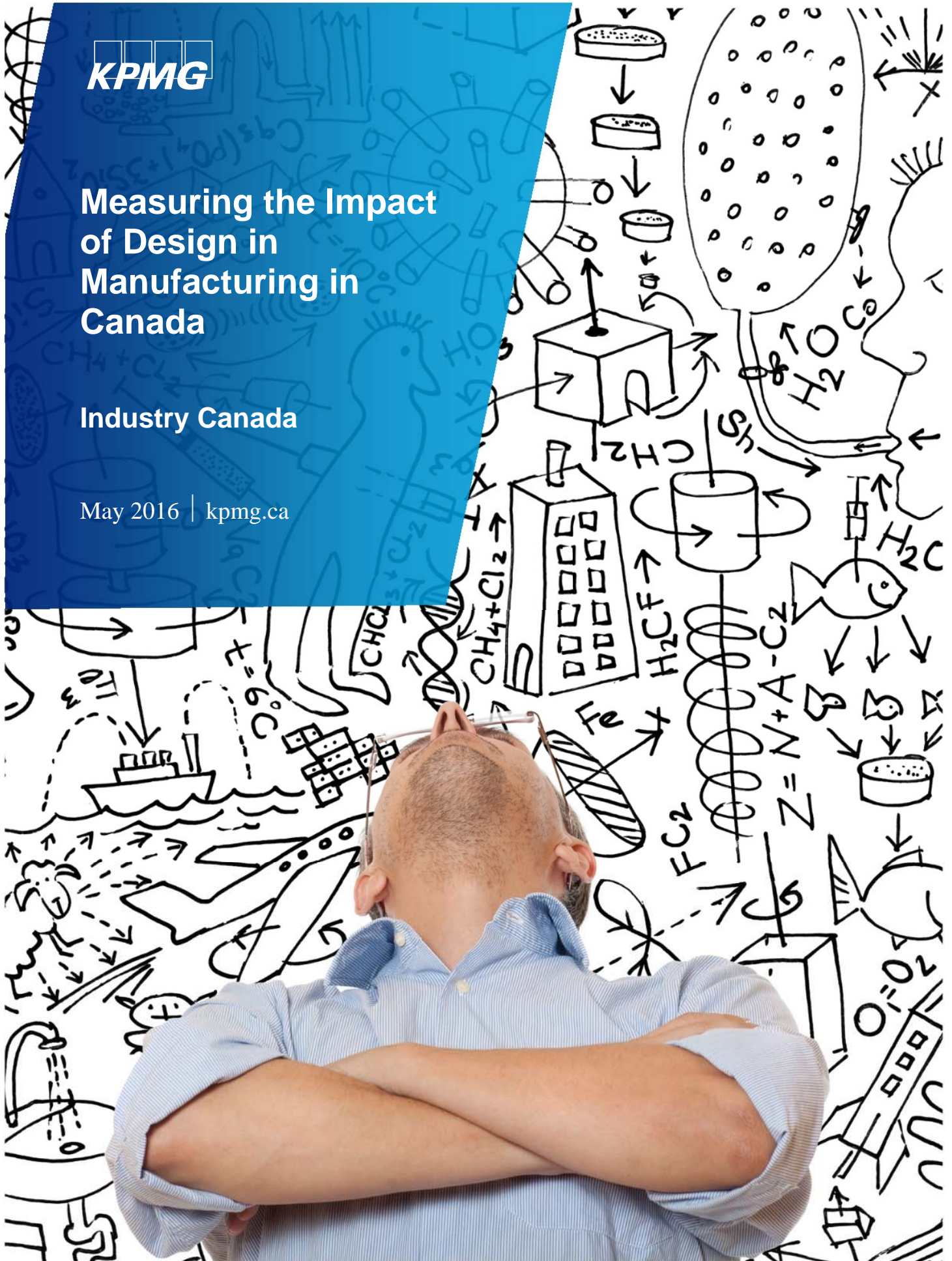




Measuring the Impact of Design in Manufacturing in Canada

Industry Canada

May 2016 | kpmg.ca







Glossary

BERD	Business Expenditures on Research and Development
DIAC	Design Industry Advisory Committee
GDP	Gross Domestic Product
GTA	Greater Toronto Area
GTMA	Greater Toronto Marketing Alliance
MPI	Martin Prosperity Institute
NAICS	North American Industry Classification System
R&D	Research and Development



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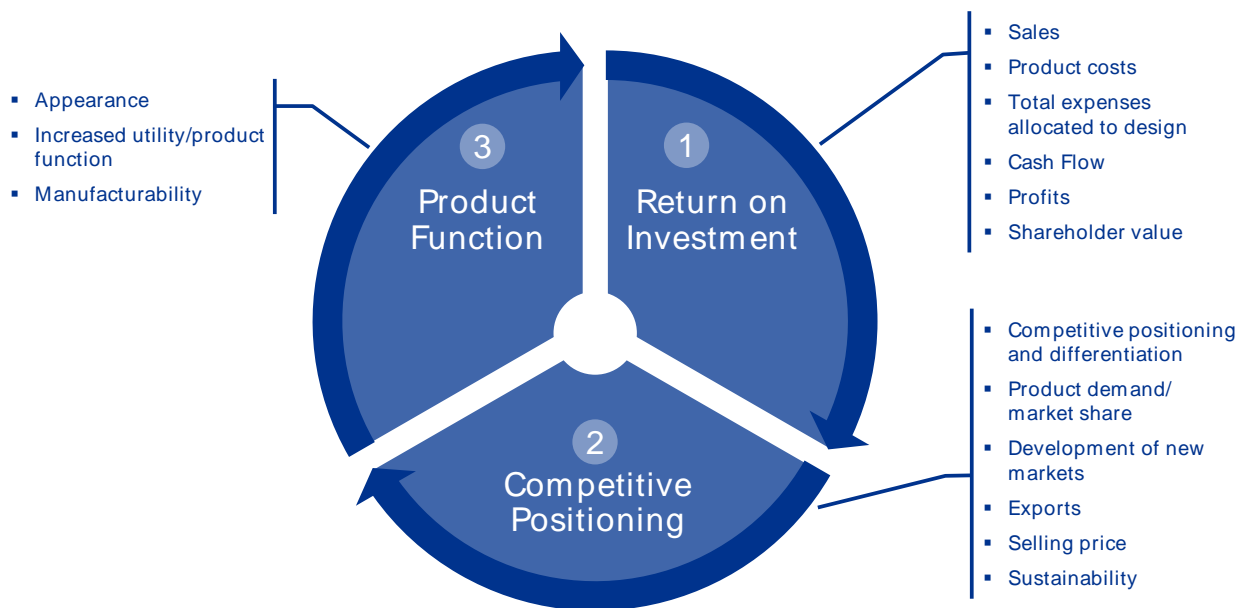
1. Executive Summary

KPMG LPP (KPMG) was engaged by Industry Canada to perform a study to fulfill the following two objectives:

- Assess the impact of investing in product design and branding on the competitiveness of manufacturers; and
- Determine the competitive advantages of product design, and its role in innovation and in integrating global value chains for Canadian manufacturers.

Graphic and Industrial design within the manufacturing industry can act as a driving force of the manufacturing process due to its use from strategic planning, conceptual design and manufacturing, to maintenance and repair, including end of life processing. The key findings of this study are the following:

- Various studies have looked at the impact of design on the manufacturing industry in Canada and globally, but none have been able to accurately quantify the impact of design.
- Generally, innovation studies and strategies rarely discuss the link between design and innovation. While this study provides a starting point for discussing the link between Graphic and Industrial design and innovation, including design as a contributor to innovation and competitiveness in broader innovation studies would be relevant.
- The metrics most relevant to measuring the impact of design on the Canadian manufacturing industry can be divided into three main categories:
 - Return on investment;
 - Impact on competitive positioning; and
 - Impact on product function.



- It is difficult to derive conclusions that apply to both the use of Graphic and Industrial design because the two disciplines are used for different purposes and in different phases of the product development cycle. The use of Graphic and Industrial design services varies significantly based on the size of the organization, its business model, its industry sector, and its target markets.
- The role of Graphic designers within manufacturing firms is most often limited to the marketing function. However, some firms also mentioned using Graphic designers outside of the marketing function and as part of the product development process for the development of the visual components of products.

- The role of Industrial designers within manufacturing firms relates exclusively to the product design and development function. Industrial designers are used to generate new product ideas, develop designs and concepts, and optimize the aesthetic, utility and manufacturability characteristics of products.
- Most often, Graphic designers are part of the company's marketing team, while Industrial designers are part of the company's product development or R&D team. Some companies have dedicated design departments.
- While the majority of firms interviewed possess internal design capabilities, most companies also hire external design firms for specific purposes or when demand surpasses internal capacities.
- The main takeaway from discussions with interviewees and focus group participants is that both Graphic and Industrial design are critical elements of the product development process and add a significant level of value if they can successfully introduce design at the front-end of the product development process.
- While the value of design is widely recognized, none of the firms interviewed measured the return on design investment independently from other business functions. Firms interviewed stated the following reasons for not measuring the return on design investment:
 - Design is integral to the company's operations and to its success in the marketplace and there is no need to specifically measure its return;
 - Design is well supported within the firm at the strategic level and it is not necessary to justify design investments;
 - Without design, the company would simply not exist; and
 - Design overlaps and is intertwined with all product development activities, including R&D, engineering and marketing activities, and the return on design investment would be extremely difficult to isolate from other business functions.
- Although firms do not specifically track and measure return on design investment, all firms interviewed stated significant impacts from design on their competitive position, and on their product's aesthetic, utility and functional characteristics.
- Firms also argued that Graphic and Industrial design can add value to the manufacturability of their products and increase the firm's productivity through the development and implementation of more efficient product development and manufacturing processes. The use of design services provides benefits that go beyond the aesthetic and functional characteristics of products.
- All firms interviewed described a link between design and innovation. According to interviewees, they could not attain competitive levels of innovation without the use of internal or external design services.
- Most firms stated that they were indeed part of a GVC. In fact, the majority of companies interviewed either had suppliers or outsourced certain manufacturing functions offshore. These companies were asked to describe the role played by design within those GVCs in terms of access to GVCs, bargaining power of suppliers, and bargaining power of customers. Most firms interviewed saw no clear link between design and their capacity to enter GVCs outside of the relationship between design and their capacity to enter new markets and to export to foreign countries. However, most firms saw a link between their design process and their relationships with suppliers.



2. Introduction and Objectives

2.1 Introduction

A major transformation is coming to the global manufacturing sector, led by the forces of technology, innovation and new innovators. As a result, the pace of innovation is accelerating and new disruptive innovators are revolutionizing new product development, manufacturing processes, automation and business models. This, in turn, will drive the need for more agile, transparent and demand-driven supply chains and integrated business planning models. Manufacturers will need to make bigger efforts on research and development (R&D), with broader, more inclusive innovation models and tech-savvy partners to help them capitalize on breakthrough innovation opportunities. At the same time, manufacturers will also need to invest in technology and talent or risk losing the innovation battle.

The Canadian manufacturing industry faces global competitive pressures as productivity, automation and innovation levels continue to increase. Canadian manufacturing companies face challenges in terms of their capability to generate viable product ideas and translate them into commercial success. Canadian innovators realize commercialization success equal to their level of creativity and innovation, and to their level of investment in R&D. Could graphic and industrial design significantly improve creativity, innovation, competitive positioning, and commercial success? Some argue that challenges can be more easily overcome with a focus on strategic design. Unfortunately, comparative studies have demonstrated that the lack of the effective use of design is a weakness for the Canadian manufacturing industry compared to its global peers.¹

This report presents an assessment of the value of graphic and industrial design to the Canadian manufacturing industry, in particular how investments in design impact financial performance, competitiveness, innovation, and integration in global value chains. It is expected that this analysis would ultimately contribute toward the development of strategic and evidence-based advice on product design as a value-added activity of manufacturing.

2.2 Objectives of the Study

KPMG LPP (KPMG) was engaged by Industry Canada to perform a study to fulfill the following two objectives:

- Assess the impact of investing in product design and branding on the competitiveness of manufacturers; and
- Determine the competitive advantages of product design, and its role in innovation and in integrating global value chains for Canadian manufacturers.

2.3 Scope of Work

The scope of this study covers Graphic and Industrial Design as they apply to the Canadian manufacturing context. The definitions of Graphic and Industrial design used for the purpose of this study are based on the North American Industry Classification System (NAICS):

Graphic Design (NAICS 54143): This industry comprises establishments primarily engaged in planning, designing and managing the production of visual communication, so as to convey specific messages or concepts, clarify complex information or project visual identities. These services include designing the visual layout of printed materials, web pages, packaging labels and graphics, advertising, signage systems, logos and corporate identification.

Industrial Design (NAICS 54142): This industry comprises establishments primarily engaged in creating and developing designs and specifications that optimize the function, value and appearance of products. These services can include the determination of the materials, construction, mechanisms, shape, colour, and surface finishes of the product, taking into consideration human needs, safety, market appeal and efficiency in production, distribution, use and maintenance.

