported their Board included a Head of Design / R&D role. Other Board members with a responsibility for design cited include a Designer (three), CTO (three), Director of Engineering (three), Head of NPD (two), and Director of Sales and Marketing (one).

²¹ This chart only includes data from the respondents who reported developing new or improved products/services (see Figure 6)

Sector analysis

The vast majority of respondents in all sectors reported that design was discussed at Board level. Indeed, more than 80% of each sector reported this with the exception of Food and drink (67%) and Services (68%) respondents.

Of the companies that did discuss design at Board level, the Environment (75%), Advanced manufacturing & engineering (57%), and Food and Drink (50%) sectors were most likely to have a member of the Board with a specific responsibility for design.

Company size analysis

At least three quarters of all micro, small, medium and large enterprises reported that design is discussed at Board level or part of their business planning process. However, slightly more of the large enterprises (84%) discussed design at Board level than microenterprises (75%).

Of those reporting they do discuss design at Board level, microenterprises were most likely to report that a member of their Board have a specific responsibility for design with 58% reporting this compared to 37% of large enterprises.

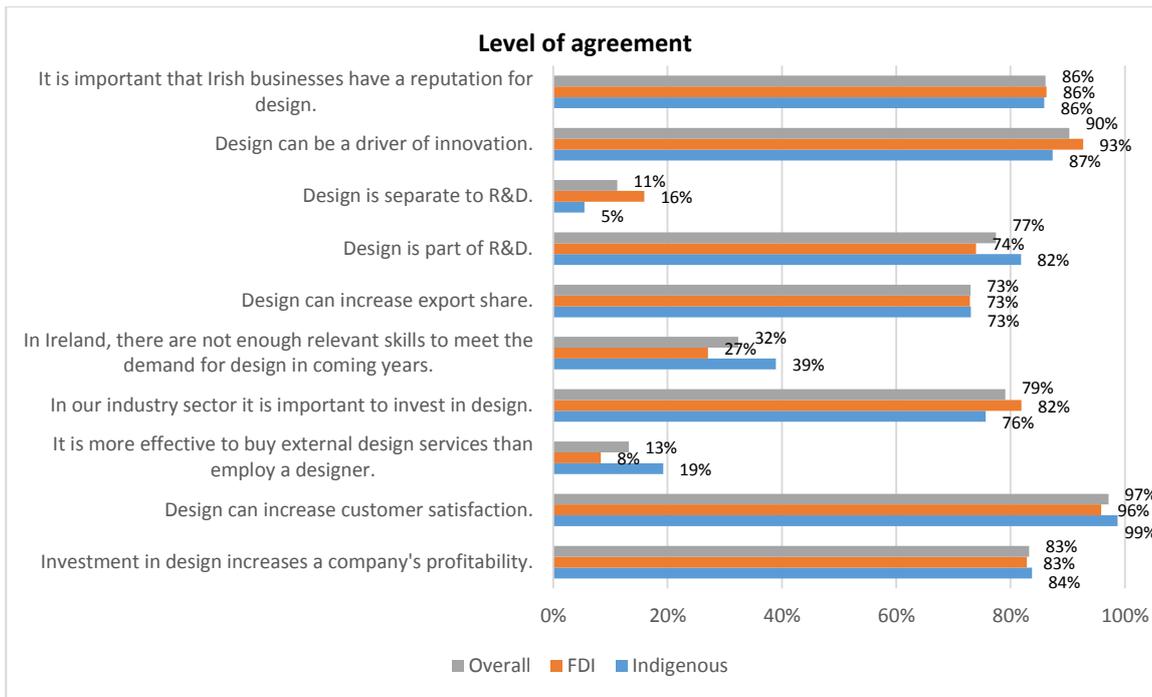
- **More than nine out of ten respondents agreed that design is key to customer satisfaction and almost nine of ten agreed it is key to Irish businesses' reputation and is a driver of innovation.**

Figure 10 shows the level of agreement with a series of statements on the role and importance of design from companies' perspectives. At the company level almost all respondents agreed that design can increase customer satisfaction (97%). The vast majority (83%) also agreed that design increases a company's profitability, that investing in design is important in their industry sector (79%) and that design can increase export share (73%). On the other hand, only 13% agreed that it is more effective to buy external design than employing a designer, suggesting that companies value an internal design structure to a much greater extent. Indigenous companies, however, were slightly more likely to report that it is more effective to buy external design services with 19% of respondents reporting this compared to 8% of FDI companies.

Other broad statements also received strong levels of support with 90% agreeing that design can be a driver of innovation and 86% agreeing that it is important for Irish businesses to have a reputation for design. The results also suggest that respondents see design as being part of R&D (77%). Indeed only 11% stated that design is separate to R&D.

Finally 32% agreed that there are not enough relevant skills to meet the demand for design. This suggests that although skills shortages is an issue for a significant proportion of companies, it is not perceived to be a significant factor. Indigenous respondents were, however, more likely to report a shortage of design skills in Ireland (39%) compared to FDI respondents (27%).

Figure 10. Role and importance of design. To what extent do you agree with the statements below? n=180²²



Sector analysis

The majority of all sectors agreed that it is important that Irish businesses have a reputation for design. The Medical devices & pharmaceuticals sector in particular appear to value the importance of having a reputation in design with all sector respondents (100%) reporting this.

The Advanced manufacturing & engineering, ICT, and Medical devices & pharmaceuticals respondents were particularly in agreement that design is part of R&D with 89%, 85%, and 83% reporting this respectively. The results suggest that design skills shortages is a much bigger issue for Medical devices & pharmaceuticals companies with 52% of respondents reporting it as an issue compared around 30% of the other sectors. Finally, Food and drink companies were far more likely to agree with the statement that it is more effective to buy external design services than employ a designer with 46% of respondents reporting this compared 15% or less of all other sectors.

Company size analysis

The larger companies were most likely to agree with nearly all the statements. For example, 97% of large company respondents agreed that it is important that Irish businesses have a reputation for design compared to 78% of microenterprises. Conversely, microenterprises agreed more with the statement that it is more effective to buy external design services with 26% reporting this compared to only 10% of large enterprises.

²² This chart only includes data from the respondents who reported undertaking design activity (see Figure 11)

3.3 Design expertise: internal / external

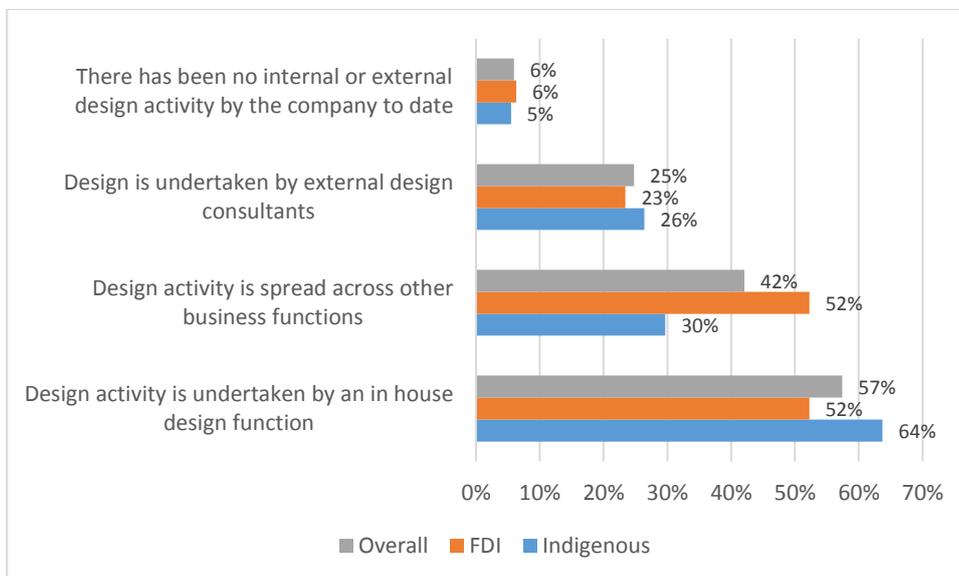
- **Design tends to be undertaken internally, either in a specific in-house design function or spread across other business functions.**

Figure 11 shows that only 6% of respondents reported they have not undertaken any design activity to date and this 6% cohort indicate that they do not expect to do so in the next two years. These results mean that 94% of survey respondents are design active.

The majority of respondents reported that they have an in-house design function to manage their design (57%). This was especially the case among indigenous companies with 64% of respondents reporting a specific in-house design function compared to 52% of FDI respondents. Just as many FDI respondents (52%) also reported that their design activities are spread across other business functions whereas only 30% of indigenous respondents reported the same.

Finally, only a quarter of respondents reported that they undertake design activity through external design consultants suggesting that design tends to be undertaken internally. This is consistent with the results set out in figure 10, which indicate that only a small proportion of respondents believe it is effective to purchase external design services.

Figure 11. How does your company manage its design activity? n=202



Sector analysis

There were a number of sector differences reported in relation to management of design activity. Respondents in the Environment (80%), Advanced manufacturing & engineering (64%), ICT (60%), and Services (57%) sectors were more likely than other sectors to have a specific in house design function. Respondents in the Food and drink sector (47%), however, were more likely than other sectors to undertake their design activity through external design consultants, indeed only 27% reported they had an in house design function. Finally, relative to other sectors, more respondents in the Medical devices & pharmaceuticals sector reported that they spread their design activity across other business functions (59%).

Company size analysis

As might be expected, smaller companies were more likely to report that they haven't undertaken any design activity - 9% and 8% of micro and small enterprise respondents reporting this - compared to 2% of medium enterprises and 3% of large enterprise respondents.

Of those that do engage in design activity, most respondents of every size had a specific in house design function - 55% to 62% of each size cohort. Large enterprises, however, were far more likely to spread their design activity across business functions (62%) compared to smaller companies e.g. only 22% of microenterprises. Microenterprises, on the other hand, were comparatively more likely than firms of other sizes to use external design consultants with 35% of microenterprises reporting this. A significant proportion of large enterprises also used external consultants with 27% reporting this. Small and medium enterprises were least likely to use external consultants with only 17% and 23% reporting this respectively.

Employment growth characteristics

Companies experiencing employment growth were far more likely to have undertaken design activity than companies with no employment growth. Indeed only 2% of respondents that had experienced employment growth reported they haven't undertaken any internal or external design activity compared to 13% of those that have not experienced employment growth in the last two years²³. The respondents that had experienced employment growth were also more likely to report that they have an in house design function (62% against 51%), spread design activity across business functions (44% against 40%), and undertake design by external consultants (28% against 21%) compared to company respondents that have not experienced employment growth.

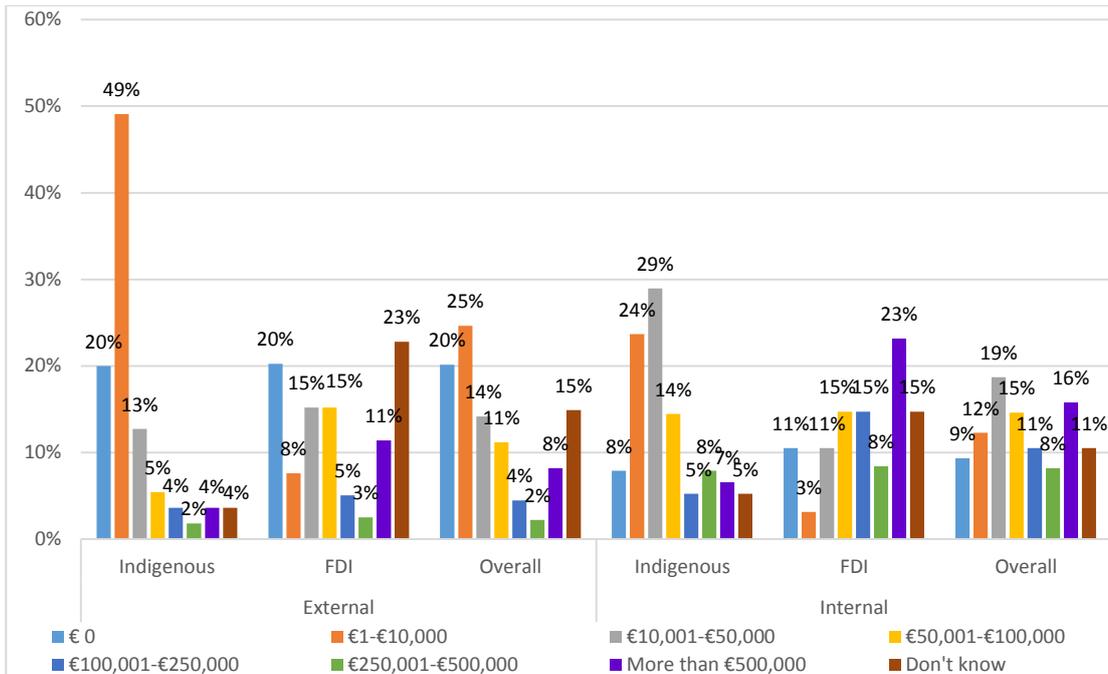
- **Companies generally invested more on internal design activities than external design activities and FDI companies were far more likely to invest heavily in design.**

Figure 12 illustrates the level of spending on both external and internal design activity. It shows that overall, companies spend far more on internal design activities, with 52% of respondents spending up to €500k on internal design compared to only 32% on external design. Furthermore, 16% spent more than €500k on internal design compared to only 8% spending that amount on external design. Finally, only 21% spent €10k or less on internal design activity compared to 45% of respondents spending the same on external design activity.

There was a big difference in spending on design activity between indigenous and FDI companies which shows the difference in their respective spending power. Whereas 69% of indigenous respondents spent €10k or less on external design activity and 32% spent €10k or less on internal design activity, this can be compared to only 28% and 14% of FDI respondents spending the same on external and internal design activity respectively. At the other end of the scale, only 4% of indigenous respondents spent more than €500k on external design activity compared to 11% of FDI companies, and only 7% of indigenous respondents spent more than €500k on internal design activity compared to 23% of FDI respondents.

²³ It should be noted that the majority of respondents indicated engagement in design activity (94%).

Figure 12. Approximately how much did your company spend on internal (staff salaries etc) and external design expertise in 2014 in Ireland? n=171 (Internal), n=134 (External)²⁴



Sector analysis

Respondents in the Medical devices & pharmaceuticals sector had invested heavily in design activity with 42% investing more than €250k on internal design activities (including 21% that invested more than €500k). This is followed by 25% of Advanced manufacturing & engineering, 22% of ICT, and 15% of Services respondents investing more than €250k on internal design activities. 42% of Medical devices & pharmaceuticals sector respondents also invested more than €50k on external design activities.

Company size analysis

Large companies, unsurprisingly, were able to spend more on design activity in Ireland with 33% of respondents spending more than €500k on internal design and 15% spending more than €500k on external design in Ireland in 2015. No microenterprise spent more than €500k on any design activity, with half of microenterprises spending less than €10k on internal design and 77% spending less than €10k on external design. This can be compared to 7% and 15% of large enterprises respectively.

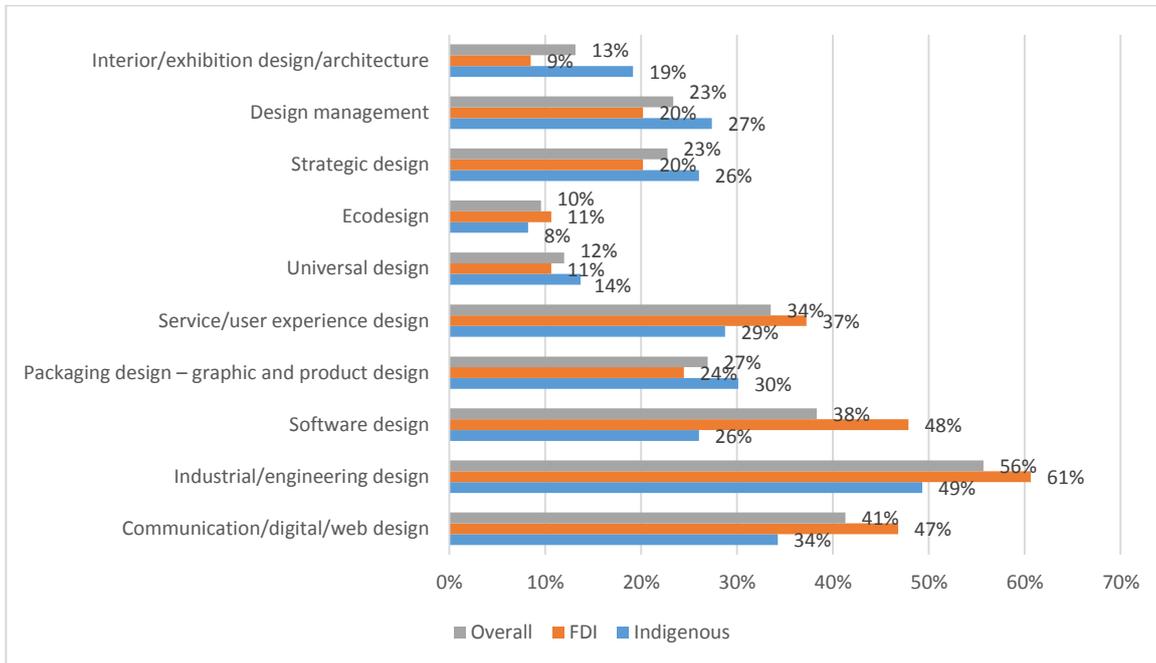
- **The internal design activity most regularly used was ‘industrial design / engineering’ while ‘communication, digital and web design’ was the most regularly used external design activity**

Figures 13 and 14 show that respondents undertake various types of internal and external design activities²⁵.

²⁴ This chart only includes data from the respondents who reported undertaking design activity (see Figure 11).

The main activity cited for internal design was industrial / engineering design (56% overall). This was more pronounced amongst FDI companies with 61% of respondents undertaking internal industrial / engineering design activity compared to 49% of indigenous respondents. Some 41% of respondents who undertook external design activities used external consultants for industrial / engineering design.

Figure 13. What type of internal design activities does your company undertake? n=167²⁶

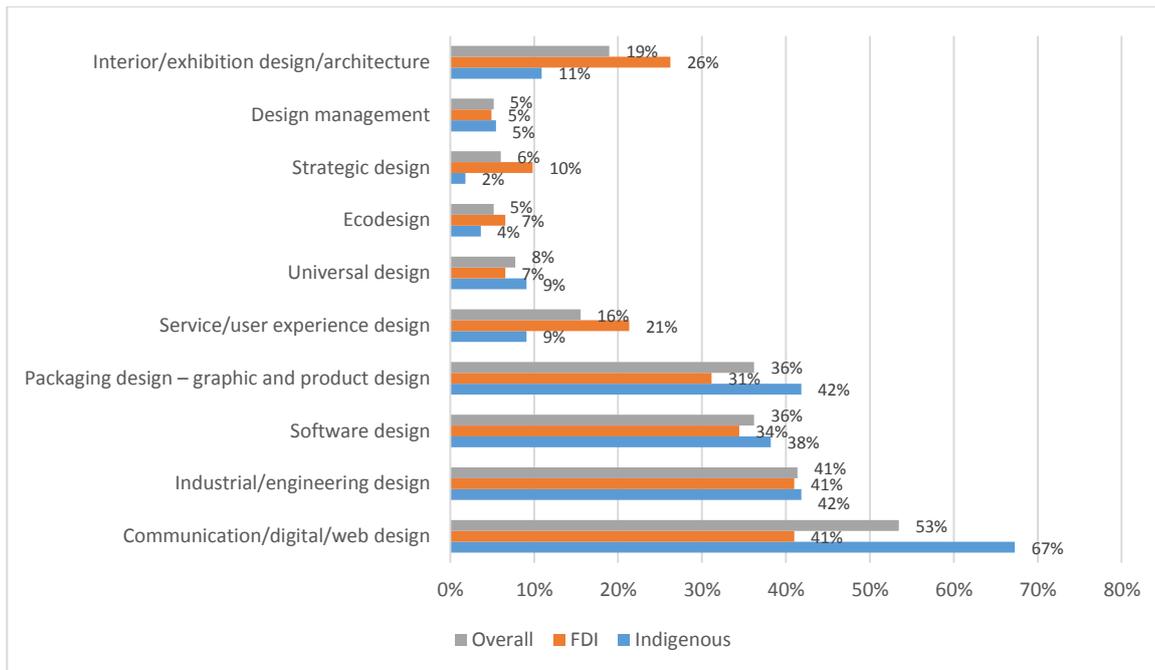


The main external design activity undertaken however was the use of external design consultants communication / digital / web design (53% overall). The figures show that FDI respondents tend to undertake communication / digital / web design internally (47% compared to 34% of indigenous respondents); while indigenous respondents tend to undertake these activities through external design consultants (67% reported this compared to 41% FDI respondents).

²⁵ Figure 13 includes data from the respondents who reported undertaking internal design activity and figure 14 only includes data from the respondents who reported undertaking external design.

²⁶ See section 2.1.1 for discussion of the types of design activities discussed in this table.

Figure 14. What type of external design activities does your company undertake? n=116



Software design was also undertaken by 38% of respondents internally as well as 36% externally. Again FDI companies tended to undertake these activities internally while indigenous companies tended to use external design consultants.

Other design activities undertaken frequently include packaging design (undertaken by 27% of respondents internally and 36% externally) and service / user experience design (undertaken by 34% of respondents internally and 16% externally).

Sector analysis

The sector findings demonstrate a close link between sector activities and the nature of design activity undertaken. For example, the main type of internal design activity undertaken by Environment, Advanced manufacturing & engineering, and Medical devices & pharmaceuticals sector respondents was industrial / engineering design (88%, 85%, and 83% respectively). This can be compared with only 16% of Services sector respondents reporting the same. Similarly, the main internal design activity undertaken by the Services sector was communication / digital / web design with 64% reporting this compared to less than 50% of all other sectors.

Strategic design was the main internal activity undertaken by Food and drink respondents with 44% reporting this. As for the ICT sector respondents, as could be expected the main activity undertaken by a long way was software design with 89% reporting this.

As for the external design activity, a large proportion of the Food and drink sector respondents undertook software design and packaging design with 55% and 45% of respondents reporting this respectively.

Company size analysis

In terms of internal design activity, large enterprises were far more likely to undertake industrial / engineering design (73%) and software design activities (57%) compared to microenterprises (34% and 32% respectively). Microenterprises were more likely to undertake interior / exhibition design with 22% reporting this in comparison to 10% of large company respondents.

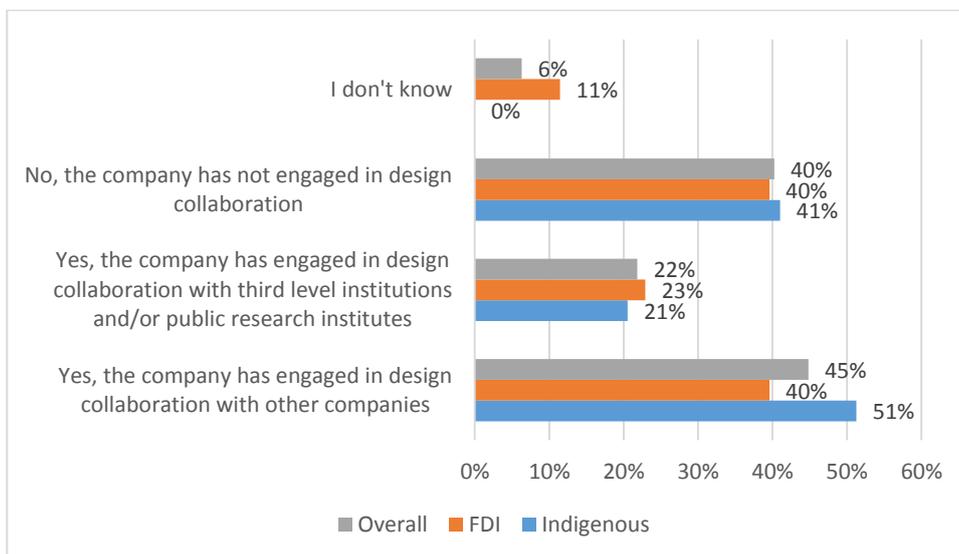
The results for the external design activity undertaken show that large companies (33%) were far more likely than smaller companies e.g. microenterprises (12%) to undertake interior / exhibition design activity through external consultants. As with the internal design activity, large companies (57% were also far more likely than smaller companies e.g. microenterprises (30%) to undertake external industrial / engineering design. Smaller companies such as microenterprises, however, were far more likely to use external consultants to undertake communication / digital / web design activity with 67% of respondents reporting this compared to 33% of large company respondents.

- More than half of respondents have engaged in design collaboration with other partners

Overall, more than half of respondents (54%) have engaged in design collaboration with other partners as illustrated by figure 15²⁷. However, a large proportion (40%) reported that they haven't engaged in any design collaboration which suggests much of the activity is undertaken independently (figure 14).