¹ Design Management Group, Institute for Manufacturing, University of Cambridge (2011). International Design Scoreboard: Initial indicators of international design capabilities

The scope of the study includes general manufacturing with a focus on the following sectors, as defined by NAICS:

Motor vehicle and parts manufacturing (NAICS 3361-3363 and 326193): This industry group comprises establishments primarily engaged in manufacturing motor vehicles and parts, including engines, for transporting people and goods. Establishments that rebuild motor vehicle parts are included in this industry group, in the same industry as the manufacture of new parts.

Aerospace product and parts manufacturing (NAICS 3364): This industry comprises establishments primarily engaged in manufacturing aircraft, missiles, space vehicles and their engines, propulsion units, auxiliary equipment, and parts thereof. The development and production of prototypes is classified in this industry, as is the factory overhaul and conversion of aircraft and propulsion systems.

Pharmaceutical and medical manufacturing (NAICS 3254): This industry group comprises establishments primarily engaged in manufacturing drugs, medicines and related products for human or animal use. Establishments in this industry may undertake one or more of several processes, including basic processes, such as chemical synthesis, fermentation, distillation and solvent extraction; grading, grinding and milling; and packaging in forms suitable for internal and external use, such as tablets, vials, ampoules and ointments.

Food and beverage manufacturing (NAICS 311-312): This industry comprises establishments primarily engaged in producing food for human or animal consumption and manufacturing beverages.

Consumer products manufacturing (NAICS 313-316, 323, 3256, 3322, 3351-2, 3369, 337 and 339): This industry group comprises establishments primarily engaged in manufacturing the following:

- Textile, clothing, leather and allied product manufacturing (NAICS 313-316)
- Furniture and related product manufacturing (NAICS 337)

2.4 Approach



The Design Industry Advisory Committee (DIAC) acted as Subject Matter Professionals on this research, conducting some of the interviews and providing information, insights and contacts during the various steps of the research process.

DIAC is a non-profit, cross-disciplinary design research group established in 2001 by the City of Toronto. DIAC research and programs focus on ways to leverage the capability of designers to achieve economic and social prosperity. DIAC's board represents the design associations in Ontario:

- Association of Chartered Industrial Designers of Ontario (ACIDO)
- Association of Registered Graphic Designers of Ontario (RGD)
- Association of Registered Interior Designers of Ontario (ARIDO)
- Ontario Association of Architects/Toronto Society of Architects (OAA/TSA)
- Ontario Association of Landscape Architects (OALA)
- Fashion Industry Liaison Committee (FILC)

The approach used for this study followed the three steps outlined below:

Step 1: Literature Review

KPMG performed a thorough literature review to assess design services as they apply to the manufacturing industry, as well as a review of existing studies pertaining to the impact of design on the manufacturing industry in Canada

and globally. This review also included literature related to competitiveness and innovation in the Canadian manufacturing context.

Step 2: Interviews with Key Organizations

KPMG and Industry Canada, with the help of DIAC and industry associations, identified a number of manufacturing firms active in the sectors mentioned under section 2.3. Participants were selected based on the manufacturing industry sectors targeted, their size and geographic location. Interviews were carried out through phone interviews. An interview guide, prepared by KPMG in collaboration with Industry Canada, was used throughout the interview process.

The interview guide covered questions relating to the following areas:

- Use of design services;
- Design departments;
- Use of external design firms;
- Product development cycle;
- Measuring the return on design investment;
- Measuring the impact on competitive positioning;
- Measuring the impact on product function;
- Assessing the relationship between design and productivity;
- Assessing the relationship between design and innovation;
- Measuring the impact of design on sustainability; and
- Measuring the impact of design on global value chains.

A complete version of the interview guide can be found in Appendix B.

Step 3: Focus Group

The findings and results from the previous activities were reviewed by a focus group through structured discussions. Participants were selected by Industry Canada, KPMG, and DIAC based on their geographical location and area of expertise as it relates to design and manufacturing. Participants represented DIAC and the following industry associations:

- Association of Canadian Industrial Designers of Ontario
- Association of Registered Graphic Designers
- Canadian Apparel Federation
- Institut de développement de produits
- Quebec Furniture Manufacturers Association

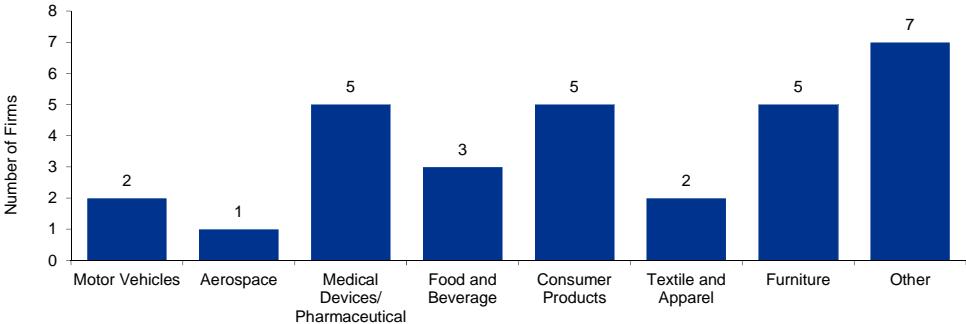
In addition, KPMG consulted the following industry associations:

- Food and Consumer Products of Canada
- Canada Medical Technology Companies
- Aerospace Industries Association of Canada
- Automotive Industries Association of Canada

2.5 Sample

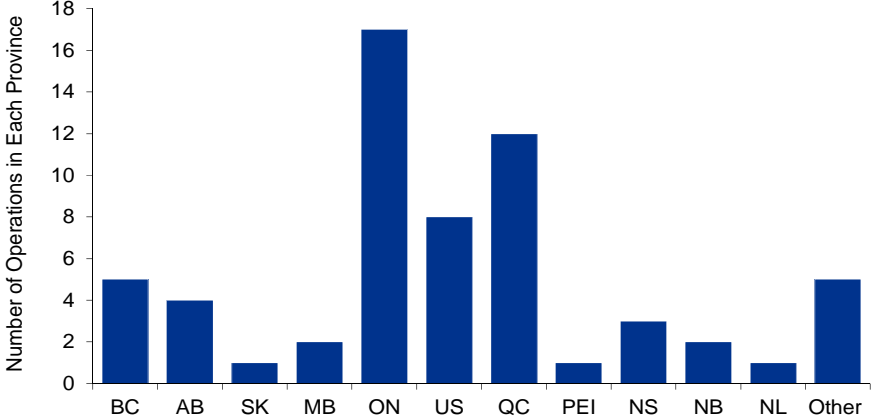
A total of 30 interviews were conducted with firms from various sectors of the manufacturing industry. The distribution of firms across sectors is presented in the following graph:

Number of Firms Interviewed By Sector (n=30)



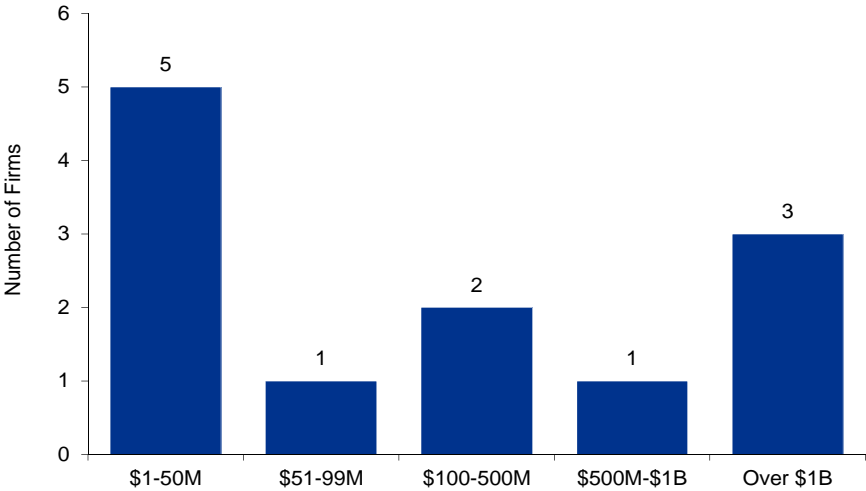
Included in “Other” were companies operating in the following industries: general manufacturing, water slides manufacturing, tools, equipment or machinery manufacturing, as well as space and marine industry manufacturing. Only three of the companies interviewed have headquarters located outside of Canada (all in the U.S.); the rest are Canadian-owned companies. Interviewees were asked to identify the geographic locations of their firm’s operations in Canada. As depicted in the following graph, operations are distributed across Canada, with the majority of firms possessing operations in Ontario and Quebec. (It should be noted that most firms possess more than one facility.)

Number of Operations by Province

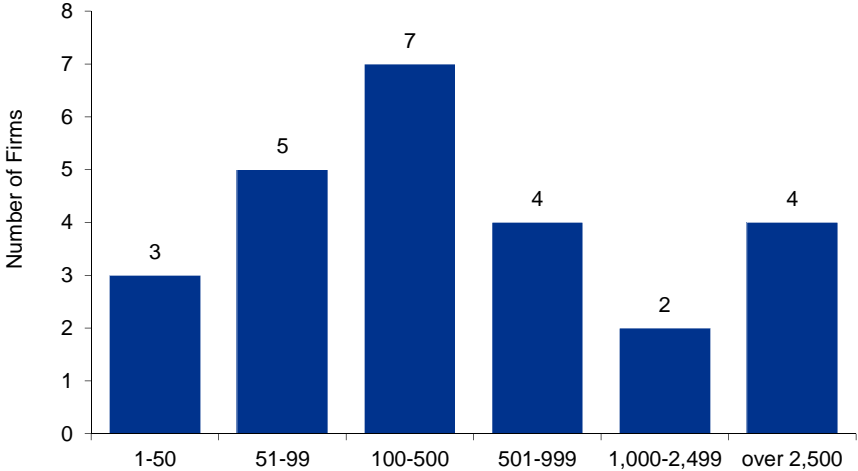


In terms of size, the sample of firms included a range of companies, including small, medium and large enterprises, as presented in the following revenue and employee distribution graphs.

Revenue Distribution



Employee Distribution



2.6 Limitations

Sample Selection

The target number of participants for this study was established by Industry Canada, and the sample was identified by Industry Canada with the help of DIAC and industry associations. The sample selection process was not derived by random selection, nor from a statistical method. As such, the sample does not allow the direct extrapolation of results to the manufacturing industry as a whole. In addition, it should be noted that many of the companies identified were selected based on their use of design services and were likely to be strong supporters of design. However, a few of them did not use design services, which is reflected in the number of answers received for each question. The sample selection process ensured that variations in terms of geographic distribution, firm size, and manufacturing sectors were taken into consideration. Although not scientific, the methodological approach allows for the description of the use and value of design services in the manufacturing industry and for the identification of trends. Due to the small sample size, these results should be used for a general assessment of the situation and not as precise numbers to be used for extrapolation purposes.

Data Verification

The data collected was provided by interviewees and KPMG did not perform a verification of the data.

Canadian Operations

Respondents were asked about their Canadian operations only. Therefore, results presented in this report refer to their use of design services within Canada only.

Findings from Interview Process

Findings from the interview process are presented throughout the report. As previously mentioned, a total of 30 interviews was conducted with firms from various manufacturing sectors. However, it should be noted that the total number of respondents for each question varies based on the number of responses obtained. In some cases, interviewees refused to answer certain questions for confidentiality reasons or unavailability of information. In other cases, some questions did not apply to the firm being interviewed. This explains the variations in the total number of respondents presented for each question.

Quantitative and Qualitative Metrics

The initial objective of this study was to attempt to quantitatively measure the impact of investments in graphic and industrial design on a company's competitiveness. However, interviews demonstrated that the majority of manufacturing firms do not specifically measure the return on design investment. Therefore, the findings presented in this study are qualitative in nature.

3. Context: The State of Innovation in Canada

3.1 Context

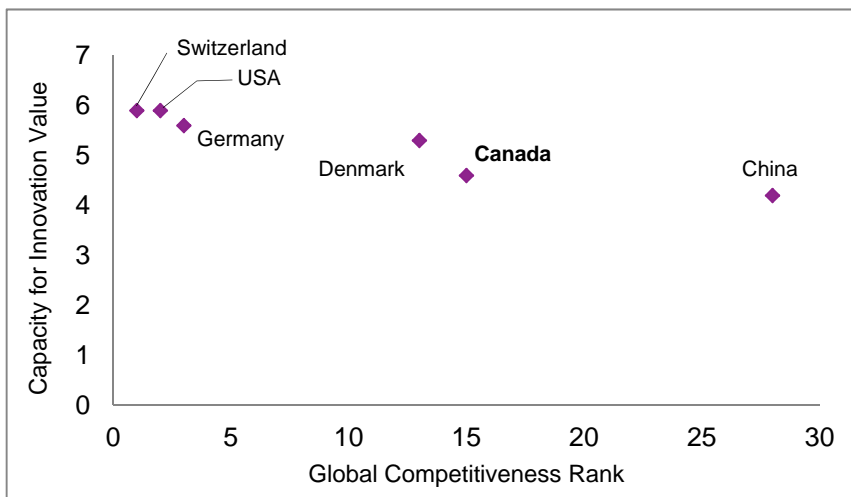
This section presents an overview of the state of innovation in Canada based on a high-level literature review. The objective of this section is to provide some context in terms of Canada's global position in relation to innovation and competitiveness and to pave the way for a discussion of the relevance of graphic and industrial design investments in the Canadian manufacturing industry.