The collaborative activity includes 45% of survey respondents engaging in design collaboration with other companies while 22% also reported they've engaged in design collaboration with third level institutions / public research institutes. There were no significant differences between FDI and indigenous companies in this instance.

Figure 15. Has your company engaged in design collaboration with other partners? n=174²⁸



Sector analysis

The majority of respondents in all sectors had engaged in design collaboration with the exception of Food and drink and Environment sectors (67% and 56% hadn't engaged in any design collaboration respectively). Most of the Advanced manufacturing & engineering sector respondents (51%) had collaborated with other companies in their design activity followed by just under half of the Services

²⁷ i.e. the total of 'I don't know' and 'No the company has not engaged in design collaboration' equals 46%. The inverse, representing those that are aware of engaging in design, is therefore 54%.

²⁸ This chart only includes data from the respondents who reported undertaking design activity (see Figure 10)

(47%) and ICT (43%) sector respondents. Finally, a large proportion of Medical devices & pharmaceuticals (43%) respondents also engaged in design collaboration with third level institutes and/or public research institutes.

Company size analysis

More of the large company cohort reported engagement in design collaboration relative to companies of other sizes with only 23% reporting they hadn't engaged in any design collaboration whatsoever compared to 38% of medium, 45% small, and 48% of micro enterprises. This was because of far greater design collaboration with third level institutions / public research institutes, relative to companies of other sizes, where 45% of large company respondents engaged in design collaboration with these organisations compared to only 13%-21% of SMEs. There was no significant difference, however, in design collaboration with other companies where 43%-48% of each size cohort reported collaborative design engagement with other companies.

Employment growth characteristics

The majority of companies experiencing employment growth (53%) had collaborated with other companies in their design activities, and a further 24% collaborated with third level institutions / public research bodies. However, of those companies who have not experienced growth only 28% of companies had collaborated with other companies and only 17% had collaborated with third level institutions / research bodies. These results suggest that based on the measure of employment growth, engaging in design collaboration with partners is beneficial to company performance.

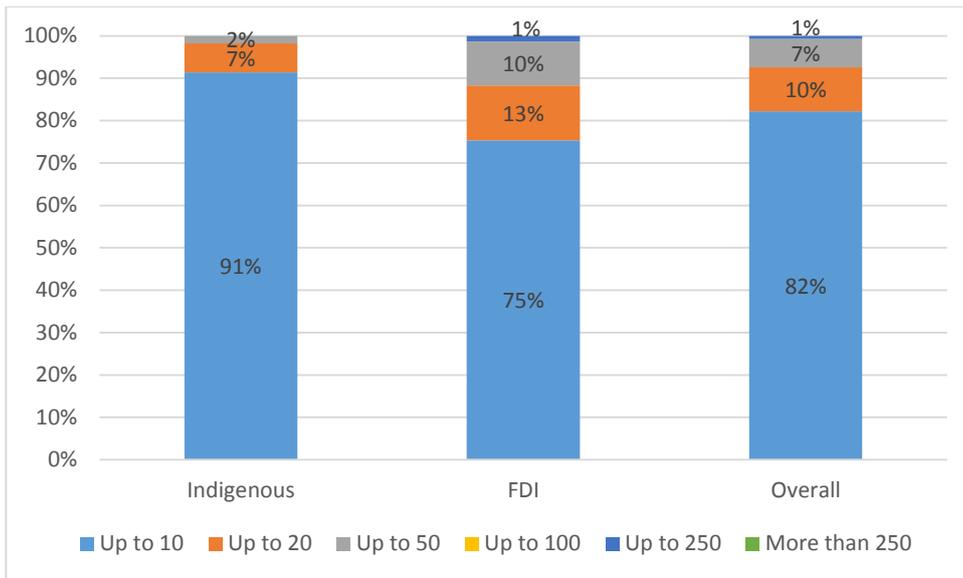
3.4 Design and human resources

- **More than eight out of ten respondents had fewer than ten employees with a design role in Ireland**

82% of respondents that specified their design employees in Ireland reported they had up to 10 employees with a design role (figure 16).

The FDI companies reported more employees with a design role. This was consistent with such companies generally having more employees overall. Some 24% of FDI respondents reported more than 10 employees with a design role compared to only 9% of indigenous respondents.

Figure 16. How many employees have a design role in Ireland, in your company? n=135²⁹



Sector analysis

The results suggest that companies in the Medical devices & pharmaceuticals and Services sectors have most employees with a design role, with 13% and 11% of respondents respectively having up to 50 design employees compared to 4% or less of every other sector. Most other respondents reported less than 20 employees with a role in design.

- **Six out of ten respondents employed staff with a design role in their product or service development business function**

The two business functions that employ staff with a design role in most companies were in the product or service development function (60%) and the companies' specific in-house design function (50%). These are followed by 31% of respondents reporting design staff in their Marketing / Communications function and 28% employed design staff under their Business development function (figure 17).

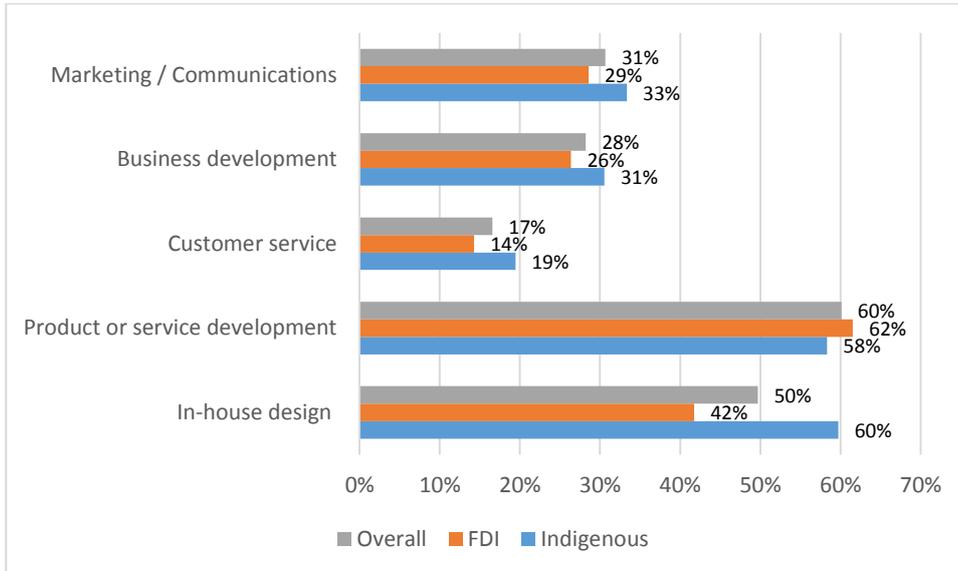
In addition, four respondents³⁰ reported that their RD&I business function employ staff with a design role including one company reporting their innovation lab included design employees. Four respondents also reported that staff with a design role are in the engineering department of their company while yet another four reported employees have a design role throughout their company.

Far more indigenous companies employed staff under their in-house design function (60%) compared to FDI company respondents (42%). This reiterates findings from figure 11 where FDI companies tend to undertake their design activities through other functions whereas indigenous companies focus more on a specific in-house design function.

²⁹ This chart only includes data from the respondents who specified design employees in Ireland, and reflects the difficulties that some companies were likely to have had in providing specific design employee numbers for Ireland.

³⁰ Via the free text option, provided with this question.

Figure 17. Which business functions employ staff with a design role? n=163³¹



Sector analysis

The product / service development department was the main business function for design staff in the ICT (77%), Medical devices and pharmaceuticals (72%), Food and drink (63%) and Advanced manufacturing & engineering (60%) sectors. Services sector respondents were far more likely to employ staff with a design role in the marketing / communications department (53%) than other sectors e.g. Advanced manufacturing & engineering respondents (13%). The Environment sector was most likely (78%) to employ design staff through an in house design function while a majority of Services and Advanced manufacturing & engineering (53% each) also reported this.

3.5 Spending on design activity & type of design activity engaged

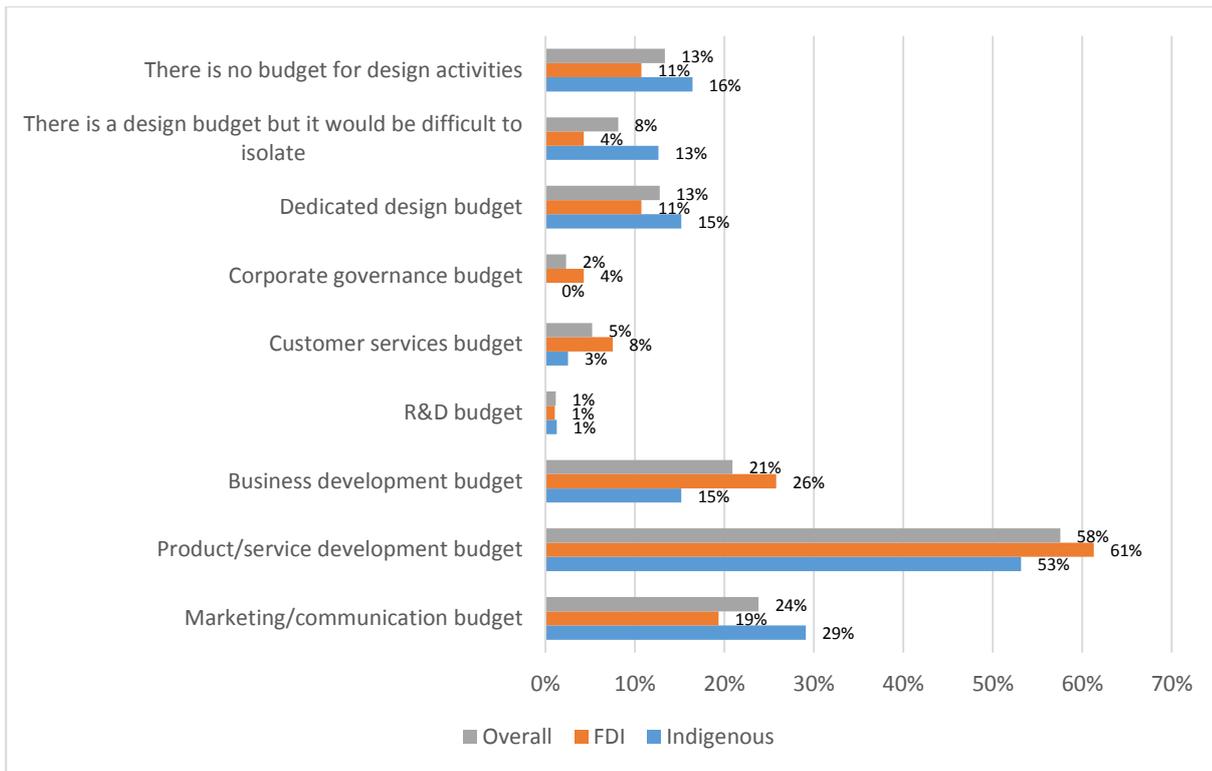
- **Design spending was included in the product / service development budget of six out of ten respondents**

Figure 18 highlights the budget lines in which companies include their design costs. As with earlier results it shows that 58% include them under a product / service development budget. All other budget lines account for less than one quarter of responses including marketing / communication (24%) and business development (21%). Only 13% of respondents reported a dedicated design budget and only one per cent selected an R&D budget. The low response for R&D budget might be explained by respondents not differentiating between the categories of 'R&D budget' and a 'product / service development budget' used in this question.

There was not much variance between FDI and indigenous companies' management of design in this question.

³¹ This chart only includes data from the respondents who reported undertaking design activity (see Figure 10)

Figure 18. Under which budget line in your company are design costs included? n=172³²



Sector analysis

The majority of nearly all sectors reported that design costs are included in a product / service development budget with the exception of the Services sector (only 40% included costs in this budget line) and the Environment sector (only 11%). A relatively large proportion of Services (46%) and Food and drink (42%) sector respondents included costs for design in their marketing / communication budget compared to less than 20% of other sector respondents reporting the same.

Company size analysis

Product / service development budget was again the main budget line used by companies of all sizes to include design costs. This was especially the case for large enterprises with 68% of respondents reporting this compared to 49% of small and 54% of microenterprise respondents.

Beyond that, a quarter of small company respondents reported they had no budget for design activities, followed by 13% of microenterprises. This can be compared to only 6% and 3% of medium and large enterprises respectively. Microenterprises were also more frequent in reporting that their design costs were included under a marketing / communication budget with 37% reporting this compared to 13% of large enterprises reporting the same.

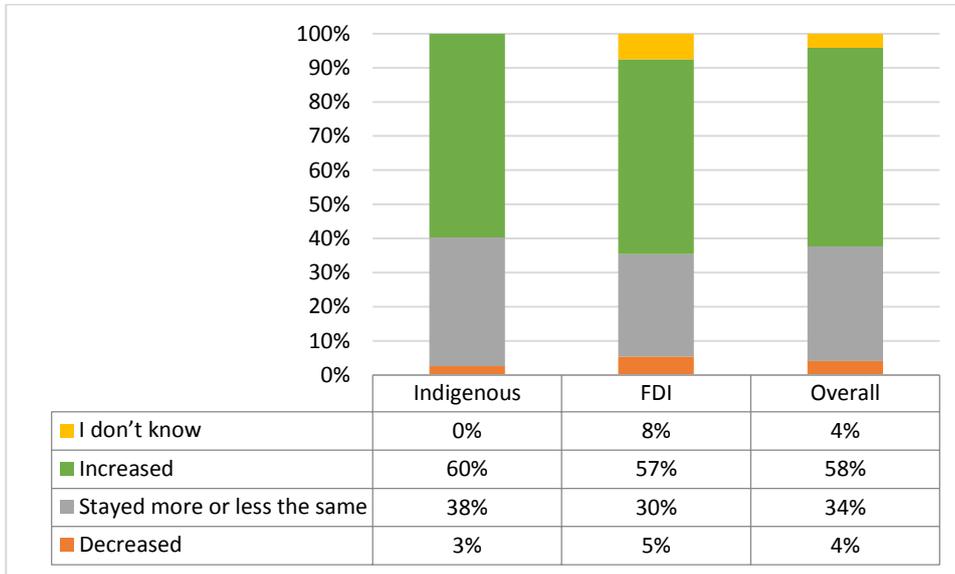
This again illustrates how companies of different sizes differ in the way they use and think of design, with larger companies more likely to use it as part of their development process and smaller companies more likely to use it to market their products / services.

³² This chart only includes data from the respondents who reported undertaking design activity (see Figure 10)

- **Six out of every ten respondents increased their spending on design in the last two years**

The trajectory of design spending is illustrated in figure 19. This suggests that design is having an increasing importance in companies' activities with 58% of respondents reporting they had increased spending on design in the last two years. Some 34% reported it had stayed the same while only 4% reported it had decreased. This was consistent for both FDI and indigenous respondents.

Figure 19. How has spending on design in your company changed in the last two years? n=170³³



Sector analysis

Some 72% of the Medical devices & pharmaceuticals sector respondents had increased their spending on design in the last two years, followed by 62% of ICT and 59% of Advanced manufacturing & engineering respondents. The sectors with fewest respondents reporting an increase in design spending include the Environment (44%), Food and drink (50%), and Services (51%) sectors.

Company size analysis

More of the larger company respondents have increased their spending on design (71%) compared to less than half of micro (49%) and small (48%) enterprise respondents.

Employment growth characteristics

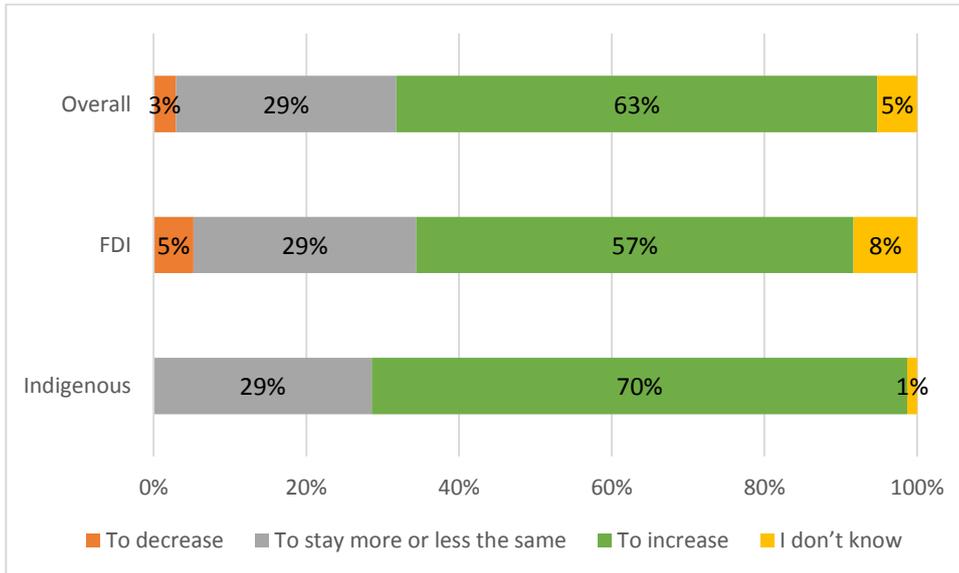
The results also suggest that there is a correlation between companies that have experienced employment growth in the last two years and an increase in design spending in the same period. Here some 66% of company respondents, that have experienced growth in the past two years, increased their spending on design in the same period. This is far higher than the companies that have not experienced growth in the past two years where only 40% of respondents had increased spending on design.

³³ This chart only includes data from the respondents who reported undertaking design activity (see Figure 10)

- **More than six out of every ten respondents expect spending on design to increase in the next two years**

In terms of future intentions, figure 20 shows that the vast majority of respondents expect their spending on design activities to continue growing in the next two years (62%). Some 29% expect it to remain the same while only 3% expect it to decrease. This is especially pronounced amongst indigenous companies with 70% of respondents expecting their design spend to increase compared to 57% of FDI respondents, and no indigenous companies expecting spending on design to decrease compared to 5% of FDI respondents.

Figure 20. How do you expect spending on design in your company to change in the next two years? n=173³⁴



Sector analysis

The majority of all sector respondents reported they expect to increase design spending in the next two years including 78% of Environment sector respondents. This is followed by 67% of Medical devices & pharmaceuticals respondents, 63% Services respondents, 61% Advanced manufacturing & engineering, 59% ICT and 58% Food and drink.

Company size analysis

Although large companies were more likely to report their spending on design had increased in the past two years, the results suggest that this is going to change in future with more micro (57%), small (65%), and medium (77%) sized enterprises reporting they expect design spending to increase in the next two years compared to large enterprises (45%).

³⁴ This chart only includes data from the respondents who reported undertaking design activity (see Figure 10)

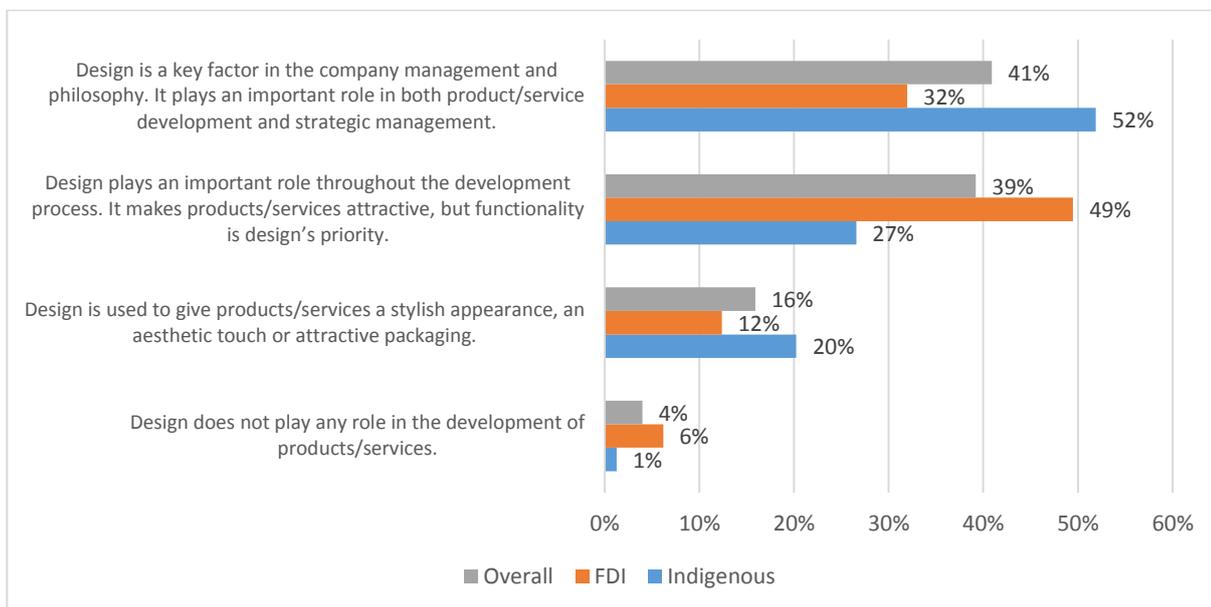
3.6 Maturity and role of design

- **Indigenous companies are more likely to exhibit strong design management and philosophies while design is generally regarded by FDI companies as playing an important role throughout the product / services development process**

Figure 21 provides further evidence of the importance of design in product / service development, and captures data on the maturity of design in companies (cf. the Danish Design Ladder). The results suggest that only 4% of respondents state that design does not play any role in the process (Level 1). Some 41% stated that design is a key factor in their management and philosophy as well as playing an important role in product / service development and *strategic* management (Level 4). A similar proportion (39%) reported design plays an important role throughout the development process (Level 3), while 16% used design in the more traditional sense to add *styling / aesthetic* touch or attractive packaging (Level 2). Overall, 80% of respondents were at the higher end (Levels 3 and 4) of the Design Maturity Ladder.

There were some differences between the response of FDI and indigenous companies with more indigenous companies reporting design as key at the higher level of company management and philosophy with 52% reporting this compared to 32% of FDI respondents. More FDI companies reported that design is important throughout the product / service development process with 49% reporting this compared to 39% of indigenous respondents.

Figure 21. How would you describe the role of design in your company? n=176³⁵



Sector analysis

A far greater proportion of Environment sector respondents (78%) described the role of design in their company at the highest level of maturity (i.e. being a key factor in the company management and philosophy). Food and drink (42%) and Services (38%) respondents were also more likely to be at this level. However, relative to other sectors, a substantial proportion of Food and drink (33%) and Services (25%) sector respondents placed themselves at Level 2 of the Design Maturity Ladder

³⁵ This chart only includes data from the respondents who reported undertaking design activity (see Figure 10)

(aesthetics and styling). As for the remaining sectors, a large proportion of Medical devices & pharmaceuticals (50%), ICT and Advanced manufacturing & engineering (both 46%) respondents reported that design plays a role throughout the development process in their companies.

Company size analysis

All large companies reported that design has some role to play in their product / service development activity. By contrast, 9% of small company respondents and 2% of medium and micro enterprises reported that design does not play any role in the development of their products / services.

Large companies mostly reported that design plays an important role throughout the development process (Level 3) with 55% of respondents reporting this compared to 30% of small companies and 37% of microenterprises. Smaller companies, on the other hand, were more likely to be at Level 1 of the maturity ladder with 47% of medium, 42% small, and 37% microenterprises reporting this compared to 35% of large enterprise respondents. Additionally, more of the small and microenterprises stated that design is used for styling / aesthetics purposes with 24% and 19% reporting this respectively compared to 9% and 10% of medium and large enterprises.

Employment growth characteristics

Companies who experienced employment growth were more likely to report that design plays a role in their product / service development process, with only 2% reporting design had no role in the process compared to 8% of companies that have not experienced employment growth in the past two years. The results also suggest that companies experiencing growth were more mature in their approach to design, and were more likely to exhibit strong design management and philosophies (42% vs 38%). Companies that have not experienced growth were slightly more likely to place themselves at Level 3 (41% vs 38%) while more companies experiencing growth used design to give products / services a stylish appearance (17% vs 13%).

Export growth characteristics

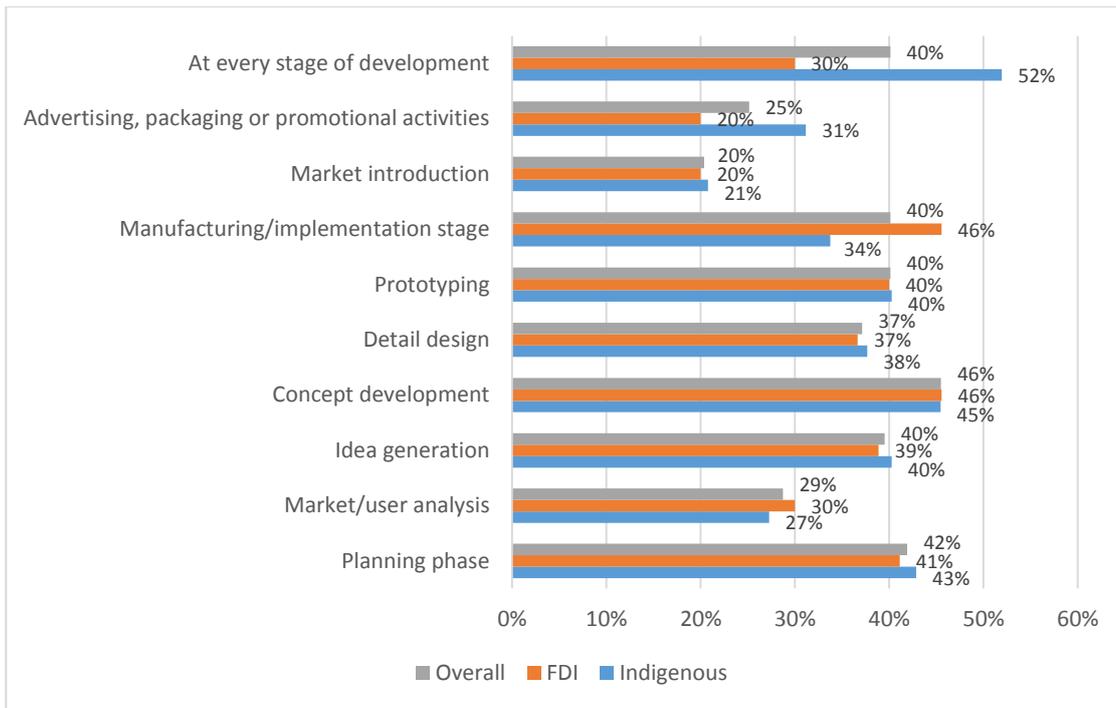
Companies experiencing growth in their export value in the last two years were higher in the design ladder with more exhibiting strong design management and philosophies (43% vs 36% of companies with no growth in export); and more reporting the importance of design throughout the design process (43% vs 41%). In addition, only 1% of company respondents experiencing growth in exports reported that design does not play any role in the development of products / services compared to 10% of company respondents experiencing no growth in exports. These results show a correlation between design maturity and higher exporting levels.

- **Most respondents used design at multiple stages of the product / service development process, from concept development to manufacturing / implementation**

Figure 22 suggests that a similar proportion of respondents used design in most stages of the product / service development process.

The concept development stage is where design was reported to be used most often (46% of respondents) while the manufacturing / implementation; prototyping; detail design; idea generation; and planning phase stages all had a design input for around 40% of respondents. The stages where design was used least include market introduction (20%); advertising, packaging and promotional activities (25%); and market / user analysis (29%) which again are associated with more traditional uses of design.

Figure 22. At which stages of the product / service development process does your company use design? n=167³⁶



Sector analysis

The main stages of the product / service development process where design was used by Medical devices & pharmaceuticals and Advanced manufacturing & engineering respondents was in the manufacturing / implementation stage (79% and 59% respectively). Design was used mostly by ICT respondents in the planning phase (63%) while it was used by most Services respondents in the concept development phase (51%). These results are consistent with the nature of design and innovation in such sectors. For example, medical device companies are product focused. Similarly ICT / software companies place significant emphasis on establishing the user experience and interface early on in the development process.

Company size analysis

The results suggest that large companies were more likely to use design at nearly every stage of the products / service development process; more so than their smaller counterparts.

In the manufacturing / implementation and prototyping stages, for example, 67% and 63% of large enterprises, respectively, reported using design compared to 25% and 36% of microenterprises; 31% of small companies in both stages; and 46% and 39% of medium companies respectively. In addition, large companies were far more likely to use design in the concept development (67% against 41% micro, 40% small, and 43% medium companies), idea generation (63% against 34% micro, 33% small, and 37% medium companies), planning phase (60% against 41% micro, 38% small, and 37% medium companies), and detail design (57% against 34% micro, 31% small, and 35% medium companies). The only exception was the advertising, packaging or promotional activities stage where microenterprises were more likely to use design (34% against 17% small, 28% medium, and 27% large companies).

³⁶ This chart only includes data from the respondents who reported undertaking design activity (see Figure 10)

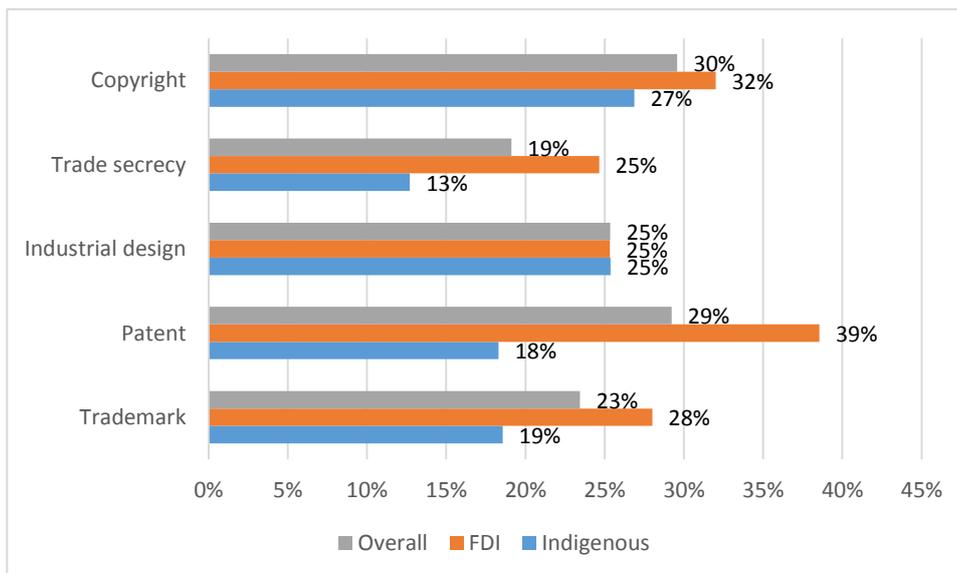
3.7 Design and IP

- **Almost half the respondents had developed at least one form of IP, with input from design, over the past two years**

Almost half of respondents (49%), overall, developed at least one form of IP with a design input in the last two years. Figure 23 shows that 30% had developed copyright IP, closely followed by 29% developing patents, 25% developing industrial design IP, 23% developing trademarks and 19% developing trade secrecy.

The figure also shows that FDI companies were more likely to develop IP with support from design. For example, 39% of FDI respondents developed patents compared to only 18% of indigenous companies. Also 28% developed trademarks and 25% developed trade secrecy compared to only 19% and 13% of indigenous respondents respectively.

Has your company developed any of the following forms of intellectual property (IP) in the past two years with input from design or a designer? n=172³⁷



Sector analysis

Most ICT survey respondents (52%) reported they had developed copyright in the past two years with input from design or a designer, while a large proportion of Medical devices & pharmaceuticals respondents (44%) and Advanced manufacturing & engineering respondents (40%) had developed patents. Some 41% of Advanced manufacturing & engineering respondents had also developed industrial design IP with input from design or a designer.

Company size analysis

Large and medium sized enterprises were far more likely to have developed the different forms of IP. Some 22% of large and 42% of medium sized enterprises have developed trademarks with a design input compared to only 16% and 17% of small and micro sized enterprises respectively. Similarly, 38% of large and 54% of medium enterprises developed new patents compared to 23% of small and just 8% of micro enterprises. Only 3% of microenterprises and 14% of small enterprises developed trade

³⁷ This chart only includes data from the respondents who reported undertaking design activity (see Figure 10)

secrecy compared to 39% of medium and 25% large enterprises. Finally, 41% of medium enterprises developed copyrights compared to around a quarter of large, small, and micro enterprises.

Employment growth characteristics

Companies that experienced employment growth were far more likely to have developed IP in the past two years with input from design or a designer. Some 42% of respondents experiencing growth developed copyrights compared to just 22% of non-growth companies. There is a similar pattern for developing trade secrecy (26% against 17%), industrial design (30% against 18%), patents (32% against 20%), and trademarks (26% against 19%).

- **15% of respondents received a design award in the past five years**

A total of 15% of respondents who responded to this question (n=171) reported they have received an award in the last five years for their design activity. Slightly more FDI companies had won an award with 18% compared to 12% of indigenous respondents.

Company size analysis

More than a quarter (26%) of medium enterprises as well as 17% of large enterprises had won a design award in the last five years compared to just 11% of micro and 8% of small enterprises.

3.8 Barriers to using design

- **Two thirds of respondents do not face any barriers to using design**

Excluding those reporting 'don't know', overall the vast majority of respondents (67%) who responded to this question (n=183) reported that they did not face any barriers to using design. However, the results do show that far more indigenous companies face these barriers (44%) compared to FDI respondents (23%).

Sector analysis

While most of the Food and drink sector respondents reported barriers to using design (62%), few other sectors reported barriers at a significant level.

Company size analysis

Smaller companies were slightly more likely to report barriers to using design with 39% of microenterprises reporting this compared to 33% of large company respondents.

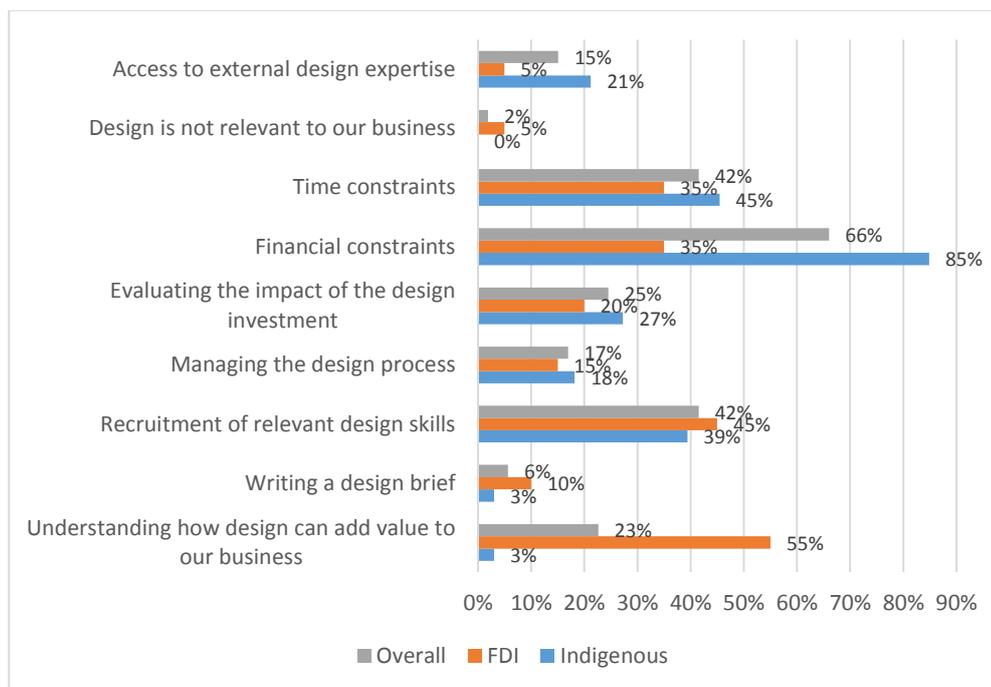
- **Of the companies reporting barriers (one third of respondents), financial constraints is an issue for around two thirds of respondents, while time constraints and recruitment are barriers for four out of ten respondents**

The main barrier reported by respondents overall was that of financial constraints with 66% of respondents who face barriers reporting this. This is followed by 42% of the respondents stating that both time constraints and recruitment of design skills were also barriers. Other barriers reported by a significant number of respondents include evaluating the impact of design investment (25%) and understanding how design adds value (23%).

Figure 24 also suggests differences in the barriers indigenous and FDI companies face. As might be expected, financial constraint was a much bigger barrier for indigenous respondents with 85% of those facing barriers reporting this (28 of 33 respondents) compared to only 35% of FDI companies (seven of 20). Having access to external design expertise was an issue for 21% of indigenous respondents that reported facing barriers (seven of 33) whereas it wasn't much of an issue for the corresponding FDI companies with only 5% reporting it as a barrier (one of 20). Conversely, understanding how design can add value to their business was an issue for most FDI respondents who faced barriers with 55% reporting this (11 of 20) compared to few indigenous respondents reporting the same (only 3% or one of 33 corresponding indigenous companies).

Other barriers reported by companies include high labour costs and planning restrictions. Two companies also reported a lack of corporate strategy with one reporting a resistance to innovate at corporate level which made the case for design difficult.

Figure 23. What are the main barriers? n=53³⁸



Several (3) respondents elaborated on the issue of financial constraints with one reporting they find it difficult to 'quantify the return on design investment for investors'. One of the smaller companies reported that although they value design and are very 'design conscious', it is 'difficult to commit resources' to it while another reported they would like to 'immerse design into operations' but require funds to do that. According to another respondent, design has an 'intangible' impact which means that companies are not always able to appreciate the value of design and are therefore reluctant to invest in it.

As for the barrier of recruiting design skills, one respondent suggested that there should be a closer partnership between business and colleges to give students practical experience to develop design

³⁸ This chart only includes data from the respondents who reported undertaking design activity (see Figure 10) and reported facing barriers in the previous question

skills. Another reported they've found it difficult to employ senior design staff in Ireland because of the 'extremely high personal tax' for well-paid individuals.

3.9 Role of the State in supporting design

- **Three quarters of all respondents (but particularly indigenous companies) believe there is a role for the state to support design activity**

Three quarters of respondents who responded to this question (n=179) reported they would value state support to help increase the use of design in their company. Indigenous companies exhibited strongest support, with some 88% of respondents reporting they would value state support. High levels of support were also evident in the FDI sector (66%).

Sector analysis

The vast majority of all sectors reported that state support would help to increase their use of design. Advanced manufacturing & engineering respondents were most likely to report this (83%) followed by Medical devices & pharmaceuticals (81%) and Environment (78%) sector respondents. Companies from the Services sector were least likely to report that state support would be useful, although the proportion stating that support would help was still high (66% of respondents).

Company size analysis

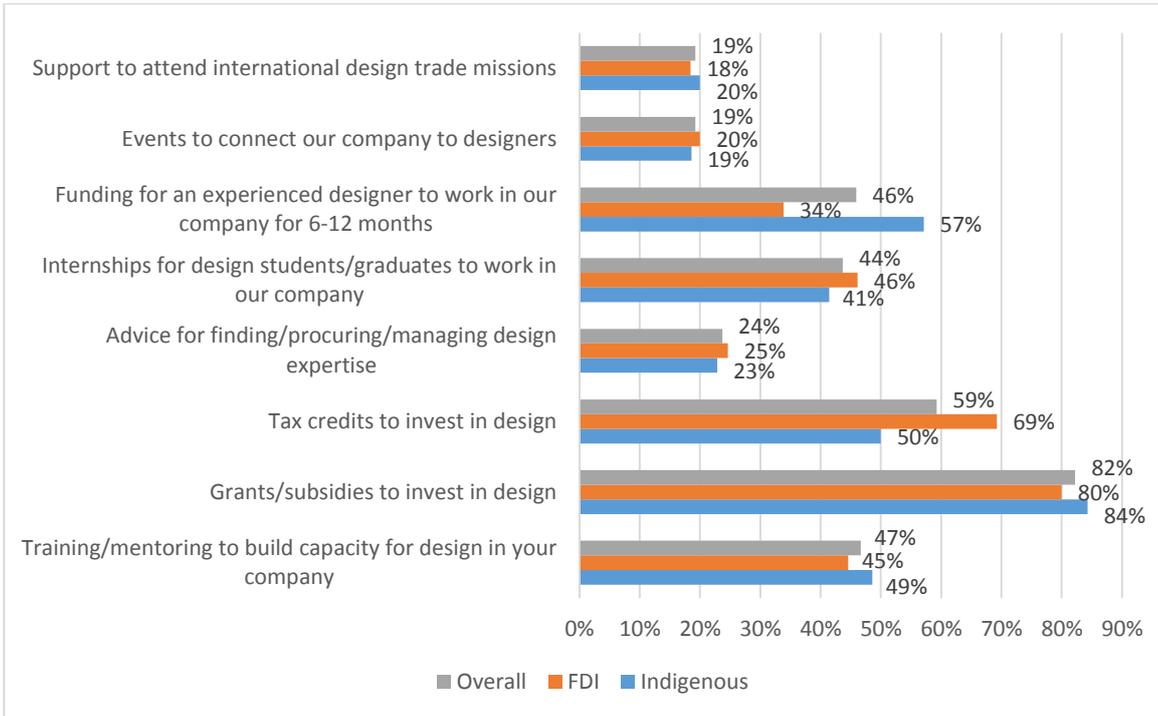
The vast majority of companies of all sizes reported that state support would increase their use of design. However, microenterprises were more likely to report this (83%) relative to large enterprises (71%).

- **Of those who believe there is a role for state support, the main types of support companies would value are financial in nature – tax credits, grants / subsidies etc.**

Figure 25 suggests that receiving support to deal with the costs of design is of most value to the companies. Of those who reported in the previous question that they believe there is a role for the state to support design activity, 82% reported they would value grants / subsidies and 59% would value having tax credits to invest in design. In addition, 46% reported that receiving funding support to pay for a designer on a 6-12 month contract would be useful. Just under half also reported that training / mentoring support (47%) and internships for design students / graduates to work in their company (44%) would increase their use of design.

In terms of the difference between FDI and indigenous responses, indigenous respondents valued having support for an experienced designer (57%) more than FDI companies (34%). FDI companies, on the other hand, value having tax credits more (69%) than the corresponding indigenous respondents (50%).

Figure 24. What type of support do you believe could best help your company to increase their use of design? n=135³⁹



Three companies reported that they already make use of state support to undertake their design activity with two reporting that R&D tax credits have encouraged their use of design, while another had made use of 'IDA grants'. According to one FDI company, R&D tax credits are a 'significant incentive for locating Product Development (and therefore design) in Ireland'.

Sector analysis

Advanced manufacturing & engineering respondents were most likely to report that grants / subsidies would best help their company to increase their use of design (92%), followed by ICT (86%), Services (82%), and Medical devices & pharmaceuticals (76%) respondents.

A high proportion (84%) of Medical devices & pharmaceuticals respondents would value tax credits to invest in design compared to less than half of Food and drink (33%) and Environment (43%) respondents reporting this. 76% of ICT respondents also reported they would value this.

Services sector respondents were slightly more likely than other sectors to value support to attend international design trade missions (30%). This can be compared to 20% or less in other sectors.

Company size analysis

Although the majority of companies of all sizes, who would value state support, reported that tax credits would help to increase their use of design, this was particularly important to large enterprises (82%) compared to 54%-57% of other size groups.

Medium sized enterprises reported, more frequently, that training / mentoring would help to increase their use of design (62%) compared to microenterprises (44%). Similarly, 57% of medium

³⁹ This chart only includes data from respondents who reported undertaking design activity (see Figure 10) and respondents who believe there is a role for the state to support design activity, as reported in the previous question

enterprises who believe there is a role for state support would value support in having internships for design students / graduates to work in their company compared to 41% of microenterprises.

Microenterprises valued the idea of receiving funding for an experienced designer on a 6-12 month contract more than the larger companies with 54% of respondents who value state support reporting this compared to 41% of large enterprises.

3.10 Summary

The findings from this section present a comprehensive picture of the role and importance of design in Irish companies working in sectors that may be regarded as non design-intensive. The results reflect the innovative nature of the company sample (drawn principally from the Enterprise Agency clients), indicating strong levels of design activity and an overall recognition of design's importance to companies competitiveness and innovation. This importance is defined principally as an activity in support of product / service development, rather than one of traditional notions of design such as aesthetics and styling. The results also show a strong link between the maturity of companies' design activities and those that report employment growth and exports growth.

Company characteristics, such as the size, sector and ownership influence companies' approaches to design activity and its overall importance. In broad terms, for example, large companies tend to use design more actively than smaller and micro enterprises. Sectors generally share a similar profile with respect to design activity. The main exception is the Food and drink sector which tends to have a stronger focus on using external design expertise, and is the most likely sector to define design in relation to styling and aesthetics.

4 Research findings: the role and importance of design

This section of the report draws together the main conclusions from the research based on the evidence presented on agency-client businesses in earlier sections, as well as evidence from the case studies (see Annex 3). The findings are drawn from a cohort of agency-client businesses- and the majority of these firms were found to be innovative and engage in design activity. In this respect the research does not report on the full population of firms in the non-design intensive sectors in Ireland, but on a sub-sector of companies in these sectors: that are agency-client firms, that are innovative and that are active in design. This offers the potential of understanding how such firms engage with design, and to understand the opportunities for the wider base of firms in the non-design intensive sectors (that may not active in design).

The results of the research are structured into a number of key research findings, which provide a picture of design's role and importance in agency-client businesses in Ireland:

- The multidimensional role of design
- The role of design in the process of developing products / services
- Organising for design
- Maturity in design activity: benchmarking Irish-based companies
- Impacts from design
- Barriers and potential role for the state

4.1 The multidimensional role of design in business

- **Agency-client companies in the non design-intensive sectors in Ireland demonstrate a high rate of engagement in design which spans multiple business activities and modes and levels of engagement. The evidence indicates the variety of roles that design plays in these firms and the many perspectives companies have on the importance of design.**

The results of the research survey indicate that agency-client companies in the non design-intensive sectors that responded to the survey engage in design (94% of respondents). While the majority of these companies see design either as a process of product / service development or an enabler of innovation and competitiveness, there were others that also see its importance in the form and function of products. The result of these different conceptions of design is that companies tend to manage design through multiple configurations, reflecting design's multi-dimensional nature.

The companies in the study tend to undertake design activity internally, with activity and spend spread across a range of business areas and business functions. This includes a broad range of internal design activities reported, including: industrial / engineering design, communication / digital / web / software design and service / user design. Companies also make use of external design expertise, particularly where they lack design capacity,

Horseware Ireland produce product ranges for horses and riders including horse rugs and clothing. The company have traditionally sought to improve existing designs through a holistic design perspective. With a dedicated team of five staff with a fashion design background to look after the clothing range, and an R&D team of four staff, the company use design to develop and refresh its products for horses and riders. Having a sizeable manufacturing operation in-house also enables the company to maintain a process design focus. For example, the company recently designed a new material handling system by adapting a system from the automotive industry to handle numerous different products at once. Additionally, design is also used in the marketing of Horseware's products including the design of packaging, leaflets, and point of sale display equipment for its network of retailers.

or require specialist skills. The Climote case study is illustrative of this, with the company initially commissioning an external design consultant, before recruiting a specialist designer for subsequent new product development activities. For the most part, however, companies in both the survey and case studies treated design as both an internal and external activity.

The multidimensional nature of design is further reflected in the diverse range of activities undertaken by employees with a design role. The primary business area of employment with a design role, for example, is the product / service development function and specific in-house design functions (see 4.2 below for more details). Other, less common, areas of design spending include business development, marketing and communication. Spending in the latter area is, however, identified in case study services companies such as PWC (via its provision of communications and marketing services), and in companies such as Irish Distillers (through their graphic and digital promotions, packaging, exhibitions etc.) This points to the role of design at different parts of the business.

4.2 The important role of design in developing products / services

- **For agency-client firms in the non-design intensive sectors, the role of design as an element of the product / service development process is considered particularly important, with design being employed across multiple stages of the product / service development continuum from concept to implementation.**

The findings from the research indicate that the role of design was most evident in the innovation and R&D process. In this respect design is clearly viewed as a key component within the R&D process, helping to add value to innovation and new product / service development. It was also reflected in the importance that companies assign to design and their spending and employment in the area of design in new product / service development activities.

The majority of companies in the research reported that they have introduced products / services with the aid of design in the past two years. This is reflected in the fact that the majority of companies allocated design costs to this to this area. Indeed,

Nypro Healthcare, Bray, manufacture and develop inhalers and epipens for the healthcare market. While initially established as a manufacturing operation it has, in recent years, begun to develop its design capability in house. This capacity provides synergies with existing manufacturing activity, helping to ensure that product prototypes are ready (tolerances etc.) for the manufacturing process. The company has been able to establish closer relationships with customers by offering this capacity, and expanding the scope of its offer.

almost all of these companies maintain that design is an important part across the different stages of the product / service development process, and not simply the final phases. For example, IBM, Horseware and Intel report design activity as being pervasive across their companies' product development activities and in other business areas such as marketing). This illustrates design's cross-cutting role within the innovation process, and challenges traditional conceptions of design as only being relevant to later stage styling and aesthetic inputs.

Case studies show important sectoral differences in the way that companies undertake product / services development, particularly between services and manufacturing cases. Here, services cases such as PWC and DAA International highlight the important role of user research in identifying needs and shaping service development, and of marketing / communications in helping to share internal and external projects.

In many instances the traditional distinction between product and service development is blurring. The case of Rockbrook Engineering, with the company's strong focus on systems integration provision, illustrates how design can be relevant to different activities, and at the forefront of new bespoke solutions development.