Globalization has created a highly competitive economic environment fueled by rapid and often disruptive technological change. Innovation increasingly drives economic prosperity and fuels advances that improve societal wellbeing. A sustainable competitive advantage in innovation is viewed as the path to success in the global knowledge-based economy.

3.2 State of Innovation in Canada

According to the World Economic Forum, Canada's business enterprise expenditures on R&D (BERD) intensity (i.e., BERD as a share of gross domestic product) dropped further between 2006 and 2013, to the point where Canada ranked 26th among international competitors, as presented on the following chart, and sat at 36 percent of the threshold of the top five performing countries. The following graph presents Canada's position globally in terms of competitiveness and Capacity to Innovation Value and depicts the country's capacity to design and develop cutting-edge products and processes to maintain a competitive edge and to move toward higher value activities. The Capacity to Innovation value is based on the levels of public and private sector investments in R&D, protection of intellectual property, high-quality scientific research institutions and competition and access to venture capital and financing for innovation. The Global Competitiveness rank is based on the nation's infrastructure, economic growth, health and primary education, labor market efficiency, and business practices. Unfortunately, this ranking does not take design into consideration.

Canada's Global Competitiveness Rank (2015)²



Source: World Economic Forum, Global Competitiveness Index 2015

² 2015 World Economic Forum Global Competitiveness Ranking

According to Canada's Science Technology and Innovation Council, Canada's most profound and urgent innovation challenge lies in increasing the number of firms that embrace and effectively manage innovation as a competitiveness and growth strategy. While Canada maintains a solid foundation in the quality of knowledge production and its educated population, the country cannot be complacent. Maintaining and enhancing excellence requires that investments keep pace with those of competing countries. Responsibility for reversing Canada's business innovation performance and growing its knowledge and talent advantages rests with all players in the innovation ecosystem.

In 2014, according to Canada's Science, Technology and Innovation Council,³ Canada's lagging business innovation performance has continued to deteriorate despite ongoing efforts. Canada has fallen further behind its global competitors on key performance indicators, reflected most tellingly in private-sector investment in R&D. The country appears to be lagging behind its peers due to the following factors:

- Canada invested less in business R&D as a share of gross domestic product (GDP) than many other advanced economies falling from 18th position in 2006 to 26th in 2013.
- Canada was in the middle position in information communication technologies investment intensity ranking 13th out of 30 countries in 2013.
- In 2013, Canada performed poorly in absorbing innovation into the labor force, ranking 22nd out of 43 countries in innovation occupations throughout the economy.

Canada's Science Technology and Innovation Council benchmarks Canada performance based on:

- Private sector investment in innovation through indicators related to investment such as R&D, Information and communications technologies and talent;
- Funding environment for business innovation including both government and venture capital funding; and
- Introduction of product and process innovations.

To address Canada's innovation performance challenges, the Science, Technology and Innovation Council recommends that Canada:

- Close the gap on firms' investment in innovation;
- Redress the imbalance of direct and indirect government funding for business R&D, to provide greater direct support for high-risk, high-reward business R&D;
- Embrace risk and ambition;
- Boost higher education expenditures on R&D to keep pace with other countries' support for "intellectual infrastructure"; and
- Invest strategically, further focusing government funds to build globally competitive critical mass in targeted areas.

The Conference Board of Canada conducted in 2015 a study entitled "How Canada Performs: A report Card on Canada," which showed that, with comparatively less innovation, Canada's economic, environmental, and social systems stagnate and that the country's performance deteriorates in comparison with its peers. To measure Canada's innovation performance, the Conference Board of Canada used the following indicators:

- Public R&D: resources and expertise required to provide a strong foundation for scientific progress and the exchange of ideas.
- Ease of entrepreneurship index: an indicator of the extent to which the business and policy environments support new ventures.
- Venture capital investment and business enterprise expenditures on R&D (BERD): investments made by businesses and other investors to further develop ideas and implement productivity-enhancing technology as well as early steps taken by entrepreneurs to start new ventures.
- Patents and enterprises entry rates: indicators which signal that the innovation process has resulted in products, services or processes worth protecting and new ventures worth starting.

³ Canada's Science, Technology and Innovation System: 2014 Canada's Innovation Challenges and Opportunities

- Labor productivity: is an overarching indicator of innovation performance. Improvements in labor productivity are the result of a number of factors, but innovation plays an important role. As a measure of the efficiency in converting inputs (e.g., expertise, technology, processes) into useful outputs in the production, marketing, or delivery of goods and services, productivity captures the gains of innovation.

Based on this study, Canada ranks 9th out of 16 peer countries.

3.3 Design as a Contributor to Innovation

In this context, the Canadian manufacturing industry could benefit from rethinking Industrial and Graphic design and their strategic importance for value-adding processes as they emerge as an important component of a firm's strategic approach and competitiveness. As derived from interview findings, Canadian manufacturing firms aspiring to establish themselves as market leaders are espousing Industrial and Graphic design as part of their corporate culture by integrating them in their branding and product development processes in the interest of differentiating their product offering and improving the efficiency of their manufacturing processes. Firms that are using Industrial and Graphic design in the Canadian manufacturing sector argue that they stand out because they have a differentiation strategy that revolves around design and solve customers' problems by integrating Industrial or Graphic design into their production process which in turn allows them to enhance their level of global competitiveness. The interview process performed for this study showed that firms investing in Graphic or Industrial design view design as a clear accelerator of innovation and competitiveness. Therefore, as efforts are made to improve the level of innovation and competitiveness for Canadian manufacturing firms, the use of Graphic and or Industrial design should potentially be included as a contributor. Unfortunately, as described above, it appears that most innovation studies and measures do not attempt to measure the importance of Graphic and/or Industrial design to innovation. Section 10 presents the findings of this study as they relate to the impact of graphic and industrial design on firm competitiveness.



4. Graphic and Industrial Design in Canada

4.1 What is Graphic and Industrial Design?

The role of designers is to create products and systems that optimize function, value and appearance for the mutual benefit of users and manufacturers. Designers develop products and systems through the collection, analysis, and synthesis of data guided by the special requirements of clients and manufacturers.

The traditional concept of design, considered as a purely artistic activity used for creating goods for niche markets is obsolete in the global competitiveness context because of the changing nature of commercial competition, consumption and production.⁴

Continuous investment in people, innovation and technology has become hardwired across the manufacturing sector and focus on design is becoming ever more important, as discussed by firms throughout the interview process.⁵

Graphic designers are primarily engaged in planning, designing and managing the production of visual communication, so as to convey specific messages or concepts, clarify complex information or project visual identities. These services include the design of printed materials, web pages, packaging labels and graphics, advertising, signage systems, logos and corporate identification.⁶ Graphic Design contributes to product success through branding, and a clear and compelling articulation of product features, benefits and uses in on-product labeling, print material, packaging and an online presence.⁷

Industrial designers are primarily engaged in creating and developing designs and specifications that optimize the function, value and appearance of products. These services can include the determination of the materials, construction, mechanisms, shape, color, and surface finishes of the product, taking into consideration human needs, safety, market appeal and efficiency in production, distribution, use and maintenance.⁸ Industrial Design starts by understanding user needs and desires via design research, and then reflects those needs and desires in product design; or in the way products look and how they interact with users. The industrial designer is responsible for making products unique, compelling and desirable to consumers and other users and customizing products for export to other markets.⁹

4.2 Graphic and Industrial Design in Canada

The Canadian design services sector comprises establishments primarily engaged in providing design services, excluding architectural, engineering and computer systems design.¹⁰ The distinction between design and engineering services is important for the purpose of this study. In fact, as will be explained in greater detail in later sections of this report, for many firms, there is a clear overlap between design and engineering. The Canadian design activity is mostly concentrated in Ontario, Quebec and British Columbia, which together account for approximately three-quarters of the total revenue from the design services sector. Toronto has the largest design workforce in Canada and is third to New York and Boston in North America.¹¹ The following graphic presents the design workforce for each Canadian province:

⁴ Role of Designers provided by Design Industry Advisory Committee (DIAC)

⁵ UK Design Council, 2015 High Value Manufacturing

⁶ Definition of Graphic Design based on NAICS

⁷ DIAC

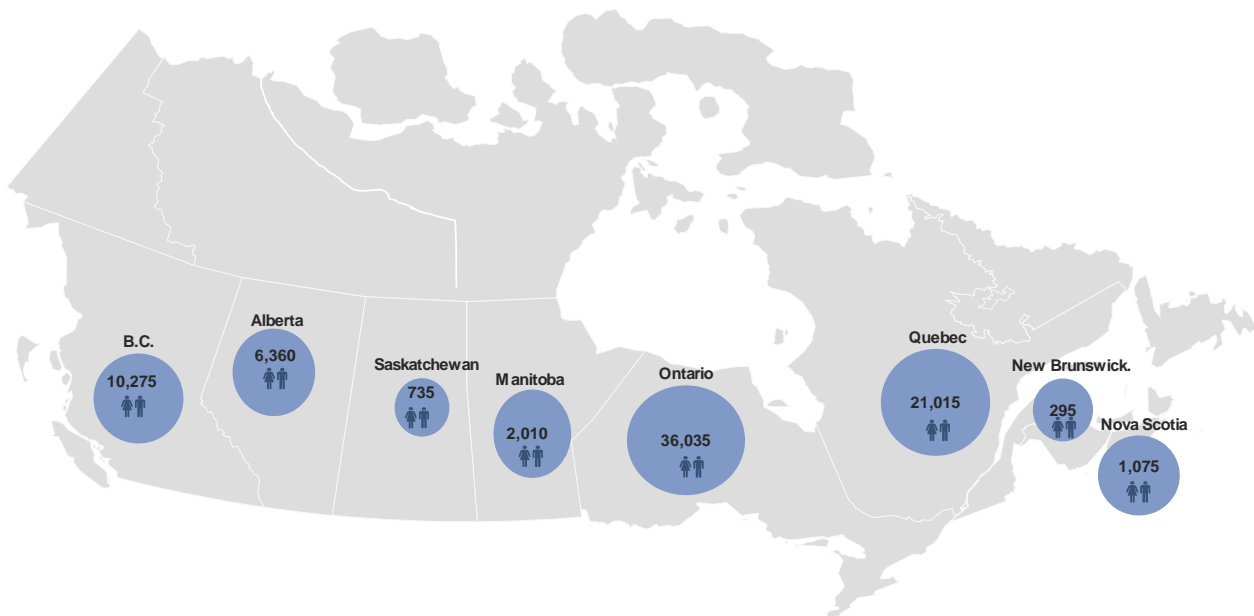
⁸ Definition of Industrial Design based on NAICS

⁹ DIAC

¹⁰ International Design Scoreboard: Initial indicators of international design capabilities report issued by the UK Design Council

¹¹ Designing the Economy: A Profile of Ontario's Design Workforce (2004) commissioned by DIAC, Researchers Meric S. Gertler and Tara Vinodrai, Department of Geography & Munk Centre for International Studies, University of Toronto.

Industrial and Graphic Designers by Province (2009)¹²



4.3 Canada's Global Positioning in Terms of Design

According to the UK Design Council, in 2013,¹³ Canada ranked fifth in the world in design. This ranking considers design at a national level as a system comprising enabling conditions, inputs, outputs and outcomes. A series of relative and absolute indicators has been identified that collectively enable a picture of national design capability, which comprises the level of public investment in design, world intellectual patent trademarks, number of design graduate, and size of design services sector.

In terms of relative and absolute indicators, the UK Design Council has considered:

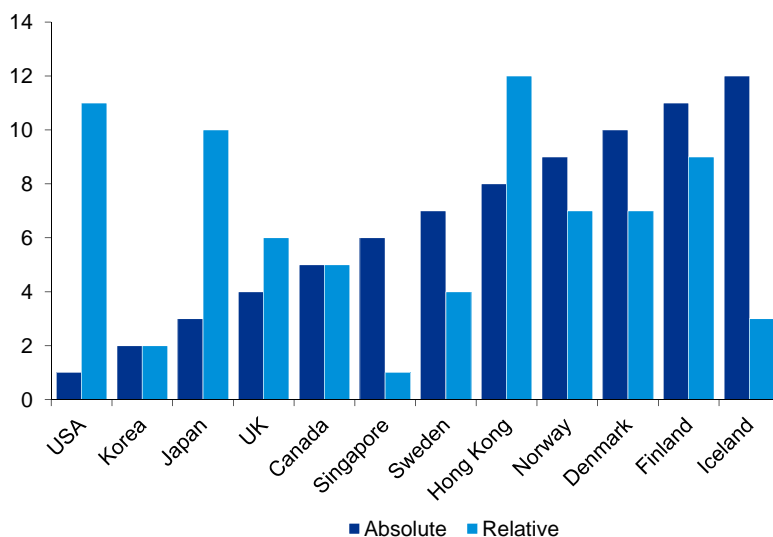
- Relative indicators (number of design graduates per million population) help to show the relative intensity of design capabilities within a nation; and
- Absolute indicators (total number of design graduates) show the overall scale of the design capacity in each country.

The following graph presents the UK Design Council's findings, which rank Canada in 5th place behind the U.S., Korea, Japan and the U.K. in terms of the relative and absolute design capabilities within the country.

¹² Data provided by DIAC from Martin Prosperity Institute and Rotman School of Management, University of Toronto (March 2009). The place of Design: Exploring Ontario's Design Economy.

¹³ UK Design Council (2013). International Design Scoreboard: Initial indicators of international design capabilities

Absolute vs. relative rankings



According to the Martin Prosperity Institute (MPI),¹⁴ design is crucial to the competitiveness of Canadian manufacturing firms, but there is a lack of strong national support for design-related activity. According to the UK Design Council, the Canadian design sector's strengths come from its high number of firms and a leading position in terms of employment in the design services sector while its weaknesses are exhibited by low levels of design graduates and international intellectual property protection.

However, Quebec offers a tax credit program for both industrial and fashion design, for which the aim is to help small and medium sized companies use design to improve their competitiveness. In 2014, a study was conducted by the Quebec government to measure the impact of this tax credit program. The results of the study show that:

- Between 2009 to 2013, the demand for this tax credit increased by up to 17%;
- 82% of recipient enterprises are satisfied by this tax measure;
- The ratio of return is 3.34, which means that every 1 Canadian dollar of tax credit generates \$3.4 of direct economic benefits; and
- The recipient enterprises have noticed value added 29% higher than their peers operating in comparable industries during the evaluation period from 2009 to 2013.

In comparison, a number of countries have recognized the value of design and made significant investments in design promotion as a means to be more competitive in the manufacturing sector globally. According to the UK Design Council, the country implemented a design policy program, which was established in 2007 to promote the use of design in the UK economy by:

- **Strengthening the design profession:** Long-term success of the UK design profession cannot depend on investment in design by UK companies alone but requires public investments in education to strengthen the profession
- **Creating national assets:** Making UK's design industry a worldwide network hub for innovation by delivering world-class brands, products and services

¹⁴ Martin Prosperity Institute and Rotman School of Management, University of Toronto (March 2009). The Place of Design: Exploring Ontario's Design Economy

- **Public expenditure on design:** The UK government has taken a variety of initiatives to increase the public sector's implication by strengthening Intellectual Property protection for design, and implementing design tax credits.

This program has allowed the design economy's gross value added to grow at a faster rate than the UK average between 2009 and 2013. Moreover, workers with a design element in their work were 41% more productive than the average.¹⁵

In 2003, Singapore developed and implemented the Design Singapore Initiative, its first national collaboration design strategy. The main objective of the five-year strategy was to build the foundation for a strong design culture in Singapore by placing equal emphasis on supply-driven policies and developing a local market for good design. The strategy established design test beds to facilitate the use of design by business, hosting and participating in international design festivals, and educating the public about the benefits of design.

South Korea has one of the most comprehensive national design strategies in the world. When Korean goods became less competitive in late 90s, the government began to develop its national design agenda. The aim of this plan was to put the country's design industries on par with those of developed countries by 2007, with dramatically increased employment opportunities for designers and general increase in design awareness by the general public. The goal underlying this strategy was to improve the competitiveness and brand reputation of South Korea's major export firms through better design. The government played a major role through its funding of public programs research and its partnerships with the private sector.

Both Singapore and South Korea have increased their design education institutions over the last decade and Singapore combined design, marketing and engineering. According to the UK Design Council, Singapore and South Korea have become design hub networks due to their delivery of world-class brand, products and services through their design policies.

¹⁵ UK Design Council: The Design Economy, the value of design to the UK (2015)



5. Metrics

Based on the literature review, and discussions held with design associations, KPMG identified a list of metrics that could be used to measure the impact of graphic and industrial design in the Canadian manufacturing industry.

Metrics were divided into 3 main categories:

- Return on investment (financial metrics);
- Impact on competitive positioning; and
- Impact on product function.

Please refer to Appendix A for the complete literature review.

The following image presents the metrics included in each category:



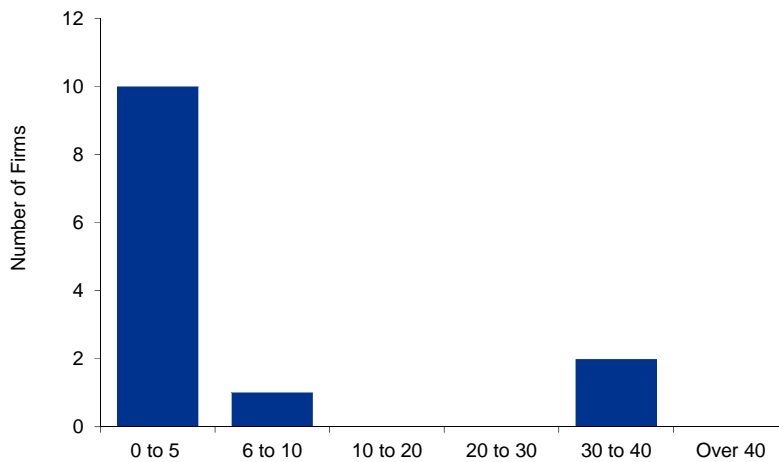


6. Use of Graphic and Industrial Design

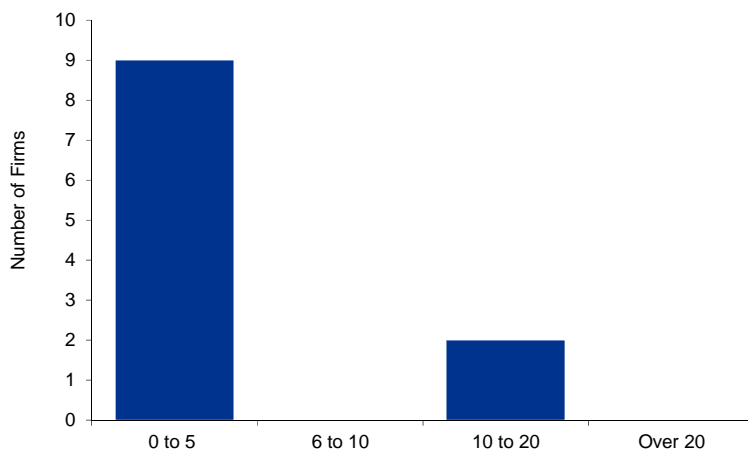
6.1 Use of Graphic and Industrial Design

While Graphic and/or Industrial design is used by most manufacturing firms interviewed for the purpose of this study, not all of them employ designers internally on a full-time basis. In fact, 13 firms interviewed (out of a total of 30) employ Graphic designers internally while 11 firms employ Industrial designers internally. In terms of numbers of Graphic and Industrial designers on staff, as presented in the following graphs, most firms, which reported hiring designers internally had fewer than 5 Graphic and/or Industrial designers on staff.

Number of Graphic Designers Hired Internally (n=13)

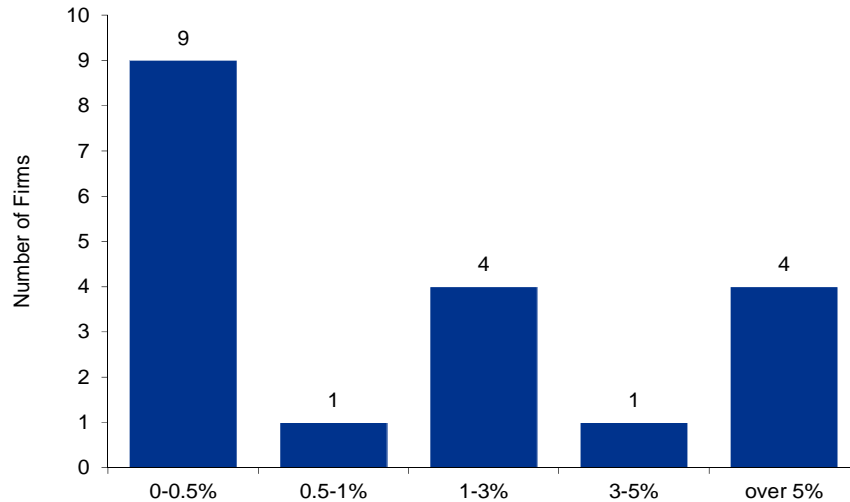


Number of Industrial Designers Hired Internally (n=11)



As can be expected, the number of graphic or industrial designers represents a small percentage of total employees for most firms. As presented in the following graph, graphic and industrial designers combined represented less than 0.5% of total employees for most firms interviewed.

Graphic and Industrial Designers as a Percentage of Total Employees (n=19)



Graphic and Industrial designers are used for different purposes. On the one hand, Graphic designers are primarily involved in the development of visual communication to convey specific messages or concepts, clarify complex information or project visual identities. These tasks can include the design of printed materials, web pages, packaging labels and graphics, advertising, signage systems, logos and corporate identification. On the other hand, Industrial designers are engaged in creating and developing designs and specifications that optimize the function, value and appearance of products. These tasks can include the determination of the materials, construction, mechanisms, shape, color, and surface finishes of the product, and take into consideration human needs, safety, market appeal and efficiency in production, distribution, use and maintenance.

Therefore, the role of Graphic designers within manufacturing firms is closely related to, and overlaps with, the branding and marketing functions. However, some firms also mentioned using Graphic designers outside of the marketing function as part of the product development process for the development of the visual components of products. Therefore, although it might be less common, the role of Graphic designers as part of the product development process should not be underestimated. In the furniture sector for example, Graphic designers may produce initial drawings that Industrial designers will then turn into actual products by identifying required materials and parts and developing a manufacturing plan.

The role of Industrial designers within manufacturing firms relates exclusively to the product design and development function. Industrial designers are used to generate new product ideas, develop designs and concepts, and optimize the aesthetic, utility and manufacturability characteristics of products.

According to focus group participants, Graphic and Industrial designers typically work as separate teams, and the blending of Graphic and Industrial designers into a single team is rare. However, participants argued that the best outcomes are typically collaborative.

In the Aerospace and Automotive manufacturing sectors, the use of industrial designers appears to be limited. Although the sample of firms used for the purpose of this study only included two firms from the automotive and aerospace sectors, aerospace and automotive industry associations were consulted to validate some of the

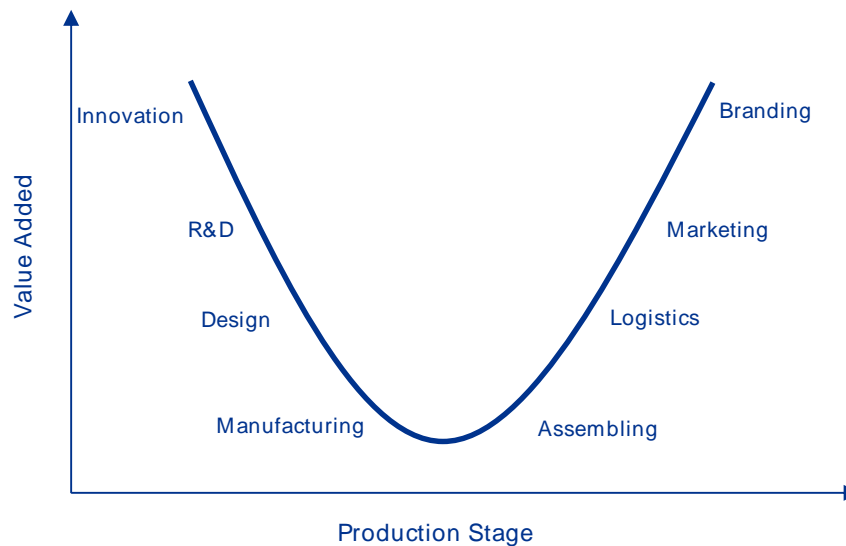
assumptions relating to those sectors. According to industry experts, firms involved in aerospace and automotive manufacturing exhibit significant variations in terms of how the product development function, including product design, is handled and by whom. For large original equipment manufacturers with head offices in other countries, the design function is often located outside of Canada. Aerospace or automotive companies with product development departments in Canada might employ industrial designers who would typically work hand in hand with engineers to handle the design function collaboratively. However, other firms, such as parts manufacturers for example, might rely exclusively on engineers to design their products.