The role of design in the product and service development process can also be seen in the input of design to IP. Here the research indicates that around a half of companies have secured forms of IP protection with input from design or a designer. This highlights the contribution of design to the R&D process and the ability of companies to protect IP. These results contrast with a commonly held view that design is difficult to 'pin down', and suggest that companies are able to utilise design inputs and able to codify the results in a way that is suitable to protect their IP.

Rockbrook Engineering is Ireland's largest systems integrator of open protocol technologies. There are two sides to the business: industrial control solutions, which encompass industrial automation and building technology; and audio visual solutions, covering exhibition design, the graphic content and the actual control systems and installation themselves. Design is critical in developing solutions in both activity areas, with the design of content for the audio visual solutions and detailed engineering design for the industrial control projects. Additionally, around 80% of the company's contracts relate to bespoke solutions. These require design input to provide solutions that have different emphases and meet unique requirements. Tailoring solutions in this way through the company's modular approach to system design is key to the development of Rockbrook Engineering's services.

4.3 Organisation for design

- **Design, in Ireland's agency-client companies in the non design-intensive sectors, is characterised by high level strategic commitment, development of internal design capacity, collaboration with external partners in the third level sector, and selective use of external design services.**

Design was discussed at a high level in the majority of businesses surveyed. This included board members, and senior management staff with a specific remit or responsibility for design (although this is most commonly found in indigenous companies).

For the most part design activity is undertaken internally, either in an in-house design function, or spread across a wider range of business functions. In-house design can take different forms, ranging from individuals, dedicated design functions, or other business units as dedicated in-house design functions (for example companies such as Cygnum Timber Frame and Nypro Healthcare report specialist teams with responsibility for design, supporting other business functions). Many also spread design activity across different business functions such as product or service development, Marketing / Communications and Business development function (for example, PWC view design as part of the business development / service provision and marketing processes).

Companies in the Services sector appear to be far more likely to employ staff with a design role in the marketing / communications department while most of the other sectors were more likely to employ design staff in the product / service development department. This, again, is a reflection of the wider

concept of design identified in section 4.1 above, and further illustrates the continuum of design activities ranging from R&D through to more traditional concerns such as marketing and promotion. In this respect the results point to the use of design both at the beginning (user needs, R&D) and the end of the product / service development process (marketing and promotion).

Companies, on the whole, believe that it is better to recruit and build design capacity internally than it is to use contractors. This appears to be principally linked to reasons of control, cost containment and business understanding. Despite this the research does reveal that for some companies external expertise can be important (especially in the Food and drink sector). For example, the evidence from the case studies highlights a number of instances where the use of an external design agency has been central to the success of a project (for example Climote's use of an external designer for its initial product). This use of external expertise can be particularly valuable in companies new to design (whose design capacity is limited), and those not wishing to recruit specialised but infrequently used skills such as architects, software products, regulatory support.

Climote, Letterkenny, is a manufacturer of home heating automation products. As a new entrant into manufacturing the company sought the expertise of an external design house. This enabled it to develop its first product – the Climote smart heating thermostat. The company was quick to recognise the importance of design in its sector and has subsequently recruited a designer to develop its new generation of heating automation products.

While the use of external design expertise (contracted) was comparatively low, evidence from the survey and case studies suggests that a substantial number of companies have engaged in design collaboration to complement their internal design activity. This includes collaboration with other partners such as companies (e.g. suppliers, customers, networking etc.) and third level institutions / public research institutes. This collaboration was illustrated in the case studies. The

Aerogen, headquartered in Galway, manufactures and delivers aerosol drug delivery devices. The company employ respiratory consultants in an in-house clinical science department to undertake the product and process design activity. In addition to their internal design capacity, Aerogen also make extensive use of external centres of excellence including leading Irish universities and those overseas such as Stanford.

Aerogen case study, for example, indicates the use of sources of research both within Ireland and internationally, to ensure its designs meet the exacting cost requirements of clients and regulations in the healthcare sector. Elsewhere, Alps Electric has also drawn on expertise from the university sector in recent years to assist in the testing of concept feasibility and development of products.

The case studies point to the broad range of skills of design staff including product engineers, software engineers, graphic designers, architects etc. Results from the survey also confirmed that design activity was spread across a number of functions, with 'industrial design / engineering' representing the most important area of internal spending, and 'Communication, digital and web design' the most important area of external design activity.

The range of these activities, and associated skills, is understandably linked to sectoral characteristics, with design engineers typically found in the Advanced manufacturing & engineering and Medical devices & pharmaceuticals sectors, software engineers in the ICT sector and so on. The diverse spread of skills and activities, however, also emphasises the broad and multidimensional nature of the design processes and competences required by staff.

Most in-house design teams are small in size, however, the case studies also provide evidence of companies developing significant strategic capacity in Ireland (for example, IBM has made a significant investment in its design capacity in Ireland, creating a design studio in Dublin as part of a global network of such studios). The importance of such capacity is not solely in scale but their role in delivering services and disseminating design across business functions.

IBM Ireland is part of a global integrated technology and consulting company, with offices in Dublin. The IBM Design Division was created in 2012 to embed design thinking in all aspects of IBM activities, with Design camps provided for staff at all levels and in all business functions to instil design thinking. Thirty five designers are currently employed by the company in Ireland and IBM have a strategic aim to achieve a ratio of one designer per sixteen engineers. In addition, the company aim to employ 1,000 additional design employees globally in the next five years.

4.4 Maturity in design activity: benchmarking Irish-based companies

- **Agency-client companies in Ireland, in the non design-intensive sectors, tend to adopt a mature approach to design, viewing it as either key to product / service functionality or wider strategy. This contrasts with Ireland's wider business base (and internationally), which report lower levels of design maturity.**

In line with other studies the research presents evidence on the maturity of design in businesses. The results suggest that agency-client firms in Ireland, exhibit a highly mature approach to design, with more than four in every ten companies indicating that design was a strategic concern (level 4 of the design ladder) within the business (see, for example, the IBM, Horseware and Cygnum case studies that illustrate businesses with strong levels of business design maturity).

A similarly high proportion of businesses maintain that design is key to their business's processes and functionality (level 3 of the ladder) and only relatively few companies indicate that it is only of concern to product aesthetics and styling (level 2 of the ladder). Indeed, some case studies, such as Irish Distillers, reported that while they primarily see design as a process of product styling / branding and communication, they recognised they would need to expand their design thinking to other business activities in future. This again, is consistent with the importance assigned to design, and its role in innovation and competitiveness.

The maturity of design within the companies does, however, appear to vary according to ownership characteristics with more indigenous companies reporting design is key to their companies' strategy, compared to FDI companies reporting design being important to the development of functionality in products / services.

Cygnum Timber Frame is a leading Irish manufacturer of timber frames. Design is key in developing timber structures for their clients. The company's Design unit includes a team of 15 designers. Design is key to the company's strategy with all activities dependent on internal design capacity. The company manages its design activities weekly through meetings of all departments, and monitors design expenditure through measures such as the level of design cost per unit manufactured.

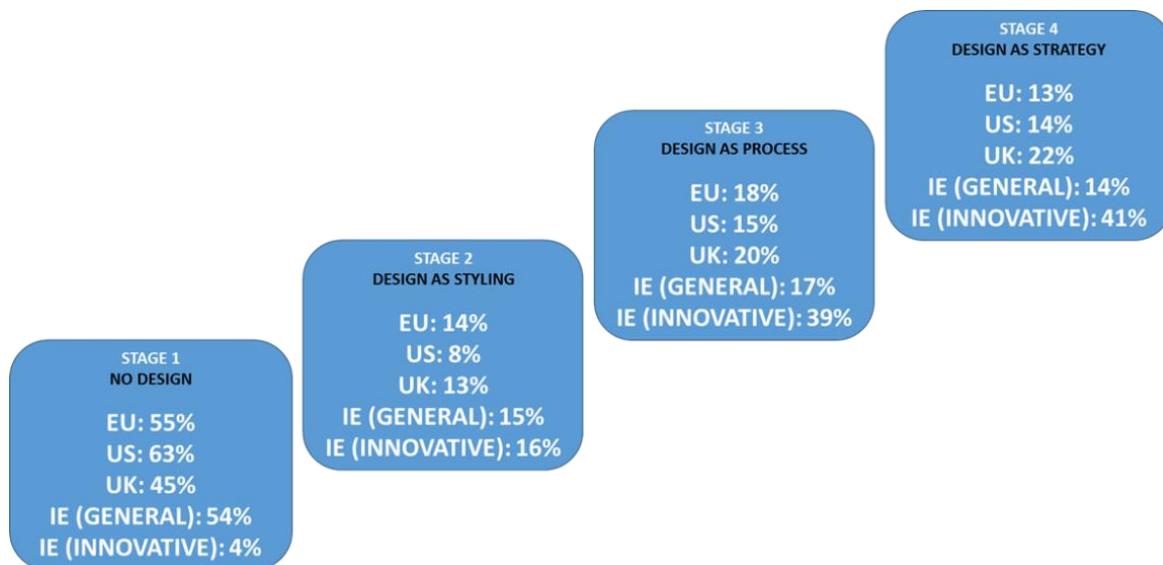
While a strong degree of design maturity is found in the agency-client companies discussed in this research there is also evidence that the wider base of businesses in Ireland is less design mature.

Figure 26 provides comparative data from a recent (2015) European ‘Innobarometer’ survey based on the general business population of all Member States. This data suggests that the agency-client sample of businesses in the study are significantly more design active than Ireland’s ‘general’ business population and most other international benchmarks. Indeed the agency-client businesses in the sample are more mature than the leading international performers such as the UK.

The high level of maturity identified in this study sample is some way above that of the Innobarometer findings. This reflects the sampling approach adopted – businesses that were more likely to be innovative were contacted (agency-client firms). The higher level of design maturity is also likely to be linked to the tendency for design active companies to self-select for such surveys. This self-selection was less likely to be found in the Innobarometer survey, as its focus was more broadly on innovation, with questions regarding design activity set within a wider set of questions and research investigation. This issue is explored further in section 5.

Taken together, these factors illustrate why the survey findings in this study are comparatively more design intensive than the general Irish population.

Figure 25. International design maturity benchmarks⁴⁰



Many companies featured in the research were able to report their future intention to increase spending on design further emphasising the importance of design. Here a majority of survey respondents stated that they intend to increase their spending on design. This evidence highlights the potential for design capacity to be strengthened in Ireland in the coming years.

⁴⁰ % figures refer to the responses of companies from separate surveys in the EU, US, UK and Ireland (general), plus results of the CMI survey (Innovative).

4.5 Impacts from design

- **The economic impacts of design are evident in its role in generating and safeguarding business activity in agency-client firms. Strong links between design and employment growth are evident.**

While the study results do not seek to provide a comprehensive assessment of the economic impact of design, it does present evidence which highlights design's role as an enabler of competitiveness and innovation in Ireland. The precise role of design in supporting economic competitiveness can be seen in case studies, where several companies reported that design was central to their ability to sustain operations within Ireland. Alongside this the role of design in contributing towards new/improved products, processes and services, and supporting innovation was similarly evident. Indeed, these findings point to the overall importance of design in generating new business activity, safeguarding existing activities, and supporting customer satisfaction. It is also seen as important for business reputation.

While a number of case studies indicated that it is often difficult to separate out the role of design in the overall impact of the company. There is some evidence of the importance of design in employment terms with the analysis pointing to positive links between employment growth and:

- Design activity
- Spending on design
- Design maturity
- Design collaboration
- Development of IP with input from design or a designer

Case study evidence further supports the role of design in producing economic impacts with companies reporting sales increases resulting from design activity. Together these findings indicate that design plays an important role both with respect to businesses' own competitiveness and that of the wider Irish economy. Indeed by supporting impacts such as innovation and jobs, design has a key role in contributing towards key national strategic priorities.

4.6 Barriers and potential role for the state

- **Few agency-client companies in non design-intensive sectors in Ireland report significant barriers to using design in their business. Of those barriers identified the primary barriers are the availability of time and finance, and the difficulty in making the case for design activity internally.**

The key barriers to the use of design are linked to company ownership characteristics. In this respect the main barrier to design reported by indigenous companies is finance and time constraints (see Rockbrook Engineering case study which highlights the competing priorities within the business). In contrast the main barrier reported by FDI companies is 'understanding how design can add value to the business'. In both cases, however, it should be noted that few companies reported such barriers.

Relatively few companies cited difficulties in accessing external expertise as a particular barrier to the use of design. This may reflect the 'mature' approach adopted

Irish Distillers Group was formed following the merger of John Jameson & Sons, Powers & Sons and the Cork Distillery. The company are currently exploring the possibility of making design a core element of the brand strategy but there needs to be 'an organisational mind-set shift'. In this respect, understanding how design can add value has been a barrier.

Recruitment of relevant design skills is also a barrier as there is a shortage of experienced strategic designers: 'there is a lot of talented designers, but not many who could bring a strategic business dimension to the table'.

to design by many of the companies in the research. The use of external design by companies new to design / micro enterprises, may illustrate that such external support may be more important in the general business population.

In making the business case for companies to use design the research reveals the interlinked nature of the barriers faced by companies. Here factors such as time and money, recruitment of relevant design skills, and to a lesser extent access to external expertise, are likely to be at the heart of what makes it difficult to make an effective case. This, however, may be contrasted against the more general findings of the survey that the majority of companies believe design has a key role in supporting company profitability, customer satisfaction and wider business reputation.

A high proportion of companies in this research believe that there is a role for the state to support design activity. The majority of companies surveyed favour public supports that are financial in nature – tax credits, grants / subsidies etc. (particularly indigenous companies). This is a typical response to such questions when identifying support needs.

Other potential roles for the state identified include training, recruitment and capacity building actions (indigenous and FDI). For example, just under half of companies in the survey would value a design graduate or student internship or funding for an experienced designer to work on placement within the company. The Cygnum Timber Frame case study shows that recruiting designers with the right skills can be a major barrier for companies as graduates with the appropriate skills are ‘quite scarce in Ireland and tend to choose to work in other sectors’. The company suggested the solution is to introduce apprenticeship schemes, more promotion of the sector and more design courses in universities in general.

There is, however, mixed evidence on the precise role of the state in addressing skills deficits, with comparatively few companies identifying this as an issue. Indeed this may be a particularly important sectoral issue, with design skills shortages most evident in the Medical devices & pharmaceuticals sector. This point was evident in the Nypro Healthcare case study where a shortage was reported in system engineering skills in the Medical devices & pharmaceuticals sector.

Through discussion at the stakeholder workshop held to discuss the research findings, confirmation was provided of the importance of skills development to both the design intensive and non design-intensive sectors. In particular, the workshop revealed a perception that career paths for designers were insufficiently well developed. This, it was felt, was hindered by issues such as underdeveloped linkages between the education sector and designers, the wide-ranging definitions of design, and weak career structures and pathways for designers.

4.7 Summary

The findings from this section illustrate the role of design based on the survey and case study interviews and workshop. They highlight the strategic importance of design to business competitiveness, and within the innovation and R&D process specifically. They also indicate that design has multiple roles within companies, and that these stretch beyond traditional concept of styling and aesthetics.

In terms of managing design activity, the evidence shows that design is undertaken internally for the most part, but it is commonplace for companies to engage in design collaboration in order to complement their activity. The results also indicate that design maturity is growing with eight out of ten survey respondents indicating that design was a strategic concern within the business (level 4) or maintain that design is key to their business’s processes and function (level 3).

Key barriers expressed to the use of design are financial and time constraints as well as 'understanding how design can add value to the businesses. Companies believe there is a role for the state to support design, with the principal areas being: business finance and capacity building actions, and skills development.

The summary findings noted above have important nuances according to company characteristics and businesses and sectors. These are discussed below with findings by ownership, size and sector considered separately:

Summary findings by ownership

- **FDI and indigenous agency-client companies demonstrate high levels of design activity, with evidence that it is important to competitiveness and wider innovation activity.**
 - Both FDI and indigenous agency-client companies define design as an enabler of innovation and competitiveness, and key to product / service development. Comparatively few companies view design in the traditional sense of styling and aesthetics.
 - Both FDI and indigenous agency-client companies discuss design at the board level. Indigenous companies, however, are far more likely to have a board member(s) and staff with a specific remit for design. FDI companies, however, were more likely to spread design activity across other business functions and generally had larger design capacity (in terms of design employees and investment).
 - The majority of agency-client FDI and indigenous companies are at the higher levels of the Design Maturity Ladder. Indigenous companies, however, are far more likely to undertake design at a strategic level, relative to FDI companies – who generally see functionality as the main priority for design.
 - Comparatively few FDI and indigenous agency-client companies face barriers to using design (although more indigenous companies report barriers). Of those reporting barriers, indigenous companies cite finance as the main barrier, while understanding, at a corporate level, how design can add value is the main barrier for FDI companies.
 - The majority of FDI and indigenous agency-client companies believe there is a role for the state in increasing the use of design. Financial measures (grants / subsidies and tax credits) are identified as the most important areas for state support.

Summary findings by sector

- **While the majority of sectors are design active there are subtle differences in the approaches adopted. Agency-client companies in the Services sector, for example, have a comparatively stronger focus on design as a process of styling and aesthetics, and agency-client companies in the Food and drink sector have a strong focus on external design expertise.**
 - In all sectors design is defined as a process of product / service development, or an enabler of innovation. Agency-client companies in the Services sector, however are least likely to define design in these terms, and are more likely to define design as a process of styling and aesthetics.
 - Design is primarily managed through companies' in house design function across most sectors, with Food and drink companies as the exception. Medical devices and pharmaceuticals are more likely to spread design activity across other business functions; and Food and drink companies are more likely to use external design consultants. Most

sectors collaborate in their design activity, with the exception of companies in the Food and drink and Environment sectors.

- Most sectors are at the higher level of the Design Maturity Ladder (with the Environment sector reporting the highest level of maturity). The Service sector and Food and drink sector, however, are more likely to have companies at the lower levels of the Design Maturity Ladder (level 2 -styling and aesthetics).
- The majority of agency-client businesses that responded to the survey do not report barriers to design activity, with the exception of the Food and drink sector. All sectors would value State support.

Summary findings by size

- **Agency-client companies of all sizes report design as being key to product / service development, and the existence of in-house design function. Large companies, however, are more likely to spread design activity across several business functions.**
 - Agency-client companies of all sizes view design as being central to their product / service development process. Smaller companies are more likely to associate design with the traditional definition of styling and aesthetics while larger companies are more likely to view it as part of their company's innovation and competitiveness.
 - The majority of agency-client companies in all size groups are likely to have an in-house design function. Large companies, however, are more likely to spread their design activity across other business functions, and collaborate with third level institutions.
 - Agency-client companies in all size groups tend to be at the upper levels of the Design Maturity Ladder. The majority of large companies, however, are at level 3 (functionality).
 - The majority of agency-client firms across all size groups do not face barriers to using design, but would value grants, subsidies and tax credit support from the State.

5 Opportunities for developing the role and importance of design in Irish enterprises

The evidence presented in this report is that there is strong agreement amongst companies that design is key to Irish competitiveness and innovation, customer satisfaction and important to Ireland's businesses reputation. These findings are broadly consistent across companies of different size, sector and ownership. There is also evidence that companies are backing their views on the importance of design with existing and future investment plans. This points to the growing future importance of design and potential strengthening of capacity.

The final section of the report draws out some potential implications for public policy arising from the research. In examining the implications evidence is drawn from the full range of research activities undertaken.

5.1 The nature and scale of the opportunity

In broad terms the implications from this research are that while Ireland has a group of agency-client businesses performing strongly in relation to design activity and capacity, these businesses are likely to be in advance of the wider Irish business base. The majority of the companies in this research, for example, are experienced in conducting R&D and innovation and use design as part of their efforts to secure competitiveness and strategic differentiation from their competitors, and represent the leading edge of design active companies.

The challenges revealed by the research findings are to:

- i. Raise the level of design activity within the wider non design-intensive business base of Ireland, and;
- ii. Strengthen the elements of the existing non design-intensive business base that are already actively using design within their companies

The opportunity associated with the first challenge is that if Ireland can grow the maturity of design within businesses in the general business population it holds the potential for contributing to improved innovation, competitiveness, profitability and so on. Likewise with the second challenge, the opportunity is one of adding value to those businesses in the non design-intensive sectors that might already be using design, by helping them to maintain their design activity, to translate this into competitiveness benefits, and to share good practices with those in the wider business base.

5.2 Potential areas for development of design in Ireland

The findings from the research and associated workshop indicate that companies believe there is a role for greater support of design activity in Irish businesses. The analysis and findings (and confirmed by the subsequent workshop) point towards a number of potential areas for development:

Raising awareness of the nature and importance of design in Ireland

The findings of the research point towards the multidimensional nature of design, with evidence that some companies may lack sufficient evidence regarding the potential benefits to businesses in the non design-intensive sector. These findings were supported by the workshop participants and a number of survey respondents, and points to a potential role for the ecosystem in providing evidence on both the economic benefits and wider social benefits that can be gained from promoting design and incorporating user and societal needs.

Reviewing existing supports to identify their ability to further encourage design activity and capacity in Ireland

The results of the research indicate that design is an important element of the wider R&D and innovation process of companies. Here, companies believe that design offers the opportunity for them to take better account of factors such as customer needs and experiences earlier on in the innovation process (rather than being left to the end of this process, when styling or aesthetic decisions are being taken). The integrated nature of design indicates that there is potential to examine whether existing R&D and design supports can be better adapted in areas such as tax credits, grants / subsidies, training and related HR supports. The recent piloting of the Design Innovation Vouchers illustrates how lessons may be learnt from better integrating design into existing innovation supports, and suggests that rather than complicating the support landscape further, it may be better to include design in pre-existing support mechanisms where appropriate.

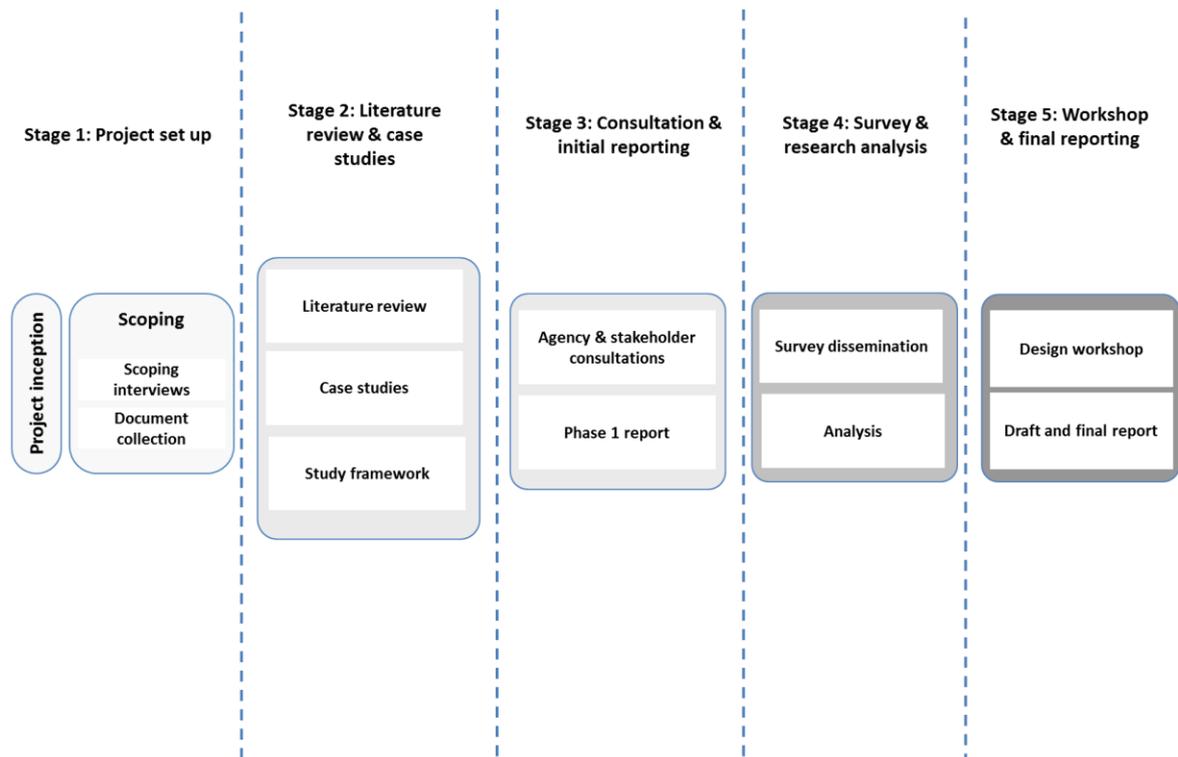
Annexes

Annex 1. Study methodology

The study was based around five work stages and includes a detailed literature review of design and its role and importance in firms and their competitiveness, company case studies, and a survey of companies in the non design-intensive sectors in Ireland.

The study was structured according to five main research stages, as set out below.

Methodological stages



The study approach included two main reporting stages, with a 'phase 1' report produced after stages 1-3; and a final report at the end of stage 5.