In other sectors, it should also be noted that some firms might use professionals from various backgrounds such as chemists and engineers or professionals with solid manufacturing or electronics backgrounds, to handle industrial design-type tasks as opposed to hiring professional designers.

6.2 Design Departments or Teams

Graphic and Industrial design services are organized differently across manufacturing firms. There is a spectrum of structures used across firms to house Graphic and Industrial designers, which may vary from informal structures, with designers spread across different teams or departments, to designers housed under specific teams such as marketing, R&D or product development, and highly structured design-specific departments. Fourteen firms interviewed stated having a distinct design department or team. In some cases, these departments might host a blend of Graphic and Industrial designers, but most are home only to Industrial designers and are dedicated to product design and development. For these firms with distinct design departments, marketing-related design activities still fall under the purview of marketing departments, where Graphic designers would be housed. Therefore, there is typically no overlap between marketing-related design activities and product development-related design activities, and limited overlap between Graphic and Industrial designers. This is typical of the value added 'smiley curve', shown below, which shows the relationship between value added activities and global value chain position.

Relationship between Value Added and Global Value Chain Position



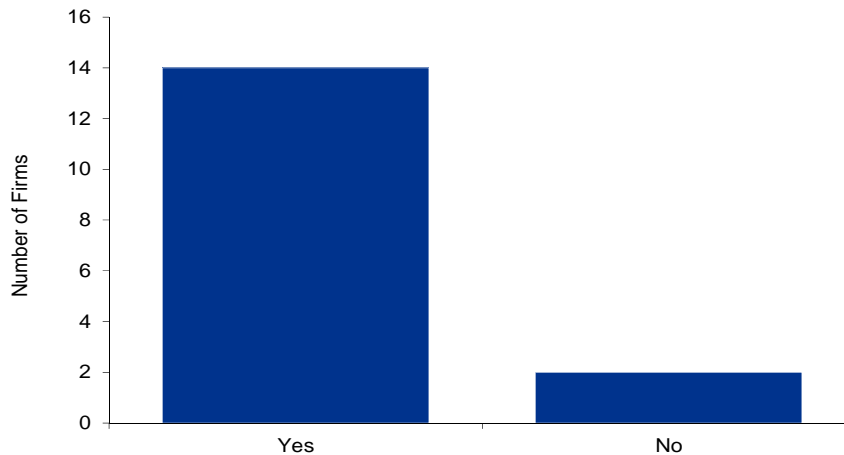
In the case of firms with specific R&D or product development departments, industrial designers are usually integrated within those departments, which may include a blend of professionals from different spheres, including industrial designers and engineers. Therefore, for those firms, it is hard to isolate the industrial design component and to measure the impact of design separately from other R&D or product development activities.

Obviously, there is a link between the size of a firm and its internal organizational structure for designers. Small companies tend to have fewer numbers of designers on staff, making them more likely to adopt a more informal structure. The firm's business model also significantly impacts the structure of design services. Firms that are highly driven by R&D typically have designated R&D teams, which will include Industrial designers. Firms that are highly driven by Industrial design will typically have specific design teams.

7. External Design Services

While 13 firms interviewed employ Graphic designers internally and 11 firms employ Industrial designer internally, 14 firms also outsource some design activities to external design firms. In most cases, Graphic design services relating to marketing and branding activities are often outsourced to external firms.

Number of Firms Using External Design Services (n=16)



The key reasons for outsourcing design services include the following:

- Workload exceeds capacity;
- Internal capabilities are not sufficient;
- Not enough steady-state design work to justify full-time internal design resources;
- Tackling design issues from a fresh perspective; or
- When restructuring processes require the outsourcing of some of the company's functions to streamline operations.

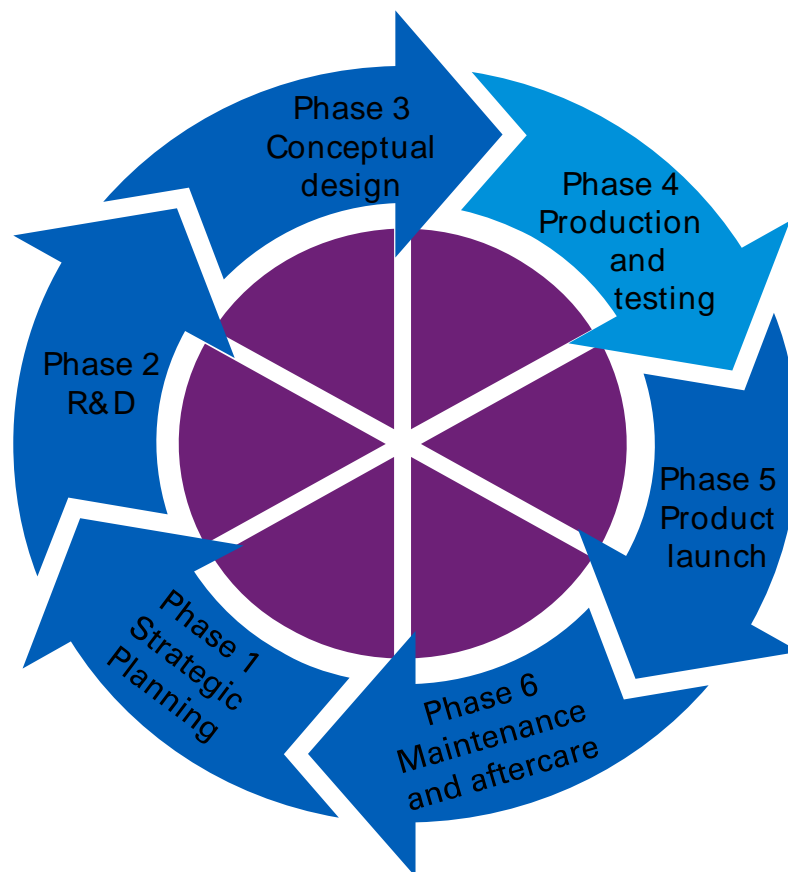
The business model and internal culture of the company appears to play a role in the decision whether or not to outsource design services. For organizations for which design is the most important generator of success, in-house design capabilities appear critical.

While interviewees stated significant benefits from hiring external designers, in terms of obtaining a fresh perspective, obtaining diversity of expertise and reducing overhead costs, others stated that having an internal pool of designers familiar with the company's products also offered significant benefits for producing high quality products that fit within the company's strategy in terms of costs, utility, manufacturability, and response time. Some interviewees mentioned concerns with the use of external design services. Some described negative experiences when working with designers whose involvement had been limited to small portions of the product development process, and therefore lacked the overall perspective of the entire product development and manufacturing processes. Interviewees argued that this could lead to productivity and manufacturability issues during the production phase of the process. Therefore, the key lesson learned for those interviewees was that, to reap the benefits derived from hiring external designers, designers had to be involved from the early stages of the product development process. Interviewees also stressed the importance of developing collaborative relationships with external design firms to ensure that they have a thorough understanding of the company's design needs and of the requirements of the manufacturing process.

8. Design within the Product Development Cycle

For the purposes of this study, KPMG developed a product development wheel, as displayed below. This wheel contains the six general phases of product development that apply to typical manufacturing firms:

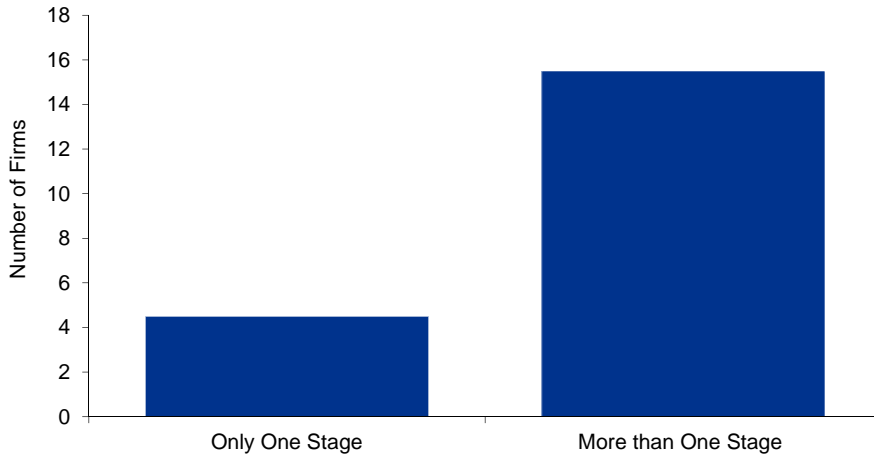
- Phase 1: Strategic planning
- Phase 2: R&D
- Phase 3: Conceptual design
- Phase 4: Production and testing
- Phase 5: Product launch
- Phase 6: Maintenance and aftercare



Most firms interviewed involve designers on multiple stages of the product development cycle. In fact, an average of 16 out of 20¹⁶ interviewees stated that their firms use Graphic or Industrial designers in more than one phase of the product development cycle.

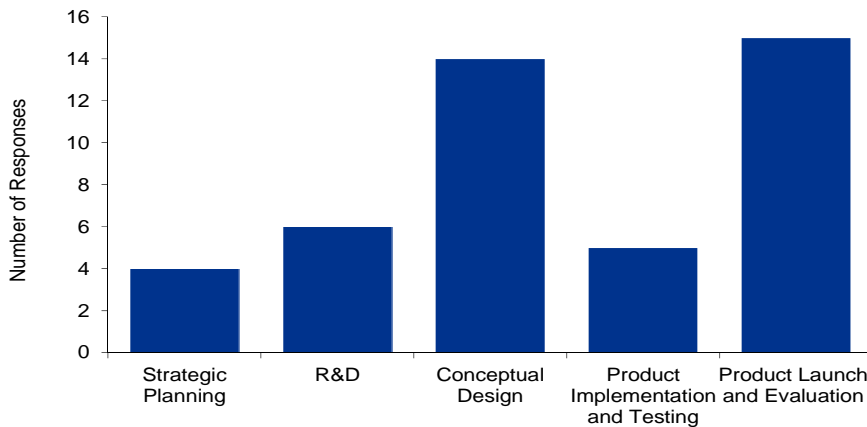
¹⁶ It should be noted that, out of the 30 firms interviewed, some firms did not use graphic or industrial design. Furthermore, the specific individuals interviewed sometimes did not possess the necessary knowledge to answer all questions. These factors contributed to lowering the number of responses for some of the questions.

Involvement of Designers in Multiple Stages of the Product Development Cycle (n=20)



8.1 Involvement of Graphic Designers

The involvement of Graphic designers within the product development cycle is presented in the following graph. The results presented are based on the number of responses for each category and results can overlap.



Involvement of Graphic Designers in the Product Development Cycle (n=20)

As previously discussed, the role of Graphic designers within manufacturing firms most often relates to the marketing function. In fact, some of the firms interviewed mentioned that the role of Graphic designers was strictly limited to marketing-related activities. Therefore, for those firms, Graphic designers are typically involved during Phase 5 of the product development cycle.

However, some firms also mentioned using Graphic designers outside of the marketing function as part of the product development process for the development of visual components of products. For example, in the medical device sector, Graphic designers are involved in the visual design of the device and in the development of on-screen

graphics. In those instances, companies mentioned that graphic designers would typically be used during Phases 3 and 5 of the product development cycle. Graphic designers are typically used later in the process. While the involvement of some graphic designers might be phased out after product launch, the graphic design team can also have a role to play in aspects of the continuing product marketing strategy after product launch.

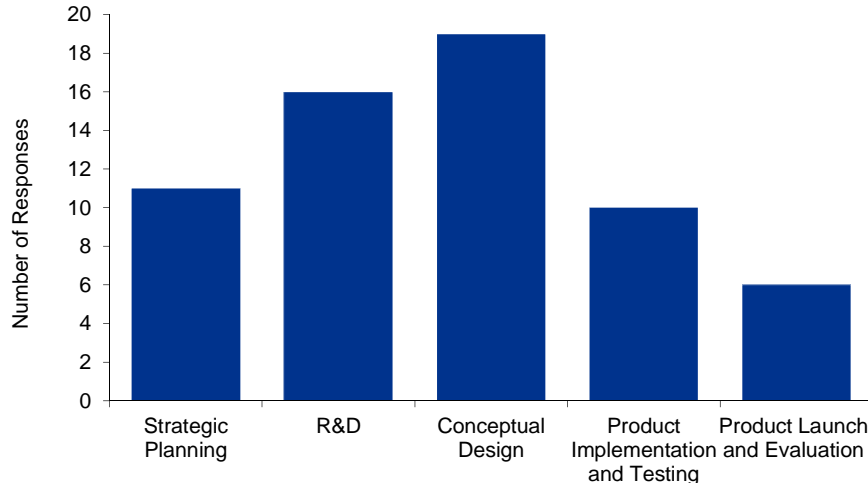
Focus group participants argued that Graphic designers were typically brought on board too late in the process, typically at the commercialization stage, a stage where strategic marketing and branding decisions have already been made and they have less influence over the process, thereby less opportunity to add value to the strategic marketing and branding process.

However, focus group participants argued that Graphic designers were increasingly encouraging manufacturers to include them in the Strategic Planning phase to ensure that Graphic design considerations were incorporated at an early stage of the product development process to increase the success and value added of Graphic design strategies, whether they are aimed at successfully achieving marketing or product development objectives. Because of the significant relationship between a product's design and a company's branding strategy, participants argued that there was a need for manufacturers to better understand how the early involvement of Graphic designers could contribute to adding value to their marketing strategies.

8.2 Involvement of Industrial Designers

The involvement of Industrial designers within the product development cycle is presented in the following chart. The results presented are based on the number of responses for each category and results can overlap.

Involvement of Industrial Designers in the Product Development Cycle (n=22)



As previously explained, the role of Industrial designers within manufacturing firms is intrinsically linked to the product design and development function. When asked to identify the phases of the product development cycle where Industrial designers are engaged, most firms stated that Industrial designers were used throughout the product development process. For these firms, the involvement of Industrial designers at all stages of the process is critical to optimizing the value added of Industrial design services. For some firms, the involvement of Industrial designers throughout the strategic, conceptual, manufacturing phases, as well as maintenance and aftercare, is critical to ensure the seamless delivery of a product.

8.3 Early Involvement of Graphic and Industrial Designers

The main takeaway from discussions with interviewees and focus group participants is that both Graphic and Industrial design can be critical to the product development process and add a significant level of value if they can successfully introduce design at the front-end of the product development process. In fact, it was argued that the design process starts exactly at the moment when an idea is first conceived. Therefore, it makes sense for design professionals to assist in the design and development process at every phase.

As an example, focus group participants stated that, as regards the furniture industry, there has been a shift in the last two years where professional design services have increasingly been brought into some firms. Despite resistance in established, family-run businesses where the design function was exclusively under the purview of management where, in most cases, the founder or owner of the company was still responsible for all design-related decisions, these firms have recognized the significant competitive contribution brought by professional designers. Stakeholders of the furniture industry argued that this strategy has led to growth increases of 20% and more by forcing these firms to step outside of the status quo.

Focus group participants mentioned the importance of design as being an integral part of the DNA of some of the most innovative companies. For these companies, discussing the relationship between design and the product development process would not make sense because they would be one and the same.

Interview Insight

“Industrial designers are involved at the start of the product development process. In fact, they come up with the ideas quite often. They are responsible for new product ideas.”

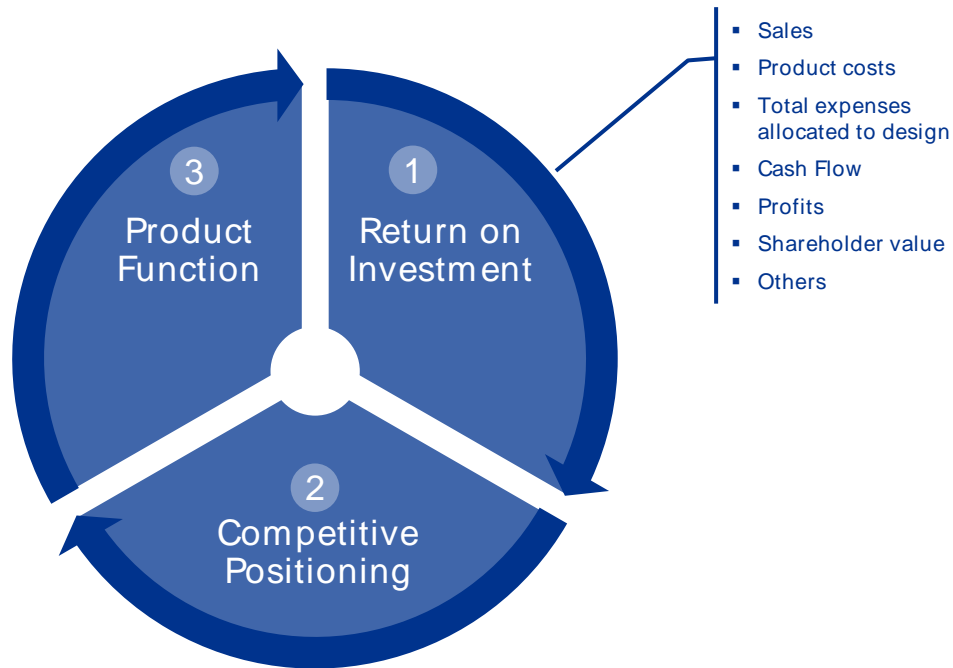
Interview Insight

“The best outcomes are usually collaborative and start early on in the process. Where the crossover takes place is where acceleration happens.”

9. Measuring the Return on Design Investment

9.1 Financial Impact of Design

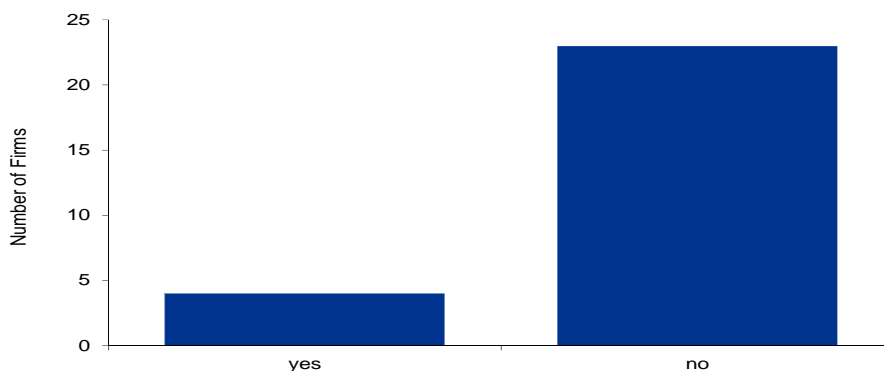
During the interview process, interviewees were asked to identify different financial metrics that could be used, quantitatively or qualitatively, to measure the impact of Graphic and Industrial design on their financial success. It should be noted that these metrics were not identified by participants; they were identified through the literature review and supplied in the interview guide. The following metrics were used to assess the return on design investment:



9.2 Return on Design Investment

The majority of firms interviewed do not measure the return on design investment in a structured, systematic or quantifiable manner. In fact, only 4 out of 27 interviewees stated that their firms measured return on design investment.

Number of Firms Measuring Return on Design Investment (n=27)



Interviewees stated the following reasons for not systematically measuring the return on design investment:

- Design is integral to the company's operations and to its success in the marketplace and there is no need to specifically measure its return;
- Design is well supported within the firm at the strategic level and it is not necessary to justify design investments;
- Without design, the company would simply not exist; and
- Design overlaps and is intertwined with all product development activities, including R&D, engineering and marketing activities, and the return on design investment would be extremely difficult to isolate from other business functions.

Interview Insight

“I can't quantify this. Without design, these products would not exist. So 100% of the credit goes to design. There is no point in measuring this. It's just critical. Design and product quality are critical to the bottom line and you cannot separate out design.”

Four interviewees stated that their organizations somehow measured the return on design investment and two companies were in the process of introducing methods for measuring it. Realizing the critical role played by design in increasing their competitiveness, these firms recognized the importance of specifically and quantitatively measuring the impact of design on their success. However, these firms had not yet identified how best to measure the impact of design or which Key Performance Indicators to develop.

For one organization, measuring the ROI of design is critical in understanding their products' successes or failures, measured in terms of sales levels. This organization's operations are separated into cost centers, and each cost center is responsible for forecasting and tracking costs and to estimate the level of sales required to cover those costs, over a period of 3 years. Product development costs would be one such cost center, for which total expenses would be tracked, and subsets, such as design expenses, would also be tracked. For this organization, measuring the ROI of each business function, including design, is critical because of the significant importance attributed to the aesthetics and usability of products in their industry.

Impact on Sales

Interviewees were asked to describe the impact of design investments on their company's sales. Although none of the manufacturers interviewed measured the specific impact of design on sales independently from other business functions, all interviews argued that there was a direct link between investments in Graphic and/or Industrial design and higher levels of sales for their organizations. In fact, all interviewees stated that investments in Graphic and/or Industrial design had an impact on their sales. Some interviewees from various manufacturing sectors mentioned that it might be possible to conduct the exercise of measuring the impact of design on sales in the case of specific product redesign projects, for example, where increases or decreases in sales would be directly linked to design. However, these analyses had not been performed.

Impact on Product Costs or Total Company Expenses

Interviewees were asked to describe the impact of design investments on product costs and total company expenses. Depending on the organization's accounting and financial structure, product development costs may be tracked on a product-by-product basis or as a percentage of total company expenses.

When tracked as a percentage of total company expenses, design-related expenses are typically measured in terms of payroll and salary expenditures attributed to Graphic and/or Industrial designers. For some firms, tracking design expenses overall is more appropriate than tracking them on a product-by-product basis because of the significant variations that exist between products. In addition, the size of investments in design might not always be proportional to the benefits derived from using design. In fact, some products might require significant investments in design while reaping fewer benefits than other products, which might require smaller investments in design but reap higher benefits from design. Therefore, tracking expenses on a product-by-product basis could lead to inaccurate conclusions about the impact of design.

When tracked on a product-by-product basis, design-related expenses are measured in one of two ways:

- Some companies track total product development costs (including design, R&D, and other product development expenses) as a whole on a product-by-product basis but cannot isolate design-specific costs;
- Some companies track Graphic and/or Industrial design costs on a product-by-product basis independently from other product development costs. Based on interviewees, this is typically done by companies with specific design departments or teams who require that design professionals track specific hours spent on each product.

Focus group participants argued that, while the quantity of design being used is important, the quality of the design work is even more important. Therefore, they argued that, while looking at design expenses might provide a snapshot of the use and impact of design on the manufacturing industry, it would be important to keep the quality of the design work in mind. Lower expenses in design might not signify less interest in design or less value added from design.

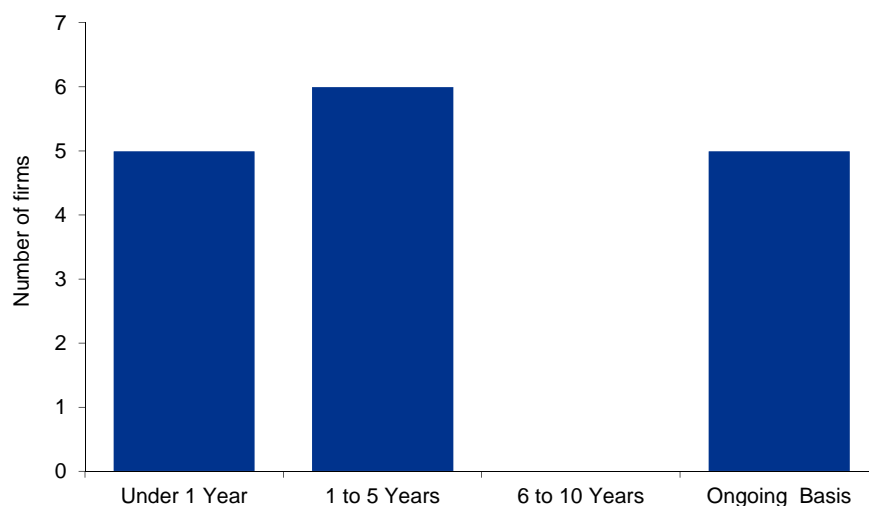
Period for Measuring the Return on Design Investment

Firms were also asked to identify the period over which they expect to reap a return (albeit not measured) on investment. Firms were asked to select from the following choices:

- Less than 1 year;
- Between 1-5 years;
- Between 6-10 years; or
- On an ongoing basis.

Most interviewees explained that they do keep an eye on how soon new investments in design (typically measured in terms of new design employees) would pay off. The majority of interviewees expect the benefits from additional design resources to provide benefits within one year or on an ongoing basis over the life of the product through increased sales or higher margins. New hires are expected to rapidly lead to the conception of new products, with a direct impact on sales. Investments in design also pay off over the life of the product through higher unit sales and increased market share.