This approach is described in more detail below:

Stage 1: Project set up

The project set-up began with an inception meeting with key stakeholders. This included discussions with DJEI project staff, as well as the project Steering Group. At this meeting the proposed methodology was discussed and agreed, including key stakeholders and suggested focus sectors.

Following this meeting a series of scoping interviews were undertaken with stakeholders. The objective of these meetings was to explore key issues for the study and secure support for the case study and survey elements of the study (see Stage 3 and 4 for more detail).

Stage 2: Literature review and case studies

In parallel to the project set-up activities a literature review of design and its role and importance was undertaken. This considered existing reports and data sources, and identified definitions and typologies of design activity within business. A review of existing surveys was undertaken to inform the survey being undertaken in Stage 3. By reviewing existing surveys the intention was to allow for benchmarking of design activity of firms in Ireland with design activity of firms in other countries.

While the literature review sought to examine the role and importance of design from a sector perspective, the results found comparatively few studies in this area. The main sector perspectives in this study are therefore taken from the fieldwork undertaken (case studies and survey).

Sampling of companies was taken in a number of stages. Stakeholders were initially asked (see stage 3) to suggest, from the perspective of their organisation’s client base, companies that were likely to be active in design (in the non design-intensive sector). Based on the responses a long list of 60 potential case studies was identified. Following initial research these companies were allocated by sector and companies contacted for interview using an agreed interview schedule / case study template. Care was taken in the final selection of case study interviews to ensure balanced representation from the six broad sectors, and IDA and EI’s client base.

Case study interviews were carried out with the following companies, with key results set out in Annex 3.

Case study selection

Sector	Case study interviews
Food and drink	Irish Distillers
Advanced manufacturing and engineering	Rockbrook Engineering Horsewear Ireland
Medical devices and pharmaceuticals	Aerogen Nypro
ICT and software	Alps Electric IBM Intel
Environment	Climote Cygnum
Services	DAA International PwC

The goal of the case study interviews was to collect rich data from companies on the position of design within the business processes, use of external design services, attitudes and results achieved (where appropriate). This focused on ‘teasing out’ different sector, size and ownership factors influencing the role and importance of design, and subsequent benefits, and informing the development of the analysis framework for the study and the survey tool, alongside the results of the earlier literature review.

Stage 3: Consultation and initial reporting

This stage included a series of stakeholder interviews. In many cases such interviews were conducted alongside the scoping discussions noted in Stage 1. The goal of the interviews was to examine stakeholder perspectives on the role and importance of design in Irish non

design-intensive sectors, and the impact of size and ownership on these trends, and to discuss potential case studies and survey support.

Stakeholder consultations were undertaken with the following:

- Eugene Ford (Department of Jobs, Enterprise and Innovation)
- Neil Cooney / Paula Maguire (Enterprise Ireland)
- Michael Lohan (IDA Ireland)
- Sharon Higgins (IBEC)
- Karen Hennessy (ID 2015 / Design and Craft Council of Ireland)
- Ger Craddock (Centre for Excellence in Universal Design)

The results of the literature review, case studies and emerging research framework were subsequently reported in a Phase 1 report to the Steering Group.

Stage 4: Survey and research analysis

The survey was designed to examine different aspects of the role and importance of design in non design-intensive businesses. It was informed by the findings of the literature review, and the case study research.

The goal of the survey was to collect largely quantitative data from companies in the target sectors. It was disseminated as an electronic survey by selected stakeholders (IDA, EI, IBEC, a number of Local Enterprise Offices (LEOs), and Engineers Ireland), and supported by reminders. A full version of the survey can be found in Annex 4.

Agency client lists were the primary source list for the companies surveyed. As anticipated, there was a tendency for companies active in design to respond to the survey, with comparatively few companies reporting that they did not undertake design activity.

Some 216 useable responses were achieved, representing a circa 16% response rate (see section 3 for full details of the sample).

The survey data was analysed according to overall responses and also according to firm size, sector and ownership. It should be noted that survey results are estimations, with the percentage responses varying within so-called confidence limits. Based on the response rate of 216 and a population of 1,371 companies, the indicative confidence level is + / - 6.12%. That is, if 216 companies responded to a survey and 50% said that design was important to their business, it could be said that with 95% confidence that the true proportion, within the total population (of all companies in the surveyed population) was between 43.88% and 56.12%. – i.e. +/- 6.12%.

The survey and case study data was considered within the structure of the analysis framework and a set of draft key findings were subsequently developed based on the evidence collected.

Stage 5: Workshop and final reporting

A first draft of these findings was presented to the project Steering Group (5th November 2015), and discussed with stakeholders at a facilitated workshop (16th November 2015). The half day workshop engaged a diverse range of stakeholders – policy-makers, SMEs, industry representative bodies, designers and academics – to jointly examine the challenges facing non design-intensive sectors in using design. At the event the stakeholders were asked to give feedback on the findings and to provide inputs on the opportunities for job creation and enterprise more broadly in design.

The input from the study Steering Group and workshop stakeholders was considered in finalising the findings presented in this report.

Annex 2: Selection of non design-intensive sectors in Ireland

The sectors selected for this study are both strategically and economically important to Ireland. They exclude the specialist design sector and are sectors where non design-intensive businesses are likely to be found.

The following table summarises the key sectors and associated sub-sectors. Supporting rationale is provided in the form of strategic statements and economic evidence supporting the selection. It should be noted that the economic data sources are typically from secondary sources, reflecting the difficulty of identifying sector boundaries within official Central Statistics Office (CSO) datasets.

The sectors have been used in the study as the basis for identifying case study companies, and to act as a guide to the dissemination of the survey by the enterprise agencies.

In each sector the companies selected for interview and to which the survey was disseminated were drawn primarily from agency client lists.

Sector selection rationale

High level sectors	Indicative sub sector	Selection rationale
Food and drink	Food Drink	<p>The sector is at the heart of the Government strategy 'Food Harvest 2020'⁴¹. This provides a framework for the development of the sector, and suggests that Agri-food, fisheries and forestry represent Ireland's largest indigenous industry, employing some 150,000 people, with an annual output of over €24 billion.</p> <p>The sector is highlighted as a high growth and strategically important sector in the Action Plan for Jobs 2015</p> <p>The agri-food and drink sector accounts for 7.7%</p>

⁴¹ <http://www.agriculture.gov.ie/agri-foodindustry/foodharvest2020/>

		of Ireland's economy-wide GVA, 12.7% of Ireland's exports and 8.4% of total employment ⁴² . In 2014, Irish agri-food and drink exports increased by an estimated 4% to approximately €10.5 billion ⁴³ .
Advanced manufacturing and engineering	Automotive and aerospace Agricultural machinery Materials handling	Advanced manufacturing and engineering represents a key sector for Ireland's economy, including many sub-sector prioritised by both IDA and Enterprise Ireland. It is highly diverse and includes both large and small companies. The Action Plan for Jobs 2015 sets a target of creating 13,800 annual science, technology, engineering and maths graduates by 2018 (up from 10,200 in 2011). ⁴⁴ Elsewhere, a 'National Step Change in Manufacturing' initiative was launched in 2014, designed to 'help place Ireland's manufacturing sector at the forefront internationally and: improve competitiveness, productivity and innovation; improve connections to the customer and expansions into new markets; and to engage in new ways of working' ⁴⁵ .

⁴² DAFM (2014) 'Annual Review and Outlook for Agriculture, Food and the Marine'. Available at: <http://www.agriculture.gov.ie/media/migration/publications/2015/AROfinalVersion2015Amended210915.pdf>

⁴³ Bord Bia (no date) 'Factsheet on the Irish Agriculture and Food & Drink Sector'. Available at: <http://www.bordbia.ie/industry/buyers/industryinfo/agri/pages/default.aspx>

⁴⁴ DJEI (2015) 'Action Plan for Jobs 2015, p21'. Available at: <https://www.djei.ie/en/Publications/Publication-files/Action-Plan-for-Jobs-2015.pdf>

⁴⁵ DJEI (2014) 'Action Plan for Jobs 2014'. Available at: <https://www.djei.ie/en/Publications/Publication-files/Action-Plan-for-Jobs-2014.pdf>

		<p>The manufacturing sector employs some 207,500 persons in Ireland⁴⁶.</p> <p>It is estimated that the engineering sector includes over 600 companies, employing more than 16,000 people. This sector is estimated to produce sales of €2.7 billion and exports of €802 million⁴⁷.</p>
<p>Medical devices and pharmaceuticals</p>	<p>Medical devices Pharmaceuticals</p>	<p>This sector makes an important contribution to Ireland, including both indigenous and multinational businesses. It is supported by both IDA and Enterprise Ireland, with a strong focus in the West of Ireland.</p> <p>The sector employs over 25,000 people in Ireland, representing 6% of Europe's medical device employment, and annual exports of €8bn and companies here directly export to over 100 countries worldwide. Some eight of the world's 10 largest medical device companies are located in Ireland, with a significant cluster of businesses located in the Galway region⁴⁸.</p> <p>The pharmaceutical industry in Ireland comprise</p>

⁴⁶ Forfás (2013) 'Making it in Ireland: Manufacturing 2020'. Available at: [http://edepositireland.ie/bitstream/handle/2262/70212/220413-Making It In Ireland-Publication.pdf?sequence=1&isAllowed=y](http://edepositireland.ie/bitstream/handle/2262/70212/220413-Making%20It%20In%20Ireland-Publication.pdf?sequence=1&isAllowed=y)

⁴⁷ <http://www.enterprise-ireland.com/en/Source-a-Product-or-Service-from-Ireland/Sector-and-Company-Directories/Engineering-Sector-Profile.pdf>

⁴⁸ Enterprise Ireland (no date) 'Medical Devices'. Available at: <http://www.enterprise-ireland.com/en/Source-a-Product-or-Service-from-Ireland/Sector-and-Company-Directories/Medical-Devices-Sector-Profile.pdf>

		<p>approximately 120 overseas companies and indigenous companies, and has some 9 of the 10 largest pharmaceutical companies in the world⁴⁹. It is estimated to employ over 24,000 people directly, with a further 25,000 employed in the provision of services to the sector⁵⁰.</p>
ICT and software	<p>Hardware Software Telecommunications Internet</p>	<p>ICT and software and the emerging digital sectors are an important focus for Ireland's support agencies. Skills in this sector are a key priority target for the Irish Government, which has recently published the ICT Skills Action Plan⁵¹.</p> <p>A key area of technological development in this sector - the 'Internet of Things' - is identified in the Action Plan for Jobs 2015 as an area of emerging opportunity⁵².</p> <p>It is estimated that the ICT technology sector in Ireland directly employs over 105,000 people in Ireland, with 75% employed in multinational</p>

⁴⁹ Irish Pharmaceutical and Healthcare Association (no date) 'Contribution to the Irish economy'. Available at: <http://www.ipha.ie/alist/contribution-to-the-irish-economy.aspx>

⁵⁰ Enterprise Ireland (no date) 'Pharmaceuticals'. Available at: <http://www.enterprise-ireland.com/en/Source-a-Product-or-Service-from-Ireland/Sector-and-Company-Directories/Pharmaceutical-Sector-Profile.pdf>

⁵¹ DJEI (2014) 'ICT Skills Action Plan: Government, Education and Industry working together to make Ireland a global leader in ICT talent'. Available at: http://www.heai.ie/sites/default/files/action_plan_ict_2014_4final_spr.pdf

⁵² DJEI (2015) 'Action Plan for Jobs 2015, p. 133. Available at: <https://www.djei.ie/en/Publications/Publication-files/Action-Plan-for-Jobs-2015.pdf>

		<p>companies and the remainder in the indigenous ICT sector⁵³. CSO Ireland estimate for employees in the ICT sector is lower, at 82.3K, and is likely to reflect a narrower definition⁵⁴.</p> <p>There are said to be almost 730 indigenous software companies in Ireland, employing over 10,000 people, and continuing to grow.⁵⁵</p>
<p>Environment</p>	<p>Construction Energy efficiency Waste</p>	<p>The environment sector is an important sector of activity in Ireland with a focus on the built and natural environment, reflected in both IDA and EI strategies.</p> <p>Construction is identified as a high growth sector in the Government strategy - 'Construction 2020 – a Strategy for a Renewed Construction Sector'. This strategy aims both to increase the capacity of the sector to create and maintain jobs, and to deliver a sustainable sector. It currently employs some 125.9 thousand⁵⁶.</p> <p>Renewable energy is among Ireland's fastest</p>

⁵³ ICT Ireland / IBEC (no date) 'Sector Profile'. Available at: http://www.ictireland.ie/Sectors/ICT/ICT.nsf/vPages/Papers_and_Sector_Data~sector-profile?OpenDocument

⁵⁴ CSO (2015) 'Quarterly National Household Survey: Main Results. Available at: <http://www.cso.ie/multiquicktables/quickTables.aspx?id=qng03>

⁵⁵ Irish Software Association (no date) 'Sector Overview'. Available at: http://www.software.ie/Sectors/ISA/ISA.nsf/vPages/About~About_us~sector-overview!OpenDocument

⁵⁶ CSO (2015) 'Quarterly National Household Survey: Main Results. Available at: <http://www.cso.ie/multiquicktables/quickTables.aspx?id=qng03>

		growing sectors, with Ireland's 240 'CleanTech' companies employing over 5,900 people ⁵⁷ - a sector which includes Energy Efficiency, Renewable Energy, Waste Management, BioEnergy Water and Services sectors ⁵⁸ .
Services	Business services (excluding design) Financial services Entertainment and leisure Retail and wholesales	The service sector (and business processes) is identified as key priority sector and area for research in the Research Prioritisation Exercise ⁵⁹ . A DJEI prioritisation action group, including EI and IDA, is currently exploring the potential for measures to support this sector and its contribution to the Irish economy. A new strategy for international financial services, was launched in 2015, with the objective of creating an additional 10,000 jobs in the sector nationally by 2020 ⁶⁰ .

⁵⁷ Enterprise Ireland (no date) 'Cleantech Sector'. Available at: <http://www.enterprise-ireland.com/en/Source-a-Product-or-Service-from-Ireland/Sector-and-Company-Directories/CleanTech-Company-Directory.pdf>

⁵⁸ Enterprise Ireland (no date) 'Cleantech Ireland'. Available at: <http://www.enterprise-ireland.com/en/Source-a-Product-or-Service-from-Ireland/Sector-and-Company-Directories/CleanTech-Directory-Aug-2010.pdf>

⁵⁹ DJEI (2011) 'Report of the Research Prioritisation Steering Group'. Available at: <https://www.djei.ie/en/Publications/Publication-files/Research-Prioritisation.pdf>

⁶⁰ Irish Government (2015) 'A Strategy for Ireland's International Financial Services Sector 2015-2020', <http://www.finance.gov.ie/sites/default/files/IFS2020.pdf>

		<p>Recent CSO data suggests that some 1.5 million are employed in the broad services, representing some 75% of all employees over 15 in Ireland⁶¹.</p> <p>Within the service sector it is estimated that the international finance services sector accounts circa 25,000 persons⁶².</p> <p>Some 10 percent of all multinational employment and 7.4 percent of Irish GDP is derived from the financial service sector.</p>
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⁶¹ CSO Ireland (2104) 'Quarterly National Household Survey Main Results, QNQ40', available at: <http://www.cso.ie/px/pxeirestat/Statire/SelectVarVal/Define.asp?maintable=QNO40&PLanguage=0>

⁶² Enterprise Ireland (no date) 'Financial Services Sector Profile'. Available at: <http://www.enterprise-ireland.com/en/Start-a-Business-in-Ireland/Startups-from-Outside-Ireland/Key-Sectors-and-Companies-in-Ireland/Financial-Services-sector-profile.html>

Annex 3. Case studies

The following 12 case studies were developed through individual interviews and documentary research. Their precise content has been agreed with the companies.

Food and drink

Irish Distillers Pernod Ricard, Ireland



Overview of the company

Irish Distillers Group was established in 1966, when three major Irish whiskey distilleries, namely John Jameson & Sons, Powers & Sons and the Cork Distillery merged with an intention to reverse the decline in Irish whiskey sales. The company was restructured and a new purpose-built facility located alongside the site of the existing distillery in Midleton, Co. Cork, replaced the old distilleries in Cork and Dublin. In 1988 the company became a part of a global alcohol conglomerate Pernod Ricard. As such, Irish Distillers' business is twofold – it is responsible for the group's flagship whiskey brands – Jameson and other of its Irish brands, and it also acts as a distribution company handling the sales and marketing of Pernod Ricard's premier brands in Ireland.

Since joining Pernod Ricard the sales of Jameson have been on a constant growth thanks to the company's global distribution network and consistent investment in the brand. In 1988, Jameson sold 466,000 cases globally, with Ireland as its main market. In 2015 the sales exceeded 5 million cases, of which a quarter was sold on the American market. Jameson holds almost 70% of the Irish whiskey market share, is sold in 130+ markets and is ranked 15th in the IMPACT Magazine top global brands ranking (a key publication for the global spirits industry).

Over 500 employees operate from four sites: the Head Office in Ballsbridge, Dublin; a main distillery in Midleton, Co. Cork; a bottling and distribution centre in Fox & Geese, Clondalkin, Dublin and a sales and marketing subsidiary in Belfast, Northern Ireland. The company also has two visitor centres based in Cork and Dublin. Recently, Irish Distillers has doubled its production capacity by investing over €200 million in a new whiskey maturation



facility, expansion of the Midleton distillery and the Fox & Geese bottling facility in Dublin to meet the growing demand for its products. Further investments are planned in the coming years.

Design activity in Ireland

Design at Irish Distillers is primarily perceived in a narrow way as the aesthetic impression of the brand. However the company acknowledges the value of strategic use of design in business. Brendan Buckley, Global Innovation & Prestige Whiskeys Director at Irish Distillers Pernod Ricard, says: 'Right now we are in the more traditional view of design, but we recognise the need to advance our thinking in that regard. We are moving towards more integrated design as a key element of our value proposition, to make it a core component of our brand'.

The design demand in such a big company is considerable and the activities range from graphic, digital and packaging design to exhibition and experience design. There are a lot of different touchpoints, where designer expertise is needed, be it merchandising and point of purchase design, stand-up exhibition for mobile events or brand homes – visitor centres, which were designed in detail to provide a great brand experience.

All of these design efforts are coordinated by a dedicated team of two professional designers. To cover the company's needs for design, they often collaborate with external design agencies, which are a mixture of Irish and international firms. Each brand has its own, separate budget for design, which is included in a total marketing budget. The value of an aggregated spend on design fluctuates at around € 3-4 million a year depending on the design projects undertaken each year.

The company identifies two main reasons that drive the use of design: yearly requirements based on ongoing demand and sales, and a more strategic driver, when design plays a key role in implementation of new initiatives and is crucial for establishing the strategic touchpoints of the brands. Currently Irish Distillers is exploring the possibility of making design a core element of the brand strategy. According to



Brendan Buckley, there are no major barriers to that - 'At the moment it is about an organisational mind-set shift, but there is no pushback on that. It is merely about finding the right time and resources. I think the resource – people-wise and financial-wise will be made available, and in the coming years we will see a much more elevated role of design in our strategy'. The only challenge he sees on the Irish market is a shortage of experienced strategic designers, 'there is a lot of talented designers, but not many who could bring a strategic business dimension to the table', he says.

Design in focus

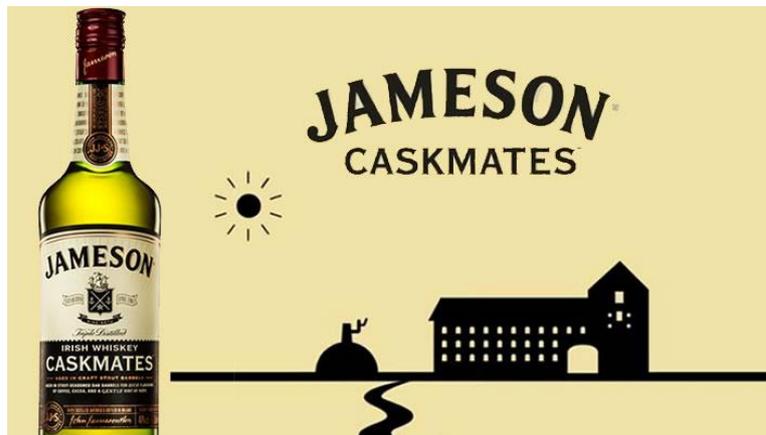
For many people design is a problem solving method, but Irish Distillers prefers to perceive it as an enabler of opportunities. It starts in the Innovation Department with spotting a market need, when the company engage designers to help them bring brand solutions to avail of this opportunity. Bringing innovations to a marketplace involves a whole array of things from advertising to point of purchase and drinks experiences to be designed. New product launches are multifaceted and design helps to capitalise on every aspect of this process.

A recent example of a new product, where designers were involved to exploit the opportunity is Jameson Caskmates. It is an innovative collaboration between Irish Distillers and Franciscan Well Brewery in Cork. Caskmates is Jameson Irish whiskey that has been finished in barrels used by Franciscan Well to finish its craft Irish stout. Jameson Caskmates sold 3,000 bottles in its pilot year in Ireland and will launch across ten markets in 2015, with volumes expected to reach 85k cases by the end of year 1.

Impacts from design

Design is central to the aesthetic and brand elements of the company and plays a strong role in the promotion and success of the company's products. In this respect it is difficult to separate out the role of design in the overall impact of the company.

<http://www.irishdistillers.ie/>



Rockbrook Engineering



Overview of the company

Rockbrook is Ireland's largest systems integrator of open protocol technologies. It is an Irish run private limited company which began by providing specialist industrial and process automation solutions to the food and beverage industry. Since then the company has grown and diversified into new market segments. It is now structured into three main divisions, each with its own dedicated engineering team and project managers:

- Industrial Control which encompasses industrial automation and building technology that were recently merged into one division;
- Audio Visual Solutions covering exhibition design, the graphic content and the actual control systems and installation themselves;
- Services across the other two business areas including an on call team for 24 hour cover on industrial and exhibition critical site.

Rockbrook Engineering specialises in 'complicated control systems' across a varied range of industries. While there are numerous competitors in the market both in Ireland and further afield, Rockbrook Engineering has the capability to deliver larger and more complex systems than even some of its larger competitors, due to their ability to deliver bespoke design to match and go beyond the end customer's requirements.

Rockbrook Engineering has 24 staff and the five founding directors own the business outright with equal shares. Its customers include multinational household names such as Siemens and Diageo. So far the business has mostly been Ireland-based, but has recently won first contracts in the UK and Europe.

Design activity in Ireland

'Everything we do is design, design is what we do' sums up Rockbrook Engineering's perspective on the importance of design for the business. Around 80% of the company's contracts relate to bespoke solutions with each division having slightly different emphases and requirements.

The audio visual team is made up of audio visual engineers who are responsible for the technical design and a creative team who develop and design the content. The aim of audio visual projects is to entertain people, the creative side of things therefore needs to be the starting point. Each project will therefore start with an ideation stage involving both specialisms. The best ideas will then be developed further by the creative team with advice from the technicians as to what is and isn't possible.



Industrial control projects on the other hand require very detailed engineering design. All Rockbrook Engineering staff on that side of the business have an original, mostly electrical trade. Even though a college degree is a key requirement and a marker that they are able and interested to undertake design work, they also need to be able to actually 'do it'.

Overall, the design process in the industrial control division is more boxed, having to go through certain stages, being based on schematic drawings and, crucially, having to pass stringent Factory Acceptance Tests (FAT).

Projects are delivered either as turnkey solutions, whereby Rockbrook Engineering will be the principal contractor and hire in all other specialist inputs, or with the customer directing the work. For turnkey solutions the company will use external expertise either where own staff do have the skills, but can't sign things off, or where additional inputs are required, e.g. an architect might have to see to the structural requirements for a video wall.

Similarly, in cases where Rockbrook Engineering is charged with setting up a whole industrial process, external expertise is required. Usually, however, the starting point for the control system design will be technical drawings specifying the locations of pumps, the sizes of pipes etc.

Delivering bespoke solutions to customers is time and resource intensive. A key challenge for Rockbrook Engineering therefore consists in combining their expertise with a way of codifying their vast experience in more standardised products. Taking advantage of an Enterprise Ireland R&D grant, the company has therefore invested in setting up a standard library of 'skills', the particular protocols and formats that capture individual components of an industrial control system. The aim is to get to a position where staff can draw on the library to use boxed products to deliver 80 to 85% of a job. Having spent six months on this work before contract work took over, the intention is to complete this work in November 2015 in order to considerably increase Rockbrook Engineering's throughput while reducing cost and risk and ultimately making the company more competitive again.

Competitiveness is also based on speed to market and the quality of the offer, and Rockbrook Engineering is continually honing its approach to creating stable customer relationships. Getting to people early and 'prompting them into design' is one way of achieving this. Similarly, for the customers with existing SLAs in place it is standard practice for Rockbrook Engineering to 'have a first crack' at any new projects. Nevertheless, the risk of being gazumped and losing valuable IP in the process remains high.