Expected Period for Return on Design Investment (n=16)

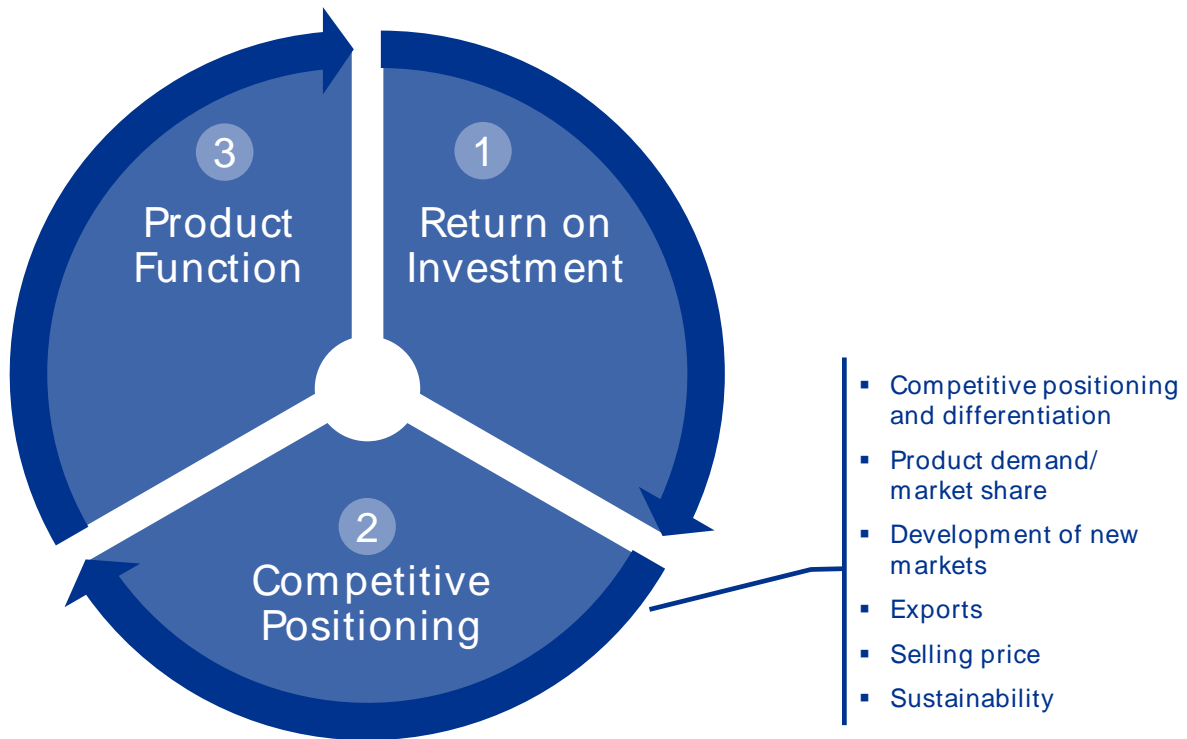


Cash Flow, Profits, Shareholder Value

None of the organizations interviewed measured impacts from design on cash flow or shareholder value. With regards to profits, interviewees argued that there were too many factors impacting profits to allow the isolation of design impacts from other factors. However, some firms mentioned impacts from design on their products' margins and selling prices. These elements will be discussed in greater detail under Section 10.

10. Impact of Design on Competitive Positioning

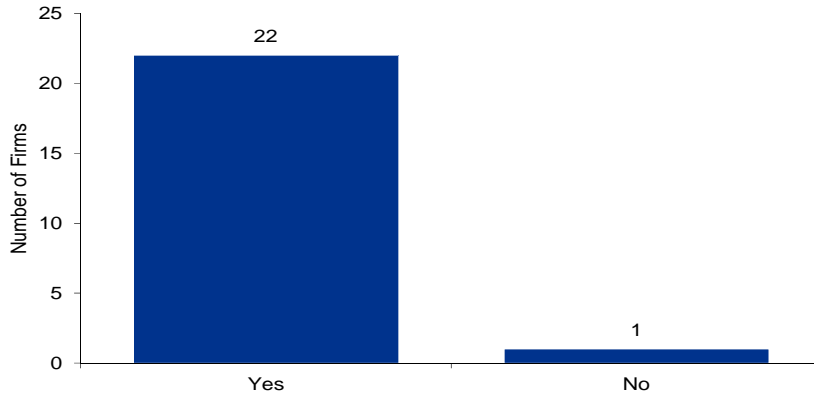
During the interview process, interviewees were asked to identify competitive metrics that could be used, quantitatively or qualitatively, to measure the impact of Graphic and Industrial design on their competitive success.



Impact on Competitive Positioning and Differentiation

When asked about the impact of Graphic and/or Industrial design on their organization's level of competitiveness, most interviewees stated that the use of design services positively impacted competitiveness. In fact, 22 out of 23 interviews stated that design was part of their company's competitive advantage.

Impact of Design on Competitiveness (n=23)



According to interviewees, Graphic design is used to articulate the features and benefits that differentiate their products from their competitors' while Industrial design contributes to differentiating the actual products. In highly commoditized sectors, such as food and beverage, interviewees stressed that design played an especially important role in terms of differentiation.

Impact on Product Demand and Market Share

Interviewees were asked to describe the impact of design investments on their company's market share and on the demand for their products. As previously discussed, all interviews argued that there was a direct link between investments in Graphic and/or Industrial design and higher levels of sales for their organizations. This is a direct consequence of increased product demand.

In certain instances where organizations had been able to develop a new product offering specifically because of design and in turn had successfully generated additional sales through the introduction of that product into the market, interviewees were able to argue that 100% of these additional sales could be attributed to investments in design.

Impact on Development of New Markets and Exports

Some firms have witnessed a direct relationship between specific design investments and entry into new markets. In fact, some interviewees pointed to Graphic and/or Industrial design as having a direct impact on their capacity to meet customer demand from new market segments and to enter new markets. Although this applies to all manufacturing sectors, it is especially accurate in sectors such as furniture and apparel, where market demands in terms of styles and aesthetics can vary significantly between demographic or geographic markets. As an example, a furniture manufacturer interviewed mentioned having to invest significantly in design in order to successfully enter specific geographic markets in the U.S.

Impact on Selling Price

The impact of design on the determination of a product's selling price varies greatly between markets, companies, and products. None of the firms interviewed stated a direct link between design content and selling price. For firms which do not track investments in design on a product-by-product basis, it is impossible to assess whether design alone impacts selling price. However, even the firms which do track design expenses on a product-by-product basis could not report a direct link between the level of design and a higher selling price. However, most interviewees

argued that design was responsible for their higher sales levels and that, as a result of Cost Plus pricing,¹⁷ higher design expenses would be reflected in a higher selling price.

According to focus group participants, the selling price is usually less important than the margin. Styling and aesthetics of a product as well as features and attributes may, in some markets, command a higher price. However, a good design should also optimize the resources used to manufacture the product and, in turn, can support cost reductions through a reduction in capital requirements, lead times, and material costs. While in some high end markets the objective might be to design and offer a product with the highest level of aesthetic and functional attributes to command the highest price possible, in other markets the objective may be to design a product that is highly competitive both in terms of attributes and value.

In highly competitive sectors, such as the furniture sector, where the costs of developing new products and the risks of having those products copied by competitors and sold at a cheaper price are high, some interviewees mentioned that the impact of design was especially important, not only to differentiate their products, but also to offer competitive pricing. According to some interviewees, design does not necessarily increase the selling price of a product. Good Industrial design can go further than simply producing an aesthetically appealing product; it can increase the product's usability and functionality and can contribute to increasing the manufacturer's productivity levels. As such, design may add value to a product, and can help manufacturers offer competitive prices to their customers.

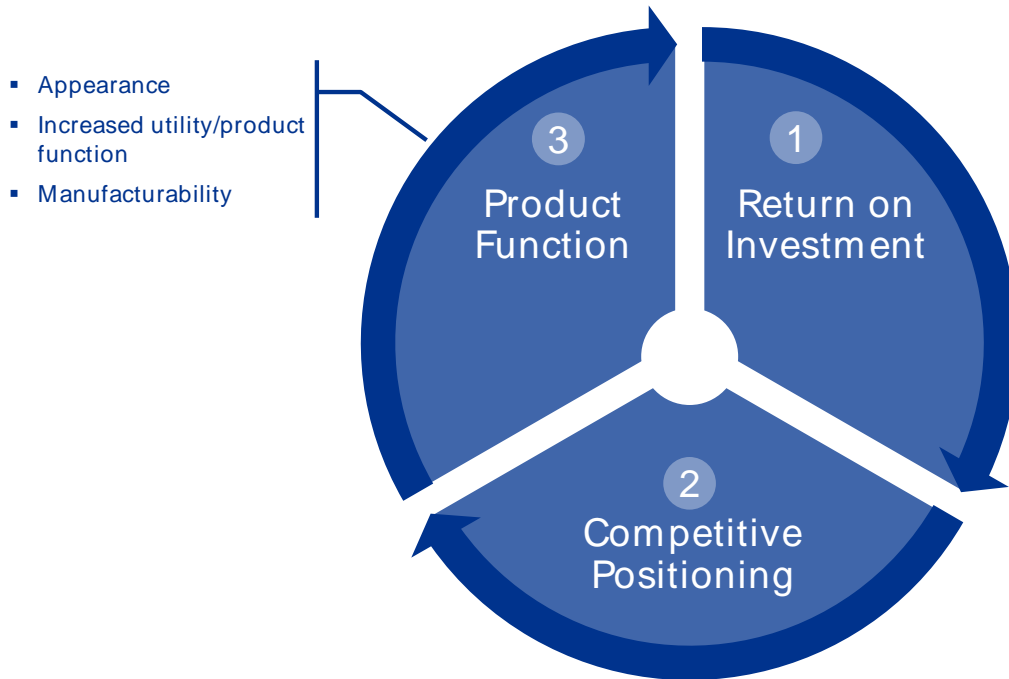
Impact on Branding

As previously discussed, interviewees mentioned a clear link between graphic design and their company's marketing activities. Although the impact of design on the success of a marketing or branding strategy is difficult to isolate from other elements, interviewees stated that graphic design was an integral part of marketing activities, whether these marketing activities are conducted internally or externally. In some sectors, such as food and beverage, designers have a limited role to play with regards to the actual products, and the benefits derived from design are almost exclusively related to branding and marketing. Although the link between graphic design and branding is clear, industrial design can also play a critical role in supporting a firm's marketing and branding efforts. For example, firms in the medical device sector highlighted the importance of industrial designers in contributing to the development of aesthetically and functionally appealing products, which can have a direct impact on a firm's marketing strategy. Furthermore, the aesthetics or 'look and feel' of a company's portfolio of products is an important differentiating criterion in the marketplace and can improve a brand's recognition value.

¹⁷ Cost Plus Pricing is a cost-based method used for determining the prices of goods and services. Cost Plus Pricing is derived by adding direct material, direct labor, and overhead costs for a product, and then applying a standard markup percentage to the sum of all cost categories to create a profit margin to derive the selling price of the product.

11. Impact of Design on Product Function

During the interview process, interviewees were asked to identify different product function metrics that could be used, quantitatively or qualitatively, to measure the impact of Graphic and Industrial designs on their product's success.



The majority of firms interviewed stated the following factors as critical to their design objectives:

- Aesthetic
- Utility/function (including ergonomics)
- Manufacturability; and
- Productivity improvements.

Focus group participants argued that, from the point of view of Industrial designers, all of these aspects are important. According to them, the value added derived from Industrial designers is their capacity to take into account all of the different factors involved in the development of a product, such as aesthetics, utility, manufacturability, productivity, and sustainability and to combine them to achieve a higher value product, increase innovation and improve competitiveness.

In some sectors, such as aerospace and automotive, the impacts of design on utility and product function are especially important, but the importance of other aspects such as aesthetics should not be undermined. In other sectors, such as apparel and furniture for example, aesthetics are especially important, but the importance of other aspects such as utility and product function should not be undermined.

Impact on Aesthetics

Aesthetics is often misconstrued as the only objective of Graphic and/or Industrial design. However, as demonstrated through the interview process, in the manufacturing context, aesthetics is only one consideration among others for designers and manufacturing firms.

While many firms mentioned aesthetics as an objective of using design services, none of the firms interviewed had aesthetics alone as a design objective. In the case of Graphic designers, the bulk of their work revolves around graphic representations and marketing objectives and their primary focus is to create impactful and clear communications and messaging to engage stakeholders. This is also illustrated by the involvement of Graphic designers in the product development cycle as presented in Section 8. Graphic designers can also bring value to other aspects of the manufacturing process such as utility and manufacturability. For Industrial designers, aesthetics appears to be secondary to other design objectives such as function, utility and manufacturability.

Impact on Utility and Product Function

Although aesthetics is significantly important for firms, it is the impact of design on utility, product function and usability that is most often the primary concern of Industrial designers.

In some sectors, such as the medical device or the furniture manufacturing sector, design for function is the most important element of product development. Functionality, usability, safety, and error reduction concerns are critical in this industry. The aerospace and automotive sectors would arguably have similar concerns.

In addition, products need to be maintained over time and as the products age, components must be designed in a way that they can be replaced or maintained. Maintenance and aftercare benefits from design also provide added value in terms of time and cost reductions.



12. Impact of Design on Manufacturability and Productivity

During the interview process, companies were asked to identify whether Graphic and/or Industrial design impacted the manufacturability of their products as well as the overall productivity of their business operations. Some interviewees stated that the manufacturability of their products was positively impacted by Graphic and/or Industrial design. Moreover, some interviewees stated that their business operations benefited from productivity improvements thanks to their use of design services.