Design in focus

The Smithwicks Visitor Centre exemplifies a typical audio visual Rockbrook Engineering contract. The initial customer contact with Diageo, the company behind the Smithwicks brand, formed the starting point of the design process. Diageo developed the concept of an

interactive visitor experience on the site of the Old Kilkenny brewery. The aim was to create an attraction that would bring 200,000 to 300,000 people through the door every year.

The concept was based on an approach whereby the individual exhibits guide visitors through the tour. Rockbrook Engineering's first task was to discuss the customer's own ideas and consider what could and couldn't work. Based on some initial drawings, the team then sat down with the client to look at early ideas for a self-guided tour.

The first milestone then consisted in developing a full design concept and securing client sign-off for this. The set-up was to involve the creation of interactive smells, the development of a 3D monk and the use of i-pads to allow an exploration of the brewing history at Kilkenny. The fact that the Smithwicks visitor experience needed to be installed in a 200 year old building also needed to be considered.

The technical specification, that had to fall out of the concept design, then delivered the blueprint for the contract and ultimate customer sign-off at the end. Rockbrook Engineering developed an installation and project schedule and project team responsible for the final design, engineering and completion of the project



A critical path analysis was developed to govern regular meetings of the project team as well as the overall time line and the project budget. A regular challenge in audio visual design projects arises from the fact that the team will always be the last in a sequence of project teams, particularly in a new build setting. It is therefore fairly usual for project schedules to be squeezed, sometimes down from three months to just one. In this case the installation period was planned for 4 weeks but was reduced down to 13 days due to various delays. Rockbrook manage this by increasing staff presence and introducing a rolling shift pattern.

Detailed design drawings then formed the basis for the procurement of the individual components, sourcing the equipment in 'just-in-time' fashion as close to schedule as possible and building components as required. The Factory Acceptance Test before delivery to site and Site Acceptance Test on site formed the final stage of the active design process followed by a 12 month warranty period.

Impacts from design

It is not possible to separate out the design process as a stand-alone part of the business – Rockbrook Engineering's overall activity is the result of the successful application of design processes. It is worth noting, however, that reducing the bespoke design input and using design in a move towards standardisation is used as a tool here to strengthen the sales approach. The maturing of design expertise and approaches through working with customers on bespoke contracts is therefore arguably leading to higher productivity and the overall growth of the business.

Horseware Ireland



Overview of the company

Horseware was established in Ireland in 1985 starting with the production of a basic horse blanket. Its core products under the brand names, Rambo, Rhino and Amigo have since become a household name in the equestrian world. By 1996 the Rambo Turnout had become the world's best-selling turnout rug and its design regarded as the industry standard. Innovations in material and design by Horseware have facilitated the development of the traditional Rambo Original into a range of Rambo rugs. Horseware products consistently win innovation awards at major European and American equestrian trade shows.

The business was started as a result of the Founder and Managing Director, Tom MacGuinness', own experience as the owner of a riding school of the specific needs of horses and riders. Horseware has since continually added new product ranges including in 2002 five clothing collections spanning different price points. The latter has since grown to make up 20% of an annual turnover exceeding €35 million.

In its thirtieth year, Horseware now has a total of 650 staff; 125 are based in Dundalk, around 30 represent the business in the United States and another 370 are employed in three factories that Horseware operates in China and Cambodia.



Horseware continues to manufacture high-end and bespoke products at its 8,000m² manufacturing base at its Dundalk headquarter which also includes a 12,000m² warehouse.

At around 30% of sales the UK is the biggest market followed by the United States (ca. 25%), Germany, Scandinavia and France.

Design activity in Ireland

All Horseware design activity is based in Ireland. Based on the simple understanding that design is about solving problems, it is the Horseware founder's firm belief that without the practical ability to make things, it is hard to innovate, develop and design

new or improved products. While expertise and equipment can be bought in if necessary, it is vital to own the skills and expertise to actually make things.

The company prides itself in having been one of the last to offshore manufacturing activities. Apart from retaining the crucial manufacturing expertise, the sizeable

manufacturing operation in Dundalk also allows Horseware to maintain a process design focus. This is exemplified, for instance, in the sophisticated material handling system. Recognising the size and weight of the fabric that the seamstresses need to handle in the horse rugs in the making, a system from the automotive industry was adapted and expanded with bespoke capabilities so that it can handle numerous different products at once.

Finally, Horseware takes it upon itself to develop all the ancillary elements required in the marketing of its products too from packaging and leaflets to point of sale display equipment for its network of retailers. It is this holistic design perspective, the drive to continually improve existing designs and the success in establishing the brand that gives the company its competitive edge.

Starting from the core expertise in textiles, but inspired by a desire to continually improve the experience of horses and riders, Horseware has a rolling portfolio of design projects and allocates between 5 and 10% of turnover to this activity and also takes advantage of relevant grants and R&D tax credits.

The company has two main teams that are involved in the design activity, namely a dedicated team of five staff with a fashion design background, who look after the clothing range, and an R&D team of four staff, who take care of a diversity of other design and development projects – two members of this team have a dedicated design background. Horseware has also invested in its own testing equipment while working with external partners to bring in additional expertise and capabilities.

The company makes use of the tools available to protect the intellectual property in its products and has, for instance, taken out a design copyright for the innovative bridle it developed. Securing this IP, however, is difficult – the company is writing to somebody who is at risk of breaching the copyrighted bridle design every week - and most products will eventually be reengineered by competitors.

Many innovation and design projects will start as a response to an opportunity, either identified by the Horseware team itself or through being approached by inventors who offer up an idea to the company looking for design and development support. Either way, Horseware will identify a small number of development and design projects to focus on at any one time in order to be able to dedicate appropriate resources to these projects.

Design in focus

Horseware was approached with a request to develop an innovative stirrup that would allow riders to mount a horse unassisted while also offering the necessary support when riding the horse. The idea was brought to the company by an inventor who recognised that a good idea alone was not enough and that both manufacturing and marketing expertise would be required to develop a product that could succeed in the market place.

The project that resulted in the Rambo Stirrup started with a basic idea of developing a stirrup that dropped down to allow an additional six inches, once the rider put their foot in the stirrup, the drop down would then retract and lock into place. Keeping the potentially dirty environment that it would be used in in mind, the search was on for a simple mechanical solution without any springs or other small delicate parts.

Taking up the fundamental idea, the R&D team developed a number of possible solutions on paper. Working with Belfast-based North Design Works, a product design and mechanical

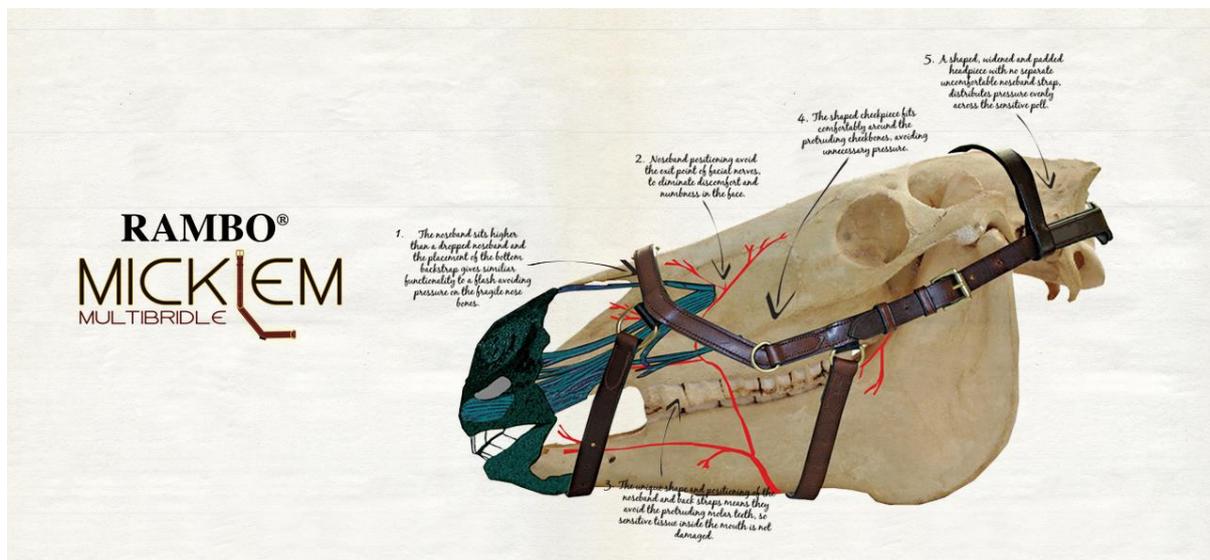
engineering consultancy, and following intensive team discussions and testing of ideas, a basic prototype was developed using digital printing technology and metal casting.

Repeating this process, the final design was developed in incremental little steps taking a whole range of different factors into account, from quality considerations to pricing, packaging and presentation. The strong commitment to the design process and a willingness to keep going until the whole product is more than satisfactory and ready to be launched is seen as the secret to success at Horeware. In the case of the stirrup, this meant that the original budget allocation of €30,000 has ended up being closer to €100,000.

The final step will be to set up the manufacturing process for the new product, which is expected to be in time for the stirrup to be available by October 2016. In the meantime the innovative stirrup has already won the highly prestigious BETA innovation award for 2015.

A number of other products have followed similar design and development paths. This includes, for instance, the Micklem Multibridle. This was originally the idea of William Micklem, an international coach, speaker, and bestselling author. Drawing on his extensive understanding of equine bio-mechanics and mental health, Micklem worked with Horeware in developing the innovative bridle. Ultimately, however, Horeware's existing knowledge about leather, tanning processes etc. combined with the focus on product presentation and retailer support was a decisive factor in bringing the project to fruition.

Designed to fit the shape of the horse's skull and take pressure off, the bridle introduced a fundamental change to bridle design resulting in a much more comfortable, effective and



flexible bridle, which won the company the innovation award at BETA International in 2008. Alongside the design of different models to suit different tastes and uses, this has resulted in 35,000 bridles being sold in 2014.

Impacts from design

Generally speaking the MD is convinced that the Horeware approach is unique and has helped establish the company as a market leader. The 'can do' attitude of seeing a problem, finding a solution, prototyping it, testing it and refining a complete solution until it is ready to go to market.

Seeing development projects through, even if this means investing more than might have been expected at the outset, ensures that the ultimate result is a tangible product including

the corresponding IP. This is the key to gaining access to different market segments and securing market share.

The focus on process design is one of the key reasons why Horseware is still able to manufacture in Europe, since it has generated a 30% reduction in the labour input required to produce each rug.

The sophisticated manufacturing process and warehousing system and the insistence to retain the skills of actually making things in-house also means that Horseware has established a unique capability to make bespoke products alongside the main standard product ranges. Combined with a reputation for durable products, this has resulted in a growth in orders for bespoke products, from banners for specific equestrian events to marketing materials and sponsored rider items and thus a further market segment for the company.

<https://www.horseware.com/>

Aerogen



Overview of the company

Aerogen undertakes the design, development, manufacturing and marketing of aerosol drug delivery devices. Aerogen's patented vibrating mesh (VM) aerosol technology is an integral part of its drug delivery systems. This technology allows drugs to be nebulised into a fine particle mist that can be absorbed through the lungs to treat a broad spectrum of patient respiratory conditions and to deliver medication in intensive care settings and throughout the hospital. It is covered by over forty patents and forms the core of all the Aerogen products.

The company is headquartered in Galway in Ireland and with offices in Europe, America and China is a world leader in acute care drug delivery for ventilated patients. Aerogen has seen considerable growth over the last two or three years and now employs over 100 staff in Ireland. Exports account for 99% of Aerogen's sales and its products are shipped to 70 countries worldwide winning the company Exporter of the Year in 2014.

Originally set up as a technology consultancy (Cerus Ltd) the business merged with California-based technology company Aerogen Inc. and, following flotation in November 2000 (with a \$300million valuation) and a period under ownership of Nektar Therapeutics, has been independent since a management buy-out in 2007 as Aerogen Ltd as a totally independent company.

The largest part of manufacturing activities is outsourced with the company itself focusing on the design and development as well as the marketing of its products. Own manufacturing activities are limited to prototyping, piloting and small runs including the 'legal ownership' of all contracted manufacturing.

Aerogen's operating model involves licensing and royalty arrangements as well as entering into strategic alliances with key custom manufacturers undertaking strategic co-development with shared risk / reward. The company's customers fall into two groups, namely Original Equipment Manufacturers (OEMs) of ventilators for clinical use such as Covidien, Hamilton Medical or Maquet on the one hand, and independent distributors into hospitals and thereby acute care consultants who will specify and recommend specific products on the other.

Design activity in Ireland

All product and process design activity is undertaken and managed from Ireland. The whole company is strategically built around design evolution and adopts a 'Blue Ocean' philosophy of creating new markets and opportunities in uncontested areas.

Design is an integral part of a knowledge intensive activity like this. Focussing the development effort on unrecognised clinical needs means that the customer / patient experience is at the centre of all innovation. Design principles allow the company to give the customer something that they did not recognise they wanted and when they get it wonder how they could ever do without it.

Under a 'market pull' approach, Aerogen continually works closely with customers to identify gaps and opportunities in the whole continuum of care. Employing respiratory consultants themselves in an in-house clinical science department, the company regularly exhibits at trade shows, presents papers and posters and leads discussion groups. This allows Aerogen to look at things in a different way and truly understand the value of different products to the customer.

At the same time a very strong focus rests on process design. This is necessary in order to



establish a robust supply chain that helps reduce the carbon foot print and minimises business risk. Aerogen products are supplied to clinical ventilator OEMs, who will not be able to ship their products, if the supply of nebulisers isn't guaranteed. Importantly, however, taking out unnecessary cost, effort and waste is also vital, since being able to offer products based on the Vibrating Mesh technology at an appropriate price point is key to the success of Aerogen's Blue Ocean

philosophy.

In practice this means that Aerogen needs to adopt an integrated design approach where the product must be designed with the process in mind and vice versa, inclusive of the all-important regulatory needs. This depends on innovative and creative staff able to challenge both customer needs and expectations and the company's own products, processes, systems & structures in order to ultimately create value for the company.

Almost all Aerogen staff come with a University qualification up to PhD level in Science, Engineering or Technology and 20% of the operating expenditure is invested back into R&D. Aerogen also makes extensive use of external centres of excellence including leading Irish Universities and those overseas such as Stanford.

A number of Aerogen staff have a dedicated design background, from mechanical, electronic, software and control engineering design all the way to ergonomics and aesthetic aspects as well as the emotional intelligence required from a design input into product development. Extensive use is made of cross functional teams working in a stage-gated process. The design approach is so integral to Aerogen's product development approach that it is not possible to identify the specific cost of this aspect. According to Brendan Hogan, Aerogen's Vice President of Engineering:

'Ascertaining, quantifying and validating unmet clinical need as a basis to create value for all involved is one of the key challenges in using design in this way',.

This helps to ensure that all design inputs are identified upfront in order to avoid late changes to the requirement and the need to redo a lot of work is difficult. Being close to the

end user and understanding the user and patient needs in as much detail as possible is therefore paramount.

One way of achieving this is to replicate the actual usage situation for Aerogen products in the development lab by recreating the clinical situation and mirroring the detailed practices. This too is challenging, however, since there is considerable variation not only between different countries, but even between different hospitals in the same country. Key to resolving this is to establish rigour in pursuing opportunities that match significant customer need and developing related products and services that are fit for purpose quickly and at the right price.

Design in focus

One example of the Aerogen design process in action is the development of Aerogen® Solo, a compact, disposable single patient use nebulizer for aerosol therapy. Customer research in the US market had identified a preference for disposable nebulisers in order to avoid having to sterilise them for reuse. Aerogen's vibrating mesh technology is considered as the 'gold standard' in patient care as measured by superior outcomes when compared to alternative competitive technologies such as ultrasonic or compressed air types. The Aerogen technology is of a higher cost than more commonly available alternatives. A key challenge therefore was to find the most appropriate price point for a disposable nebulizer incorporating vibrating mesh technology. A fully FDA compliant pilot product was therefore developed and launched at a price offering virtually no margin to Aerogen, essentially as a way of 'dipping the toe in the water' and gaining direct market intelligence.

With that knowledge in place, Aerogen then embarked on a complete redesign process focusing on the product itself and the manufacturing process. The vibrating mesh technology sub-assembly forms the 'heart' of all Aerogen products. The focus in redesigning the product therefore rested on redesigning the manufacturing process in order to produce a product with the same functional performance as the pilot disposable nebulizer, but at much



lower manufacturing cost. This involved extensive re-engineering of the components and the electromechanical assembly - itself an assembly of around 15 individual parts, by changing materials and optimising the manufacturing process as a whole with a particular focus on component and process step elimination and substitution of the respective materials as well as automated manufacture, assembly and test.

Working in a cross functional team environment involving staff with responsibility for clinical science, process development, materials science, design assurance, aerosol science, regulatory affairs, manufacturing and quality engineering as well as marketing professionals, the overall project took around two years.

The final product was initially launched in 2007, but since then there have been several relaunches – largely invisible to the customer – as a result of continually refining the design

and manufacturing processes. Most recently, for instance, Aerogen has worked with suppliers in Switzerland in developing new automation equipment at a cost of €2 million. This will further reduce the manufacturing costs, increase the output capacity and generally enhance manufacturing performance. The resulting increased product margin is then reinvested into addressing new markets facilitating the treatment of patients through effective aerosolised drug delivery.

Impacts from design

Innovative design of market leading products has been the foundations on which Aerogen is built. This has resulted in a > 30% year on year sales growth for the last 8 years and employment numbers growing from circa 20 to more than 100 in the same period. Almost 3 million patients have been treated with the Aerogen technology since product launch.

So the impact of the strong design focus is felt through the success of the products in the market place, the quantities sold and the margins secured. Other advantages have been a shortened supply chain which reduces complexity of multiple suppliers and enhances business continuity with a lower risk of product supply. In addition it has considerably reduced the carbon footprint and enhanced the level of IP protection in the area of product and process where outcomes have been inventive and novel.

The strong focus on the manufacturing process in particular is paying off for Aerogen. While seven or eight years ago the manufacturing was mostly undertaken in the far West (California) and the Far East (China & Taiwan), much of this has since come back to Ireland. This is the result of the process redesign effort which has resulted in largely automated production runs and higher volumes which can be delivered cost effectively in Ireland.

<http://www.aerogen.com/>

Nypro Healthcare, Ireland



Overview of the company

Nypro Healthcare is a recognised leader in the development and contract manufacture of complex drug delivery and diagnostic devices. It is headquartered in the US (Florida) and has sites in 11 countries. In 2013 Nypro Healthcare became part of Jabil, a US based Fortune 200 global manufacturing services company.

The company has two sites in Ireland - Bray and Waterford - and was originally established in 1980. It employs some 450 staff across its Irish sites and offers a variety of solutions to customers in the healthcare. Devices developed and manufactured include a variety of inhalers, auto-injectors and drug delivery devices. Its activities in Ireland form an important part of the wider group, with responsibility for both design and manufacturing activity. The company provides customers with a comprehensive process for early stage design and development, clinical build supply and final large scale manufacture of medical devices. It works closely with the world's leading pharmaceutical companies in the design and development of medical devices. The company's products are primarily developed for the export market.

Design activity in Ireland

Nypro Healthcare's activities in Ireland have developed in recent years from pure contract manufacturing, with the addition of an integrated design and development function. This has seen it develop a Design and Development Centre at its plant in Bray supporting Nypro Healthcare's manufacturing function in Ireland, as well as other parts of the Nypro Healthcare in Europe (including France and Germany).

Design is a priority for Nypro Healthcare in Ireland, and is embedded in both its strategy and operational processes (akin to Stage 4 of the design ladder concept). This is illustrated by the company's Design and Development Centre in Bray. The Centre currently employs 16 members of staff, with specialist skills in areas such

as product design, injection moulding and tooling, project management, design engineering and electronic engineering. Its facilities include modelling, electronic and prototyping labs



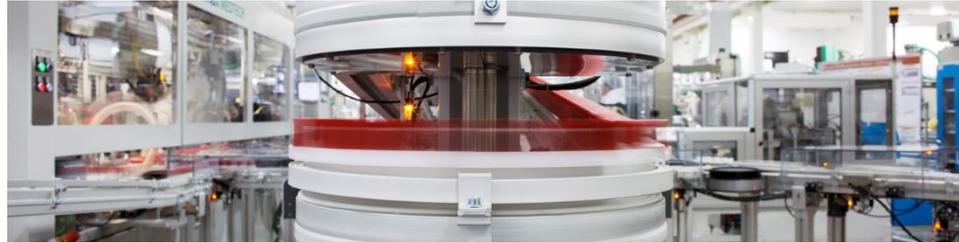
(including 3D printing), and a CT scanning room. According to the company these facilities have:

‘been developed to facilitate internal design activities, thus reducing development time and better meeting customer requirements.’

These facilities provide a statement of intent for Nypro’s design capacity, with a focus on providing advanced lab space and an environment that encourages design thinking and collaboration.

Design expertise in some specialised areas is drawn from outside the company, examples of this would

include regulatory support and specialised human factors research. It also



collaborates with external design houses to transfer their concepts or prototypes into a manufacturing ready state. In this respect a typical project may see the company work with a design house, contracted to a pharmaceutical company. Such companies approach Nypro Healthcare for ‘industrialisation assistance’ to reduce risk and prepare the product for high volume manufacture. In other cases pharmaceutical companies approach Nypro Healthcare directly for design and manufacturing support. This latter model has become more important following the creation of the Design and Development Centre.

The main drivers for the introduction of the Design and Development Centre was for the company to expand its manufacturing offering with added value services, helping customers reduce risk by getting involved earlier in the product development process. In this respect Nypro Healthcare’s objective is one of ‘Early involvement in the design and development process to define inputs and outputs in accordance with recognised quality standards (21CFR820 and EN ISO 13485)’. This was seen as important in ensuring the competitiveness of the company. The Design and Development Centre enabled the company to move up the value chain, and establish itself as a key partner in the design, development and manufacturing process. By introducing the design centre the company is better able to reduce development and manufacturing risk for customers, ultimately leading to a smoother introduction to high volume supply. It has also responded to the needs of its customers for a more integrated service, allowing them to simplify their supply chain relationships.

One key challenge faced by the company is skills-related. Here the strength of the Irish med-tech sector, particularly in the West of Ireland, has increased competition for medical device skills. The company identifies the lack of ‘system engineering’ skills as a significant challenge to its design activities, which are central to its ability to address opportunities associated with the ‘internet of things’ and smart devices. As the company stated:

‘In Ireland there is nationwide competition for medical device related skills. The trend towards increased complexity and connectivity in medical devices will increase the need for multi-disciplinary, systems engineers to manage the development of the complex systems integrating mechanical, electrical and software systems. This is an area of weakness in the current academic and industrial skill set.’

Design in focus

In 2014 Nypro partnered with UK-based Glide Technologies to design a novel auto-injector device which could deliver a solid dose of drug (See picture opposite). This needle free drug delivery concept represents an important area of technology and market development, offering the advantages of expanded immunisation coverage, decreased healthcare costs, and increased patient compliance.



The Glide SDI® is intended to open up novel therapeutic formulation and delivery options for new and existing treatments. Nypro Healthcare was subcontracted to develop an initial design to a point where it was suitable for large scale production, and optimised for patient use. Nypro Healthcare's design input focused on the repeatability of the device manufacturing and usage. It was led by staff from the Design Centre, and included a structured programme of analysis (Mechanical design analysis, Design for Manufacture and tolerance analysis, and finite element analysis) as well as the development of final prototypes.

Nypro's work on the Glide SDI® was completed in 2014 and the device is now ready for clinical trial. Nypro Healthcare believe that the partnership with Glide Pharma was very successful, and it anticipates further growth in the area.

Impacts from design

The development with Glide Pharma illustrates the role of Nypro Healthcare's Design Centre in supporting early stage design for manufacture and assembly of products, as well as their verification before manufacturing. By supporting the pathway to manufacturing, Nypro's design expertise allows it to secure revenue from its expertise at an earlier stage in the product development process, while building ongoing relationships with customers.

The example of the Glide Pharma collaboration illustrates that the timeline between early stage design support and manufacturing can be potentially long, with the requirements for clinical trials and regulatory approval. Nypro Healthcare believe that without the development of its Design Centre and expertise it is unlikely it would have been able to maintain its competitiveness of, and expand its wider operations in Ireland.

This continued evolution was recognized nationally in 2014 when Nypro Healthcare won the Irish Medical Devices Association's Medical Technology Company of the Year.

<http://www.nypro.com/>

Alps Electric (Ireland) Limited



Overview of the company

ALPS Electric (Ireland) Ltd. is a Division of ALPS Electric Co. Ltd., a Japanese public company founded in 1948. ALPS is one of the world's largest independent manufacturer of electromechanical components. ALPS develops, produces and markets electromechanical components, and operates on a world-wide basis.

ALPS Electric (Ireland) Ltd. was founded in Millstreet Town, County Cork in 1988 as a manufacturing base for ALPS customers in Europe. Manufacturing has evolved over this period from computer peripheral products (keyboard, mouse, floppy disc drives) to the supply of automotive electronics system and medical devices. Key customer groups include Volvo, BMW, Jaguar, Land Rover, Citroen, Honda and Renault. It primarily acts as a tier 1 or 2 supplier, with a focus on sophisticated electronic modules. The company is fully owned by Alps Electric.



It employs circa 600 people in Millstreet Town, and has a turnover of €60 million. The Facility has world class manufacturing capabilities in SMT, moulding, decorative parts painting and lasering marking. Its products are exported to other countries, principally in other parts of Europe.

Design activity in Ireland

Since 2011 Alps have been seeking to diversify its core manufacturing activity through the addition of a design for manufacturing capability. The main driver for these developments were the need to respond to the severe downturn in its automotive business in 2008/09. This led it to shed workforce, and explore strategies to reduce risk and its dependence on the sector. Design for manufacture was identified as an important strategic priority through this review process and has been approached incrementally and cautiously.

This has seen it work on a number of design-led projects with manufacturers outside of its automotive sector, and has resulted in the creation of a new business unit within Alps Electric (Ireland). This business unit employs a team of five design and engineering staff, all of which have degrees in electrical or mechanical, Software engineering, and is able to draw on specialist equipment such as CAD stations, prototype building, moulding, painting and so on. It has also drawn on expertise from the university sector in recent years to assist in the testing of concept feasibility and development of software.

The design activities of the unit are largely focused on the design and development of new products. It views design as a process that begins with the stage of determining customer needs and agreeing a specification. In doing this it sees the design for manufacture process as one that involves close cooperation with the customer, with the customer typically

bringing expert knowledge of the market, and Alps Electric applying this in the design process.

In developing the company's design for manufacture capability the main challenges faced have been one of promoting the service to its customers. This has required it to work closely with its sales partners in Europe to develop a joint understanding of its new design-led offering.

The company indicate that design expenditure is in the region of 1 to 2% of turnover, although it notes that this underplays the true cost, as some of the design cost is borne by the customer as part of a shared development agreement.

Design in focus

The company has adopted a cautious approach to building its design for manufacturing capacity. This has seen it work on a number of smaller scale projects since 2011/12, in collaboration with customers. The first project saw it work with a golf cart manufacturer to develop an electronic control model for a golf cart. It was selected by the golf cart manufacturer because of Alps pre-existing, high end control modules used in the automotive sector. The main driver for this product was described by the company as:

'the growing need to incorporate user functionality and improvements in the experience of users in using products'

Based on discussions between the golf cart manufacturer and Alps engineers the partners agreed an initial outline for the work, and discussed the needs of the customer and end users of the product (golfers). Key to this were the importance of ensuring the right look and feel of the controller, its ability to operate in outdoor conditions, and capability of operating with sufficient 'feel' and 'feedback' to golfers wearing a golf glove. Initial prototypes were subsequently developed and the interface designed to provide multiple data categories (time, battery status). As the company put it:

'While we had a similar controller in production for one of customers in the premium car manufacturing market we were challenged by the golf cart company to make this work in a completely different environment, making it both usable and attractive to users'.

The company views this project as providing important lessons for its subsequent design for manufacture project. This includes the importance of working closely with the customer, in agreeing an early specification, including expectations, quality standards, project management milestones and so on.

The company has subsequently worked with a major food processor manufacturer in the collaborative development of an electrical component for a high end product. This project concerned the development of a small scale electronic module for a food processor product. It built on the company's small component, moulding and electronic design competences; as well an existing sales link of the company, and saw it work collaboratively on a relatively small scale component. Again, it drew on a strong understanding of customer and end user needs, and key requirements for quality and 'high end' feel and touch of the product's



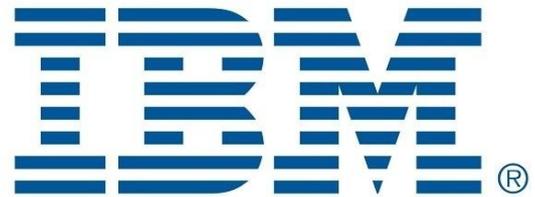
buttons. Other key considerations in the design were the need for cost control, subsequent high volume production, and the need for appropriate materials to achieve the appropriate luxury 'feel'.

Impacts from design

The company has achieved success from its early design for manufacture activities, with both of the projects noted above in production. While the golf cart module is being produced in modest volumes, the food processor model is being produced at a rate of 30,000 units per week. This latter product accounts for a large proportion of sales achieved by the new business group, with strong synergies evident with the core manufacturing offer of the company.

The group believe that this capability has the potential to grow into an important business unit within the group, with the potential to diversity its product / service offering to customers. It is also enabling the company to enter new premium markets, where look and feel are important.

<http://www.alps.com/ireland/>

IBM, Ireland**Overview of the company**

IBM is a globally integrated technology and consulting company with operations in more than 170 countries, headquartered in Armonk, New York. The company develops and sells software and systems hardware and a broad range of infrastructure, cloud and consulting services.

Historically focused on hardware manufacturing, IBM have shifted substantially since the 1990s towards higher value activities. The original software and hardware divisions are now horizontal offerings feeding into the services division as the main client interface. Today, IBM is focused on five growth initiatives - Cloud, Big Data and Analytics, Mobile, Social Business and Security.

Originally created as a hardware manufacturing base, the Irish IBM operation has undergone a wholesale transformation and is now completely repurposed. Its activities cover three main areas; software development with three labs in Dublin, Galway and Cork, a research lab focusing specifically on data analytics and a shared services offer for the group covering digital sales and inside sales servicing Europe, Asia Pacific and Canada.

Key areas of activity include middleware, apps and data analytics. The latter is linked closely to the specific IBM Ireland focus on smarter cities. Ireland is the head quarter for digital sales employing around 700 people. IBM Ireland also acts as a legal hub and resource centre with all lawyers in the company operating through the multi-lingual hub, is home to one of three Treasury functions in the group and has a particular strength in Supply Chain Management. Overall IBM in Ireland employs just under 4,000 staff. As a fully owned subsidiary of the IBM group IBM Ireland is a microcosm of IBM's global activities.

Sales come partly from within Ireland, but the majority of software development is for global customers. Much of IBM Ireland's business is focused on strategic partnerships, for instance, in the health sector with Johnson and Johnson or Medtronic, but collaboration with small technology start-ups also plays an important role. IBM owns its software products from ideation to commercialisation with limited dependence on a wider supply chain.

Design activity in Ireland

A strong focus on design was introduced in IBM as a way of changing the culture and way of thinking. IBM had started in the 1950s with an understanding that good design equals good business (see [IBM design history](#)). While this strong explicit focus was distilled over the years, the original intent to shape thinking around corporate design and culture still persisted in IBM's identity; early work drawing on an extensive network of designers, architects, sculptors and other visual artists associated with the Department of Industrial Design at the Museum of Modern Art still had echoes in IBM's approach. Going back to

these roots, IBM embarked on a transformation to put the user centre stage at all times from product development to sales.

Countering the earlier trend of designers being absorbed into the development division over the past few decades, the IBM Design Division was created in 2012 and started to embed design thinking in all aspects of IBM activities (see www.ibm.com/design). The aim is to add 1000 designers to IBM over a 5 year period and develop a network of global Studios to support this journey to design excellence and a culture that delivers exceptional user experiences. Ireland is a key part of this strategic ambition.

Globally IBM spent \$100 million on the Design Division. Each design studio has a certain budget, and designers are allocated to a product portfolio with cost being managed at local level.

From software and middleware development to service delivery and hardware design, in short for the whole marketing delivery and customer experience, decision-making is now not linear, with a product or project manager identifying the different product functions as the basis for the overall development process. Instead, the user experience has replaced the idea of functions and features and designers play a crucial role in enabling communication and collaboration between all relevant departments around product development and project delivery. Product or project managers, just as engineers, are expected to work with designers in an iterative way to address all user pain points through the delivery of a better user experience.

Key to this way of working in a global business was to establish a scalable approach to delivering user experiences. This is achieved through adopting the IBM Design Thinking framework, modelled after the Stanford University Institute of Design Programme, as a single approach to innovate, build & deliver. Alongside this the IBM Design Language offers a shared vocabulary.

Under the heading of *'works the same'* the design language provides a common look and feel across all IBM applications while allowing differentiation for different IBM products. It is a tool that creates common purpose internally and communicates a look and feel of the brand externally.

Under the heading of *'works for me'*, the design framework helps apply a user-centric design approach throughout the product life cycle. It is made up of six user experiences: Discover, Try & Buy, Getting Started, Productive Use, Maintain & Upgrade, Leverage & Extend and Get Support, as illustrated in the diagram.



Finally, the heading *'works together'* focuses attention during the design process on achieving tight integration across all core technologies and interoperability with complementary technologies, with a special focus on Cloud Solutions.

Recognising that changing the environment is a key lever to change thinking, IBM invested in a network of Design Studios, they are the cultural centres of IBM Design. The studio

launched in Dublin in early 2015 is one of the flagship design studios (see [IBM design studios](#) for all locations). These studios – the one in Ireland specifically located to reach a large population of developers and solutioners - are dedicated spaces that can be constructed and deconstructed using white boards and space and are used throughout the design process to allow true collaboration for the whole product team throughout the development stages.

It was recognised that IBM staff had to be enabled to operate in this way – many companies have failed with design thinking. Enablement is therefore a key plank of activities with design camps provided for staff at all levels and in all business functions, from executives and designers themselves to product managers, engineers and even business partners. With many of these held locally in Ireland, all IBM design graduates pass through an initial three month design camp at the ‘mother ship’ design Studio in Austin, Texas.

In Ireland, for IBM’s product development, 35 designers have been recruited so far and the ultimate goal is to achieve a ratio of one designer to every 16 engineers. Care is taken to make sure that the designers in a particular product team cover different core skills, from a front end design focus on code to user research, visual design and UX design.

Design in focus



The development of the IBM Verse on mobile platform, a new business e-mail platform, offers a good example for this design process. The starting point was to explore people’s behaviours and feelings towards email - their Inbox - in today’s business world. Through speaking, observing and empathising with users the product development team discovered that much of users’ working life hinges on their e-mail; it is a social collaboration tool. But e-mail is also a burden. People feel stressed and worried that they cannot keep up with what is important and that something critical could go unnoticed. The problem that needed to be solved therefore was how to reduce the stress of email debt and give people time back in their day. With mobile devices gaining in prominence, people’s behaviours using mobile devices throughout the day both in work and at home also needed to be considered.

User research helped the team realise that email, the calendar and the actions taken from mail or meetings are all interlinked. Users prioritise them depending on the importance of the sender. Allowing the user to easily transition between these activities on a mobile device without changing context received positive validation when tested with users.

For the calendar aspect it was identified that people need to be able to manage their day on the move. They need to know at a glance, what is happening now and what is coming next. Many potential design solutions to address this were explored and tested with users. If negative feedback was received on a concept the design would be disregarded and other

solutions considered. With positive user feedback the team would develop next steps and test again. Instead of making assumptions, this iterative process allowed the team to find out at an early stage whether a design was addressing a user's needs. Failing at an early stage saved time and resources.



Throughout the product development process designers continuously worked closely with product management and engineering in design thinking workshops. The three IBM Design Thinking core practices *Hills*, *Sponsor Users* and *Playbacks* enabled collaboration between these different disciplines.

- *Hills* are the targeted market outcomes that focus on solving major user problems and provide alignment so that the entire team is working towards solving a common goal.
- *Sponsor users* are people that share many of the characteristics of the personas that embody the characteristics of users in the market and allow the whole design team to have empathy for the people they are creating the product for.
- *Playbacks* act as milestones where the team comes together to share their work based around user scenarios. Collaboration between disciplines happens on a daily basis between Playbacks, but these are a point in time when the entire team comes together to review where they are in the project against the targeted goals.

By going through the process of exploring, prototyping and evaluating designs with Sponsor users when designing the IBM Verse calendar experience, the team finally converged on a solution where people can see their day at a glance and navigate to another date in the week or month without leaving the context of the day view. Knowing behaviour patterns in detail allowed the team to find a quick input method when scheduling the duration of a new calendar event. This led to a patented design concept where a selection of durations are offered and tapping on the device alters the length and end time of the meeting.

Impacts from design

IBM's software and middleware segment delivers the highest margins and with its differentiated products and services is expected to grow. Since 2013, IBM has therefore continually strengthened its focus and investment in high-value and rapid-growth areas like business analytics, cloud computing, and smarter planet with the aim of generating 50% of its profits from the software segment. Retaining customers is therefore a key aim that the design focus is expected to deliver.

The addition of designers to the product development teams does, of course, incur a cost, but IBM is confident that in the long run the company will save cost and become more profitable. Applying design thinking eliminates the risk of poor products being released on the market and thereby avoids additional cost for support and software updates to improve the initial user experience. Ensuring an optimum user experience right from the start also

helps gain market share as the product gets recognition for the great experience it delivers to all users.

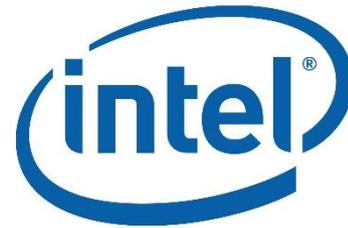
The strong design focus in IBM was reintroduced in response to people's expectations of enterprise tech, which has changed because of great design they see in devices and apps they use at work and at play. Increasingly, software for the cloud and mobile applications rely on a personal experience, an emotional connection being established between users and the product. In order to turn performance around, design is therefore a pivotal strategic tool in IBM, *'it is baked into every single part of the business.'*

Software solutions and services have to cater for the fast-growing market of mobile, social, and security tools. The investment in design is a way of adapting to a changing market environment and transforming how enterprise technology is created, with user experience at the centre. As a result of the design focus, IBM has been able to improve the response from the market and transform how the new era of software is designed, developed and used by organisations around the globe.

While quantitative results are, of course, key indicators for IBM executives, the Design Division itself monitors improvements in the qualitative feedback from the market - this is key in assessing the results achieved.

<http://www.ibm.com/ie/en/>

Intel, Ireland



Overview of the company

Intel first came to Ireland in 1989 establishing what was to become one of Europe's leading semiconductor manufacturing locations at Collinstown Industrial Park in Leixlip, County Kildare. Apart from this main campus, over the past two decades Intel in Ireland has come to represent a diversity of activities across the spectrum of Intel business. Ireland is now Intel's centre of manufacturing excellence in Europe employing a total of 5,200 staff.

The Leixlip campus is home to a semiconductor wafer fabrication facility which produces latest generation silicon microprocessors that are at the heart of a variety of platforms and technology advancements which are essential to the way we learn, live and work today.

More than 4,500 people work at the campus and in March 2014 Intel shared details of the progress of a \$5 billion campus upgrade investment at the Leixlip campus. This has been the largest private investment in the history of the Irish State.

This latest investment by Intel in the Leixlip campus brings the cumulative capital invested in Ireland over the past 25 years to \$12.5 billion.

Leixlip is also the base for a number of Intel research activities which include:

- A Silicon Nanoelectronics Research team who collaborate extensively with research institutes such as the CRANN Nanoscience Research Centre in Trinity College Dublin and the Tyndall National Research Institute in Cork. The team also collaborates with universities, other companies from across Ireland and Europe, and more than 50 PhD students (co-funded by Intel).
- The Innovation Open Lab - Ireland which is home to a research team who facilitate and engage in open research and innovation opportunities in Europe that can ultimately lead to value-driven technology solutions. The lab is focused on The Internet of Things, and Dependable Cloud & Services research. It is a member and network leader of Intel Labs Europe which has the goal of expanding the scope of Intel's European R&D activities by coordinating innovation activity and future investment against an Innovation Agenda focused on enabling a Digital Europe.

As a component manufacturer, Intel's manufacturing operation spans several continents, with wafer processing at facilities in the US, Ireland and Israel, followed by final product assembly in facilities in China, Vietnam or Malaysia. Intel performs all manufacturing stages in-house starting with the primary raw material (Silicon) and doing everything from the base piece of silicon wafer to the final Intel product.

Intel products represent the high value, central building block of many end market products in the electronics industry. Its direct customer base therefore consists of large manufacturers of end market consumer products including household names such as Nike and Samsung.

Intel Ireland is a wholly owned subsidiary of the Intel group.

Design activity in Ireland

Software design activities in Ireland include Intel Security, with significant operations in Cork since 2004. In September 2013, Intel announced a new family of products that represent a core element of Intel design activity in Ireland. Designed by a Dublin-based team, Quark products are designed for the Internet of Things (IoT) and Wearable computing space. The first Quark System on Chip (SoC) solution was launched along with the Intel Galileo Development Board which is targeted at education and maker communities and Quark based solutions were announced for IoT in Industrial, Energy and Transportation.

A mixture of Hardware and Software Engineers, the Quark team is at the cutting edge of the emerging Internet of Things (IoT) and wearable markets. The Leixlip team continues to grow playing an integral role in both Intel's Quark Solutions division and Internet of Things group.

Design in Intel is understood as the whole process from developing a new concept to the realisation of the final end market product from PCs to ATM machines and digital signs. The creation of new silicon applications will often be the starting point.

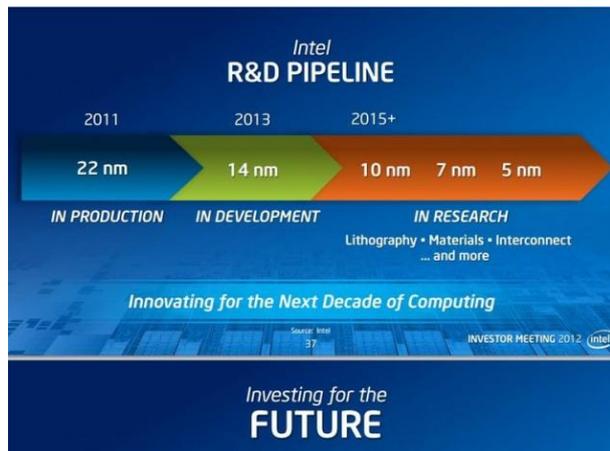
Feeding into manufacturing operations abroad as it does, Intel has adopted an eco-system friendly approach. This means that the company works closely with the downstream manufacturers of the end market products rather than 'owning' the whole supply chain up to the final consumer product. The design approach too therefore has to span the whole eco system.

The majority of new product ideas initially come from existing customers. Designing and developing new features for Intel products – from a solid state disk drive and a performance boost to cameras that recognise hand gestures - these innovations are seen as critical to drive new PC experiences.

The key challenge is to identify the most appropriate ideas to take forward. Driven largely by the market, customers' ideas are considered in a process that is likened to 'trains leaving the station'; decisions are taken regarding which features should be developed to coincide with one of two main PC buying events, Christmas and Back to School.

Accepting the constraints of the laws of physics, the available design headcount and the features requested, it is part of management's role to funnel customer requests into the design and development process. Whittling the innumerable possible combinations of features and uses down into a manageable number of use cases is the key skill required.

Design teams will take ownership of



particular features to be developed. The teams fall into two categories, design teams focusing on evolutionary developments, i.e. working on the continuous improvement of certain features (e.g. battery life), and design teams focusing on revolutionary developments. Typically, a design team focused on revolutionary features will first create an initial mini prototype product to show management what is possible.

Revolutionary and evolutionary design and development processes will usually be on a par in terms of the number and scale of projects at any one time. Under the revolutionary approach, there is an expectation that a considerable proportion of projects should fail so that the solutions that are considered and prototyped will often not ultimately come to fruition.

In terms of staff numbers, many more staff are employed in design as compared to basic 'Blue Sky' research. The central SOC / processor design team is made up of more than 20,000 staff. This is in recognition of the fact that the ultimate challenge is to convert research results into actual products.

A key challenge for the Intel design process is to gauge the most appropriate time to engage external players into the design process. In a highly competitive world, it is vital for the process to be internal for a certain period of time before the design-in phase can start in collaboration with eco system players.

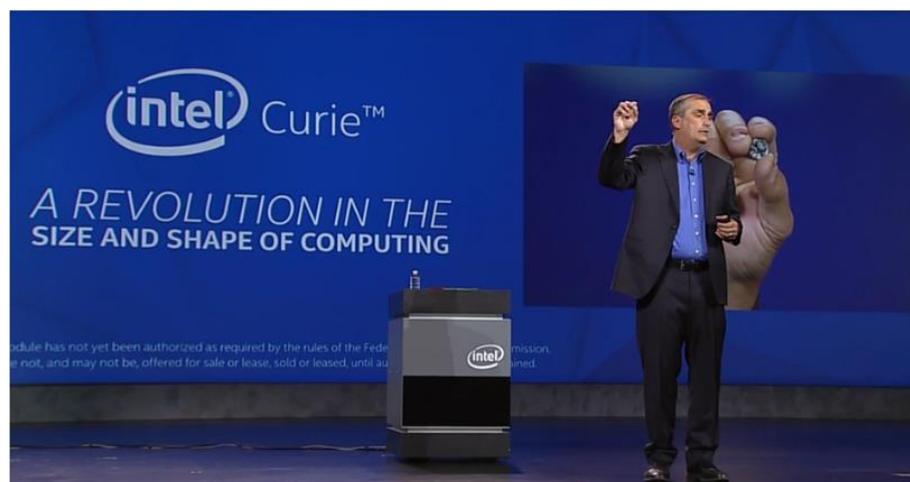
The laws of physics themselves are a further constant challenge for the Intel design teams who have to deliver more functions with each generation within a constrained cost and thermal footprint.

Design in focus

Intel® Curie™ is a recent product based upon a Quark SOC that was designed and developed by the Leixlip-based Quark team. It is a small wearable processor that can be incorporated into buttons, watches, glasses etc. for a diversity of uses in security and systems control applications.

IOT / Wearable products as a segment was identified by corporate management as an emerging market. In response, a new division was set up to oversee the development and design process.

The first stage in the design and development process, completed in early 2014, was to develop a detailed product concept. Drawing on multiple different use cases and a specification of the particular capabilities that the



team was aiming for (e.g. able to talk wirelessly), a set of key features was determined. In several iterations the design team presented the product concept to corporate level decision makers until all the required use cases had been synergised into a workable concept and product architecture.

Only then did the design team move on to focus on the implementation side of things, considering the basic properties of the new product, its size, the necessary battery capacity, the type of interface etc. This stage also involved the team in mapping out the individual features and associated costs, followed by an iterative process of considering specific design solutions until a particular platform and silicon had been determined.

As wearables are a very nascent area of activity, much of the design process would still have been framed by the two main poles of design considerations, namely the laws of physics and the market needs. Reconciling the two into a workable product concept was the key task for the design team before the process could be moved into the deployment stage.

Intel® Curie™ is a stand-alone product, but it nevertheless needs to be thought through with the wider product eco system in mind as it is the latter that ultimately reaches the end customer. The deployment design team therefore worked closely with the other eco system players.

In line with usual Intel practice, following the start of actual product manufacturing, the deployment team will focus on a small number of marquee implementations. For these, the team works closely with the manufacturer of the end product in order to further stimulate the evolutionary design process. Intel in combination with the eco system formulates further proof points for the product.

The ultimate market launch is then down to the eco system players (e.g. specific training features for a particular shoe). Following this learning phase during which the design team remains involved with the product, support teams will take over for day-to-day interactions with the eco system partners.

Impacts from design

Three main metrics are used in Intel to measure the success of the design process. The first, and narrowest, measure is whether the product functions as specified. The key question at the second level relates to how robust the design specification is in an actual manufacturing environment. Finally, the ultimate measure of the impact of design is the success of the product in the market place.

<http://www.intel.ie/content/www/ie/en/homepage.html>

Climote Ltd.



Overview of the company

Climote Ltd design and develop smart home heating controllers. The company was established in 2010/11, building on the director's experience in home automation solutions. In 2012 Climote Ltd developed its initial product concept - the Climote hub. This product enables customers to control their heating system both within the home, and externally, via text or the web. The Climote hub is one of a suite of new products under development, and is currently marketed, primarily through agreements with leading Irish and UK utilities.

The company employ circa 20 employees at its site in Dundalk, with manufacturing subcontracted to Asia. It has grown significantly since launch and secured investment to support its activities, including its development of design capacity in Dundalk. It is estimated that half of the companies' products are exported.

The company has a number of key competitors, including the US Company – NEST (owned by Google), originally established by the designer of Apple's iPod. Climote's products, and those of its competitors, form part of the emerging technology area, the 'internet of things', based on connecting everyday objects and devices to the internet, to enable the exchange of data. This is a fast moving area of technology / service development, and one that is driving the company to innovation in other products, alongside its core Climote hub.



Design activity in Ireland

The company worked with an external design house to develop the Climote hub. The company was satisfied with the work undertaken, and has subsequently sought to develop its own design capability for new product development. This has seen it recruit a specialist product designer (who has previously worked with international microphone manufacturer Rode Mic in Sydney, Australia) to work alongside a small team of engineers and software developers in the development of new products. It believes that developing its design capability in-house will enable it to contain cost, and better integrate its home automation expertise, with the design and development of new products.

Climote's design philosophy places a strong emphasis on both product styling and usability. In this respect it recognises the growing importance of aesthetics in designs such as NEST, but believes that while important, the user experience also needs to be shaped by a deep understanding of all potential user needs– not just those of 'tech savvy users':

'We have some really good innovators on our team, so we set them the challenge of solving the problem of heating controls. We were wondering if there was an

opportunity there and if we could do an Apple on heating control by making it simple and easy to use.'

The use of a sim card, for example, is one of the ways in which the company has responded to the need for a diverse range of consumers to interact with the hub, via text messages and so on.

Climote's development of design capability highlights the strategic importance attached to design in its products. This is reflected in its evolution from the use of an external design house, and focusing on competing in an increasing and innovative sector.

Design in focus

The support provided by an external design partners in the development of the Climote hub spanned the industrial design of the hub itself, brand positioning and a suite of apps. This developed the initial concept and ideas of the company and helped to create the initial prototypes. A core feature of the design created was the dial, taking design cues from smart phone devices.

The external design partners worked to design, specify, prototype and build the User Interfaces for a range of devices (web, app etc.). This sought to bring consistency across devices and platforms, allowing users to monitor heating via the Climote web portal, iOS and Android smartphones, or via text commands (see picture). Support was also accessed for Climote branding and its positioning with utility clients. All existing IP provided under this project was retained by Climote or other identified 3rd parties as appropriate. This includes patents held with respect to Ireland, the UK, US currently.

A number of other products, as noted above, are currently in development. This includes Design work for a new boiler control, of which several patent applications have been submitted.

Impacts from design

The Climote hub, launched in 2012, has subsequently won a number of awards, including Best Product of Show Award, Best Innovative Product Award and Best Controls Product Award. Its smartphone app was a runner-up in the global final of the Appy Awards in San Francisco.



Since launch the company has established trail and sales relationships with a range of key utilities including Electricity Ireland, SEE Airtricity, Power NI and Scottish Power. It is also working with social housing companies to support the introduction of heating controls. Its approach, in many cases, has been to establish pilot projects with clients, followed by subsequent commercial sales.

Product Design and R&D costs are said to be high at present for the company, given its early stage of development, and estimated to represent some 25% of sales. As the company put it:

'We fully expect our sales to increase, offsetting our costs in investing in design resources. Without this capacity it would be difficult to develop our products effectively and efficiently, and would find it difficult be competitive in our market place.'

<http://www.climote.ie/>

Cygnum Timber Frame Ltd., Ireland



Overview of the company

Cygnum is a leading Irish manufacturer of timber frames. Since 1997 the company has been engineering, designing, manufacturing and assembling the elements of a building structure: internal and external walls, mid-floors and roof structures. Their main customer groups include developers and housing associations building volume housing schemes; large contractors with public building projects; and architects and self-builders as well.



In 2005, the company opened a state-of-art manufacturing facility with a modern production line in Macroom, Co. Cork, where currently approximately 50 employees work. Cygnum's annual sales amount to about €13 million with 75% of this being exports to the UK. Design and manufacturing are undertaken in Ireland; however given its large presence in the British market Cygnum has established sales and marketing office there as well.

Design activity in Ireland

Cygnum uses specialised internal design skills that are considered central to the company's operations. John Desmond, CEO of Cygnum, uses the design analogy of creating a 'three-dimensional jigsaw' in which all elements have to match perfectly. Each project starts with architectural drawings which arrive at the Cygnum's design team from a client's architect. The building blueprints are then redrawn to check for any anomalies and subsequently every part of building's structure – walls, mid-floors and roof is designed and engineered. There can be thousands of elements which need to be manufactured and a production design is created for every one of them. That information then goes to the factory floor for production and completed elements are delivered to site. Drawings with instructions for assembly for all these elements are also provided. Design and engineering is therefore the most challenging part of the process and essential for the smooth running of the operation.

The company constantly invests in its design capacity. The design unit currently has 15 staff members consisting of qualified architecture technicians and design engineers. New designers are regularly employed and trained to fit Cygnum's specific needs. The annual spending on design amounts to circa €600,000 and is continually increasing. Almost all the design work is done by an internal unit, but the company cooperates also with the external design engineers as a part of process.

Design is key to Cygnum's strategy, because all business activities depend on design capacity. Its performance is evident during the weekly meetings of all departments, as it determines how work is running on site. The accounts department monitors design

expenditure and ensures an appropriate level of design cost per unit manufactured, however an elevated cost can result during a growth phase where there is a larger than normal number of staff in training. Recruiting designers with the right skills is the most challenging issue in Cygnum's design activity. Manufacturing is relatively easy to manage and increasing the production capacity does not pose problems as much as a need for extensive training in design to meet the company's specific requirements. It was reported that graduates with the appropriate skills are quite scarce in Ireland and tend to choose to work in other sectors, usually based in larger urban centres. The solution to this problem, it is felt, could be introducing apprenticeship schemes, more promotion from the sector and more design courses in universities in general.

Cygnum's design unit ensures not only the precision and cost effectiveness of its timber frames, but also the superior levels of energy efficiency. The experience, research and technology have allowed the company to manufacture the panels from sustainable and natural materials, which comply with the highest environmental standards. In 2013 Cygnum became the first Irish company, and one of only two in the UK and Ireland to have a certified Passivhaus system. Passive Houses are extremely well insulated and designed to be substantially heated from passive gains such as the sun's heat. Typically these houses require up to 90% less energy for heating compared to a conventional house. Many public buildings built with Cygnum's timber frames also meet the BREEAM low carbon standards (Building Research Establishment Environmental Assessment Methodology).

Design in focus



Cygnum has been involved in many very successful projects, including the Enterprise Centre at the University of East Anglia (UEA). In 2013, Cygnum were approached by the Architype Architects with an unusual challenge. Through the new building, the UEA wanted to emphasize its fine architectural legacy and commitment to environmentally friendly best building practice. The new campus building is claimed to be one of the UK's greenest building, and would not be possible without the Cygnum's design team. In six months they designed a timber frame which received Passivhaus certification and a 'BREEAM Outstanding' rating. The embodied carbon in

the UEA's Enterprise Centre is between 1/5 and 1/4 of the established best-practice benchmark for university buildings, meaning a huge saving of CO₂ over the 100-year lifetime of the building. Additionally, the timber for the timber frame structure was locally sourced from Corsican Pine grown in neighbouring Thetford Forest and the external walls are clad with wheaten straw. The project, which was worth approximately €1.8 million to Cygnum, is the UEA's showcase for the low carbon revolution in building.

<http://cygnum.ie/>

DAA International



Overview of the company

In 2014, 3.2 billion people travelled by air and this figure is set to increase to 6 billion by 2030. Last year, Dublin and Cork Airports had their highest rate of passenger growth since 2007, increasing by 6% to 23.9 million. Collectively, the two airports support an estimated 108,100 jobs and contribute €7.6 billion to Ireland's GDP. This is equivalent to 4.4% of Ireland's national economy. In response to growing demand, the business model for airport management around the world is changing. Airports used to predominately be government owned and funded but now increasingly they are migrating to private investment. Dublin Airport is a prime example of a corporatized semi-state business where the main shareholder is the Irish State represented by the Minister for Transport with an increasing share owned by private investors.

DAA International is the global arm of the DAA Group that also includes Dublin Airport, Cork Airport and ARI, operating airport retail businesses. The role of DAA International is to unlock value for airport investors through international airport operations management contracting, airport consulting and aviation training. The majority of the consulting work is internationally focused with an increasing number of clients in the Middle East, USA, India and Africa. In a small team of 12 people, designers are involved in both the business development and delivery. More than that, design, as a problem solving and explanatory tool, is an integral part of the company culture. Last year, the DAA Group's turnover increased by 13% to €564 million.



Design activity in Ireland

In the DAA Group as a whole there are over 2,500 employees with 12 employed in DAA International. The Vice-President of DAA International described it as the:

'gateway to knowledge within the broader DAA Group'

Although there is no specific design team within DAA International there are a number of professionally trained designers and design permeates the ethos and operations of the company. Designers are involved in both the business development and delivery. There are two types of design activity in DAA - branding and systems solution design. The branding element refers to the identity created by the firm. DAA International trades on the

reputation created by Dublin Airport. When investors arrive in Ireland, the traveller experience in Dublin Airport must represent the customer experience of DAA International. The systems design refers to process sequencing and designing solutions to complex challenges that are orientated around the traveller. This encapsulates user-centred design where the passenger is at the core of the solution. The customer centric model means that it's a seamless journey for the passenger even though there can be numerous and varied stakeholders involved in the travel experience.

Design in focus

The Vice President believes that design was responsible for DAA International's success in a recent multi-million euro contract to manage the operations for an airport in the Middle East for five years. The contract will involve placing 15 staff from the DAA Group into the airport for consultancy and training. In an open tender competing against five other well-known airports including the UK, Germany, Turkey, Korea and South Africa, concept and design was a significant differentiating factor in the DAA offer. The submission combined effective communication, technical, systems and crucially, user-centred design to create an all-encompassing solution for the airport authority that put the passenger at the centre of the process. The DAA submission received full marks in the technical scoring because of the visual presentation of the tender including animated film, technical specifications and infographics. Effective design transcends linguistic barriers. For winning a management contract, they use an element of communication and visual design in the tender. However, these are tools for conveying how the traveller is positioned at the centre of the whole airport operations. This is systems and user-centred design. The aim is to create a seamless experience for the traveller across multiple airport functions, operations and services - parking, transfers, check-in, baggage handling, cleaning, energy, waste management, security, retail and many others - from before departures to after arrivals. The design solution completely addressed the problem that the client had difficulty in articulating. Over the next five years, it is anticipated 15 staff from the DAA Group will manage the operations of this airport in this expanding capital city.

Impacts from Design

DAA International has been in operation for two years and is already winning significant strategic advisory service contracts from global players. Design forms an integrated element of the businesses' offer, and is perceived to have been at the heart of winning significant contracts recently. This has allowed it to increase its international activities, complementing the rest of the DAA group.



<http://www.daainternational.ie/>

Overview of the company

PricewaterhouseCoopers Ireland is the largest firm offering services across audit, tax and advisory in Ireland and advises 71% of the top 200 Irish companies and acts as auditors for 35% of companies listed on the Irish Stock Exchange. In 2014, PwC Ireland registered an annual turnover of €230 million up 7.5% from 2012. The company employs over 2,000 people and 100 Partners in seven locations: Dublin, Cork, Galway, Kilkenny, Limerick, Waterford and Wexford. Each year, PwC Ireland recruits between 220 and 280 graduates. Design is incorporated into how PwC do business – from internal and external corporate communication materials, through to digital communications, through to the strategy, integration and execution of creativity into all campaigns, through to the design of business solutions and advice for clients.

PwC globally has invested significantly in design in recent years. The core brand message ‘My relationship with PwC helps create the value I’m looking for’ is infused throughout the Global Brand and Global Digital Strategies. The cross-country Global Brand team is composed of 10 people who drive the global brand strategy and integration. Most countries have their own creative teams varying from 2-30 design or digital specialists with 7 in Ireland. Although there are global guidelines on brand, PwC Ireland can adopt its own distinct strategic values for design.



Design activity in Ireland

There are 35 people in the Business Development and Marketing department including ten senior specialists in the Creative and Content teams involved in digital content, communications, animation and user experience design (UX). Ten years ago design was seen as production and styling and now the concept of design thinking has become a strategic part of business to add more value and achieve KPIs. In only a few years the Creative team has grown from conducting small-scale internal communication activities to a fully-fledged studio. The Creative team has input into PwC Ireland’s overarching business strategy and works closely with Senior Partners. The ethos of the Creative team is ‘Design for KPIs’. According to the Creative Services Manager:

‘We aim to use design to impact business driven KPIs. We use creativity to drive our business objectives – always aiming to get the right mix of creativity versus content. And avoid doing design for design’s sake. It’s seen as a business tool’.

In addition, the Creative team conducts regular brand training for the group of 50 PAs in production and communication design. It is estimated that around 40% of the PA’s time is spent on production design working within corporate templates creating presentations and

proposals. In this way, through the training packages, the design message is infused throughout the company. At present, there is no centralised budget for design but each unit has a design budget integrated into their operations; however, PwC Ireland are looking at creating a centralised design budget to capitalise on the expertise of the Creative team.

Design in focus

One of the biggest flagship campaign projects is communicating how the Irish Government's Annual Budget will affect business operations in Ireland. Assessing the implications of Budget 2015 for PwC clients and prospective clients is as much an intelligence gathering exercise as a brand awareness exercise with a broad target audience. Design impacts all aspects of this campaign. The project involves around 60 staff from across the business as well as external expertise. As such, the Creative team must implement a rigorous design process to ensure a quality user experience. The campaign included a pre-budget video, pre-budget webpage, online tax calculator, social media campaign, ad words, vox pops, infographics, brochure, sponsorship, real-time website analysis on the night and a breakfast briefing.

As a result, the estimated number of web users was up 792% from 21,477 in 2013 to 108,242 in 2014. There was also a 21% increase in access from mobile devices. There were over 2,000 referrals from the Irish Times website. The number of attendees at the Budget briefing was up 17% from 485 in 2013 to 521 in 2014. PwC are now looking at ways to track these links back to new revenue. The estimated investment by PwC in the campaign was around €200,000 including the launch costs, ad words, external design agency costs and sponsorship. For the Creative Services Manager,

'When you are working in-house, people can underestimate how much design and creativity is involved in differentiating campaigns and projects while still operating within the parameters of the global brand.'

Impacts from design

Design is incorporated into how PwC do business. Since PwC undertook a re-branding in 2010, the global brand value has increased by 110% and in 2015, PwC were named the world's second most powerful brand by Brand Finance. In Ireland design impacts can be seen in the company's ability to secure flagship projects in areas such as the communication of key Irish policies. The company's design capability has also played an important role in its cross-cutting support for core company KPIs.

Annex 4. Questionnaire

Introduction

This survey forms part of a study of the role and importance of design to the Irish economy and is undertaken on behalf of the Department of Jobs, Enterprise and Innovation.

The survey examines four areas:

- 1. Company profile**
- 2. Definitions of design**
- 3. Use of design**
- 4. Barriers to & opportunities for using design**

The survey should be completed by a company director or a senior member of staff responsible for design. The results will be treated confidentially and will not be disclosed on an individual company basis. They will be used, in aggregate form, in the final report. It is intended that this report will be published in 2016 and made publically available.

All questions should be answered from the perspective of your company's Irish operations (for example, if your company is a multinational you should only include information about the company in Ireland).

The survey examines the nature and focus of design activity in enterprises.

The survey is designed to be completed in approximately 15 to 20 minutes. If you have any questions or concerns about completing the survey, please contact either Ioan Teifi at ioan.teifi@cm-intl.co.uk, or Dr Dylan Henderson at d.henderson@cm-intl.co.uk

Company profile

1. Profile information

Name of company

Name of person completing the survey

Your role in the company

* 2. Within which sector does your company primarily operate?

- Advanced manufacturing & engineering
- Agriculture, food & drink
- Automotive & aerospace
- Construction & energy
- Entertainment & leisure
- ICT including hardware & software
- Medical technology & pharmaceuticals
- Retail & wholesale
- Professional services, including financial services
- Telecommunications
- Other (please specify)

* 3. Is your company:

- Independent?
- Part of a multinational group?
- I don't know

* 4. Is your company:

- Irish owned?
- Foreign investor owned?
- I don't know

* 5. How many people does your company employ?

	0-10	11-20	21-50	51-100	101-250	251+	I don't know
In total	<input type="radio"/>						
In Ireland	<input type="radio"/>						

* 6. How has your company's employment changed in the last two years?(if your company is a multinational, please answer from the perspective of its Irish operations)

- Significantly decreased
- Slightly decreased
- Stayed more or less the same
- Slightly increased
- Significantly increased
- I don't know

* 7. If your company exports, how has the value of exports changed in the last two years?(if multinational, please answer from the perspective of your Irish operations)

- Significantly decreased
- Slightly decreased
- Stayed more or less the same
- Slightly increased
- Significantly increased
- I don't know
- We do not export



* 8. How many years has your company been operating in Ireland?

- Less than 1 year
- 1-4 years
- 5-9 years
- 10 years or more
- I don't know

* 9. Has your company developed a new or improved product or service in the past two years?

- Yes, we have developed new products/services
- Yes, we have improved existing products/services
- No
- I don't know

Definitions & use of design (A)

10. "Design" is understood by individuals and organisations to cover a broad range of activities and outputs. What does design mean to your company? *(select all that are appropriate to your company)*

- Its key output is styling and aesthetics
- It develops utility of function and form
- It's creative problem-solving
- It's a process for new product/service development
- It's a method for assessing user needs
- It enables innovation & competitiveness
- I don't know
- Other (please specify)

11. How important is design for the development of new/improved products or services in your company?

- Very important
- Quite important
- Neutral
- Not very important
- Not important at all
- Not applicable

* 12. Is design discussed at Board level or part of your business planning process?

- Yes
- No
- I don't know



13. Does a member of the Board have a specific responsibility for design?

- Yes
- No
- I don't know

If yes, please provide the Board member's role or position

* 14. How does your company manage its design activity? *(please select all answers that are relevant)*

- Design activity is undertaken by an in house design function
- Design activity is spread across other business functions
- Design is undertaken by external design consultants
- There has been no internal or external design activity by the company to date

Questions 15 to 19 are duplicates, and were included to improve question routing. They have been removed from here to provide a simplified version of the questionnaire.

20. Has your company used design to develop a new/improved product or service in the past two years?

(please select all that apply)

- Yes, we used design to develop new products/services
- Yes, we used design to improve existing products/services
- No, design has not been used to develop new/improved products/services
- I don't know

21. How many employees have a design role in your company (either as part of their role or as a full time role)?

	0-10	11-20	21-50	51-100	101-250	251+	I don't know
In total	<input type="radio"/>						
In Ireland	<input type="radio"/>						

22. Which business functions employ staff with a design role? (please identify all that are relevant)

- In-house design
- Product or service development
- Customer service
- Business development
- Marketing / Communications
- I don't know
- Other (please specify)

23. Approximately how much did your company spend on internal (staff salaries etc) and external design expertise in 2014 in Ireland?

	€0	€1-€10,000	€10,001-€50,000	€50,001-€100,000	€100,001-€250,000	€250,001-€500,000	More than €500,000	Don't know
Internal	<input type="radio"/>							
External	<input type="radio"/>							



24. How has spending on design in your company changed in the last two years?

- Significantly decreased
- Slightly decreased
- Stayed more or less the same
- Slightly increased
- Significantly increased
- I don't know

25. Under which budget line in your company are design costs included? *(please indicate all that are relevant)*

- Marketing/communication budget
- Product/service development budget
- Business development budget
- Customer services budget
- Corporate governance budget
- Dedicated design budget
- There is a design budget but it would be difficult to isolate
- There is no budget for design activities
- I don't know
- Other (please specify)

26. How do you expect spending on design in your company to change in the next two years?

- Significantly decreased
- Slightly decreased
- Stayed more or less the same
- Slightly increased
- Significantly increased
- I don't know



27. Do you have any additional comments on design spending/investment by your company?

28. What type of design activities does your company undertake *please indicate all that are relevant, and whether these are undertaken internally and/or purchased externally*?)

	internally	purchased externally
Communication/digital/web design	<input type="checkbox"/>	<input type="checkbox"/>
Industrial/engineering design	<input type="checkbox"/>	<input type="checkbox"/>
Software design	<input type="checkbox"/>	<input type="checkbox"/>
Packaging design – graphic and product design	<input type="checkbox"/>	<input type="checkbox"/>
Service/user experience design	<input type="checkbox"/>	<input type="checkbox"/>
Universal design	<input type="checkbox"/>	<input type="checkbox"/>
Ecodesign	<input type="checkbox"/>	<input type="checkbox"/>
Strategic design	<input type="checkbox"/>	<input type="checkbox"/>
Design management	<input type="checkbox"/>	<input type="checkbox"/>
Interior/exhibition design/architecture	<input type="checkbox"/>	<input type="checkbox"/>

Other (please specify)

29. Has your company engaged in design collaboration with other partners?*(please select all that apply)*

- Yes, the company has engaged in design collaboration with other companies
- Yes, the company has engaged in design collaboration with third level institutions and/or public research institutes
- No, the company has not engaged in design collaboration
- I don't know

* 30. How would you describe the role of design in your company? *please select one answer only*

- Design does not play any role in the development of products/services.
- Design is used to give products/services a stylish appearance, an aesthetic touch or attractive packaging.
- Design plays an important role throughout the development process. It makes products/services attractive, but functionality is design's priority.
- Design is a key factor in the company management and philosophy. It plays an important role in both product/service development and strategic management.



31. At which stages of the product/service development process does your company use design? *(please indicate all stages that are relevant)*

- Planning phase
- Market/user analysis
- Idea generation
- Concept development
- Detail design
- Prototyping
- Manufacturing/implementation stage
- Market introduction
- Advertising, packaging or promotional activities
- At every stage of development
- I don't know

32. Has your company developed any of the following forms of intellectual property (IP) in the past two years with input from design or a designer? *(please indicate all that are relevant)*

	Yes	No	I don't know
Trademark	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Patent	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Industrial design	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Trade secrecy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Copyright	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)



33. In the last five years, has your company won a design award?

- Yes
- No
- I don't know

If yes, please specify

Future use of design

* 34. Is your company expecting to undertake any design activity in the next two years?

- Yes
- No
- Possibly
- Don't know

35. What type of design activities does your company expect to undertake in the next two years? (please indicate all that are relevant, and whether they are likely to be undertaken internally and/or purchased externally)

	internally	purchased externally
Communication/digital/web design	<input type="checkbox"/>	<input type="checkbox"/>
Industrial/engineering design	<input type="checkbox"/>	<input type="checkbox"/>
Software design	<input type="checkbox"/>	<input type="checkbox"/>
Packaging design – graphic and product design	<input type="checkbox"/>	<input type="checkbox"/>
Service/user experience design	<input type="checkbox"/>	<input type="checkbox"/>
Universal design	<input type="checkbox"/>	<input type="checkbox"/>
Ecodesign	<input type="checkbox"/>	<input type="checkbox"/>
Strategic design	<input type="checkbox"/>	<input type="checkbox"/>
Design management	<input type="checkbox"/>	<input type="checkbox"/>
Interior/exhibition design/architecture	<input type="checkbox"/>	<input type="checkbox"/>

Other (please specify)

Barriers to & opportunities for using design

* 36. Does your company face any barriers to using design?

- Yes
- No
- I don't know

37. What are the main barriers? *(please select up to 3 from the following list)*

- Understanding how design can add value to our business
- Writing a design brief
- Recruitment of relevant design skills

- Managing the design process
- Evaluating the impact of the design investment
- Financial constraints
- Time constraints
- Design is not relevant to our business
- Access to external design expertise
- I don't know
- Other (please specify)



38. To what extent do you agree with the statements below? (please consider all statements in the list)

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
Investment in design increases a company's profitability.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Design can increase customer satisfaction.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is more effective to buy external design services than employ a designer.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In our industry sector it is important to invest in design.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In Ireland, there are not enough relevant skills to meet the demand for design in coming years.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Design can increase export share.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Design is part of R&D.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Design is separate to R&D.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Design can be a driver of innovation.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is important that Irish businesses have a reputation for design.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

* 39. Could state support help to increase the use of design in your company?

- Yes
- No
- We are not interested in increasing the use of design in our company



40. What type of support do you believe could best help your company to increase their use of design? (please select up to 3 from the following list)

- Training/mentoring to build capacity for design in your company
- Grants/subsidies to invest in design
- Tax credits to invest in design
- Advice for finding/procuring/managing design expertise
- Internships for design students/graduates to work in our company
- Funding for an experienced designer to work in our company for 6-12 months
- Events to connect our company to designers
- Support to attend international design trade missions
- I don't know
- Other (please specify)

End of questionnaire

41. The results of this survey will be included in the final report which is intended be made publicly available. However, if you would like a compilation of the results, please state so here:

- I would like a compilation of the results
- I don't want/need a compilation of the results

If you would like a compilation of the results, please provide an email address so that we can get back to you.

You have reached the end of the questionnaire, thank you very much for your time.

If you would like to offer any additional comments, please do get in touch with the evaluation team at CM International on 029 20 389 597 or ioan.teiff@cm-intl.co.uk.