Firms argued that Graphic and/or Industrial designers, through their role in strategic planning, R&D, conceptual design, and manufacturing, can positively impact the manufacturability of products by influencing concepts, drawings, materials chosen, and manufacturing processes used. Through their choices, designers can have a significant impact on the ease, or complexity, of product manufacturing, which, in turn, can have a significant impact on costs and lead time. Interviewees stressed the importance of involving designers through the manufacturing phase of the product development cycle in order for them to understand the manufacturing process and apply this knowledge to the conceptual phase, but also in order to have design experts oversee the manufacturing process and ensure that conceptual designs are respected and that the end-product matches requirements. According to interviewees, this help improves quality and reduces errors and defects.

As discussed in Section 8, the involvement of designers throughout the product development cycle, and especially their early involvement in the process, will generate greater benefits in terms of productivity. This finding was supported by focus group participants.

Interview Insight

“By introducing design at the early onset of product development, we can identify opportunities for reusing designs or parts. Design and parts commonalities allow us to keep costs down by adapting them to other products with limited additional investments.”

Interview Insight

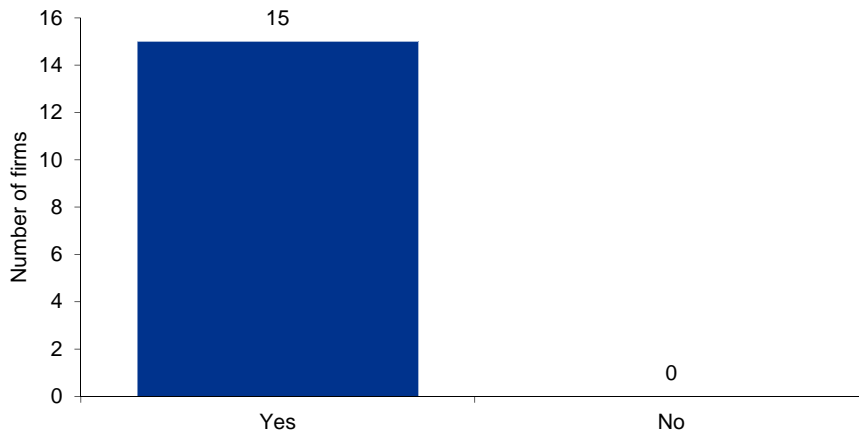
“As much as 80% of impacts on manufacturability and productivity are created during the product development process. Every design decision taken early on in the process impacts the other development phases and the effects of early mistakes are compounded and multiplied throughout the process.”



13. Impact of Design on Innovation

As part of the interview process, interviewees were asked about whether or not there was a link between Graphic and/or Industrial design and innovation within their organizations. Manufacturers asked about innovation stated a direct link between design and innovation, as well as a positive impact from design on increasing their organization's level of innovation. In fact, 15 out of 15¹⁸ interviewees stated that design was a direct contributor to innovation within their organizations.

Design as a Contributor to Innovation (n=15)



Focus group participants also stated that there was a clear link between both Graphic and Industrial design and innovation. By coming up with new ideas, developing conceptual designs, and increasing the utility and aesthetics of products, interviewees argued that designers contributed to increasing the overall level of innovation of the firm. Many firms that stated investments in R&D argued that Industrial design was an integral part of their R&D activities and contributed to increasing their level of innovation. As discussed under Section 8, industrial design often overlaps with R&D activities and Industrial designers are often part of R&D teams or departments. As a consequence, it is difficult to measure the specific impact of design on innovation independently from R&D and other activities that can impact innovation. This is especially true in the aerospace and automotive sectors, where industrial design activities overlap with engineering activities and where the majority of the design work might be undertaken by engineers. In fact, all of the firms interviewed from the aerospace and automotive sectors mentioned that the bulk of the design work was undertaken by engineers and that their use of industrial designers was limited.

As discussed in Section 3, the Canadian manufacturing industry faces significant challenges, including pressures on costs, technology and innovation. To overcome these challenges, interviewees and focus group participants agreed that manufacturers increasingly recognize the importance of using design to create and develop concepts and specifications that optimize the function, value and appearance of products and systems for the mutual benefit of both users and manufacturers. By using design services, and by integrating those services at the onset of the product development process, manufacturers can increase the aesthetics, utility, function and manufacturability of their products. Through design, they can differentiate themselves from competitors in the marketplace and improve their business performance. Design can lead to radical or incremental innovation depending on the strategic approach involved.

¹⁸ It should be noted that, out of the 30 firms interviewed, some firms did not use graphic or industrial design. Furthermore, the specific individuals interviewed sometimes did not possess the necessary knowledge to answer all questions. These factors contributed to lowering the number of responses for some of the questions.



14. Impact of Design on Sustainability

As part of the interview process, interviewees were asked about whether or not Graphic and/or Industrial design had an impact on their organization's or their products' environmental sustainability footprint. Environmental and sustainability concerns and considerations vary between manufacturing sectors. For some sectors, such as medical devices, automotive and aerospace, environmental and sustainability concerns are directed by regulations that must be complied with. For other sectors, such as apparel and consumer products, environmental and sustainability concerns are directed by market demand. Moreover, environmental concerns and regulations vary between geographic markets and jurisdictions. As an example, furniture manufacturers mentioned the stringent Californian environmental standards that they must abide by in order to serve those markets, which make design an important tool to ensure that all standards are met.

Few firms interviewed mentioned a direct link between design and environmental sustainability. However, firms with significant environmental concerns mentioned that Industrial designers could improve the sustainability of products by introducing sustainability concerns from the onset of product development and design. For one firm active in the furniture manufacturing sector, environmental sustainability was described as a priority and design as an integral part of ensuring that the firm's standards are respected. This firm developed a set of standards and metrics used to track sustainability considerations throughout the product development process, including activities conducted by designers, who are responsible for ensuring that the company's standards are respected.

Some interviewees, as well as focus group participants, mentioned the importance of training designers to adopt a sustainable and environmental framework when looking at projects to ensure that sustainability would be taken into consideration. According to interviewees, this could contribute to increasing the sustainability and reducing the environmental footprint of the product development process and of products themselves as well as of the firm's overall operations.

Two interviewees admitted that they had never seen a link between design and sustainability, but that the discussion had sparked their interest and motivated them to learn more about how Industrial design could improve their organization's sustainability practices.



15. Impact of Design on Global Value Chains

As part of the interview process, interviewees were asked to state whether or not they considered that their organizations belonged to a Global Value Chain (GVC). Most firms stated that they were indeed part of a GVC. In fact, the majority of companies interviewed either had suppliers or outsourced certain manufacturing functions offshore. These companies were asked to describe the role played by design within those GVCs in terms of access to GVCs, bargaining power of suppliers, and bargaining power of customers.

Most firms interviewed saw no clear link between design and their capacity to enter GVCs outside of the relationship between design and their capacity to enter new markets and to export to foreign countries (as discussed under Section 10). However, most firms saw a link between their design process and their relationships with suppliers. In fact, it appears that the level and complexity required by specific designs can have an impact on materials purchased as well as on manufacturability, which in turn can impact quality and cost. This is especially true for firms that outsource manufacturing functions. For example, for manufacturers that outsource part of their manufacturing function to lower cost jurisdictions, and when cheaper costs are a primary objective, minimizing the complexity of designs can have a significant impact on costs.

In terms of the specific impact of design on the bargaining power of suppliers and customers, the results are fairly clear. Firms stated that design could either strengthen or weaken the bargaining power of suppliers, depending on the level and complexity of designs. When design requirements are complex and require more expensive materials or more complex manufacturing processes, suppliers have more leverage to increase costs.

In a GVC, the risks related to defects and quality are high and must be managed carefully. According to interviewees, highly complex designs can increase the risks related to defects and quality. To alleviate these risks and to prevent surprises at the end of the manufacturing process, some companies mentioned the importance of collaborating and working hand-in-hand with suppliers from the conceptual stage and onwards to ensure the manufacturability of their designs and mitigate risks throughout the product development process. Companies stressed the importance for designers to possess a thorough understanding of suppliers and of the entire manufacturing process to ensure that their designs are well adapted. For some companies, this sometimes goes as far as sending designers to visit and collaborate with offshore suppliers to ensure the smooth implementation of product designs through the manufacturing process.

Interview Insight

“Good design does have a return on investment. We are a development and manufacturing company. We partner with international medical companies and those companies decide who to partner with. Good design plays a key role in our success in marketing and establishing international partnerships. Good design is critical.”

16. Lessons Learned

As exhibited throughout this report, manufacturing firms interviewed witness positive impacts from Graphic and Industrial design on competitive positioning, product function, manufacturability, productivity, innovation, sustainability and positioning within global value chains. Although firms were able to address the qualitative impacts of design, quantifying those impacts or specifically measuring return on design investment was difficult and uncommon. As previously explained, various reasons explain why firms do not specifically measure return on design investment:

- Design is integral to the company's operations and to its success in the marketplace and there is no need to specifically measure its return;
- Design is well supported within the firm at the strategic level and it is not necessary to justify design investments;
- Without design, the company would simply not exist; and
- Design overlaps and is intertwined with all product development activities, including R&D, engineering and marketing activities, and the return on design investment would be extremely difficult to isolate from other business functions.

In order to quantify the impact resulting from specific Graphic or Industrial design investments, firms would have to track design expenses separately from marketing, R&D or product development expenses. Furthermore, it would be necessary to identify and carve out the portion of sales, or profits directly and singularly attributable to design investments. This would prove difficult since a myriad of factors, other than design, can impact those metrics.

Although this study contributes to a better understanding of the impacts of design on the Canadian manufacturing industry, it does not provide a quantitative answer to the question of return on design investment. In addition, the literature review brought to light the fact that studies that have attempted to quantitatively measure the return on design investment have only been partially successful at providing an accurate or consistent answer.

Based on the literature review, the study that comes the closest to measuring the return on design investment is the Quebec's Ministry of Economics, Science and Innovation Design Tax Credit for industrial design in Quebec, which estimates that

- The ratio of return is 3.34, which means that every Canadian dollar of tax credit generates \$3.4 of direct economic benefits; and
- The recipient enterprises have noticed value added 29% higher than their peers operating in comparable industries during the evaluation period from 2009 to 2013.

However, without a similar tax credit program in Canada or elsewhere, it would prove difficult to replicate this study outside of Quebec or to establish benchmarks or standards.

The present study contributes to qualifying the link between successful design strategies and investments and competitiveness and innovation. As highlighted in Section 4.3, existing studies related to competitiveness and innovation in the Canadian industry context fail to describe and measure the role played by design as it relates to competitiveness and innovation. Therefore, actions could be taken to encourage the various organizations studying competitiveness and innovation in the Canadian context to include design as an indicator in their studies.

Appendix A – Literature Review

A literature review covering numerous studies conducted in Canada and globally was performed. The objective of this literature review was to identify the quantitative and qualitative impacts of graphic and industrial design on manufacturing and to identify metrics for measuring this impact. The following presents an overview of the findings from some of the most relevant studies.

It should be noted that this literature review allowed KPMG to identify a list of metrics that can be used to measure the impact of design in the manufacturing industry. Unfortunately, no study has a clear answer in terms of how to quantitatively measure the impact of design to the manufacturing industry.

UK Design Council. The Design Economy, The Value of Design to the UK.¹⁹

This study provides an overview of the value created by the design workforce in the UK, from design-intensive sectors, such as web design or animation design to design-engineers in automotive or aerospace companies. The research assessed the contribution of design to the UK economy using a set of key measures including:

- **Gross value added:** In 2013, Design's contribution to the UK economy was £71.1 billion in gross value added.
- **Productivity:** Workers with design element to their work were 41% more productive than the average. Every worker with design element delivers £47,400 in output (GVA per worker) compared with £33,600 across the rest of the economy.
- **Employment:** The design economy in the UK is mostly male (78% of designers compared to 53% of the wider UK workforce).
- **Exports of goods and services:** In 2013, the total value of exports where design had made a key contribution was £34 billion.

As a result, this study has shown the noticeable impact of design on not only the value design contributes to the wider UK economy but also on the make-up of the design economy.

UK Design Council. Leading Business by Design, Aerospace Sector²⁰

This study was conducted by the UK Design Council and presents how industry sectors, such as Aerospace, which are not traditionally associated with design, can benefit from design.

As a result, this study has highlighted recommendations for the aerospace sector in how to leverage design-led thinking.

The key findings of this report are grouped into five categories:

- **User-center success:** The report has shown design succeeds most in aerospace if it is driven and informed by customer and passenger requirements.

¹⁹ UK Design Council (August, 2015). The Design Economy, The value of Design to the UK

²⁰ UK Council (June, 2015). Leading Business by Design, Aerospace Sector

- **Customer expectations:** Evolving industry trends pose a whole new series of challenges for designers in aerospace. Future requirement for passenger experience will transform design's role.
- **Strategic implementation:** One of the outcomes of this report is for sustained corporate success and design needs to be embedded strategically and take place in a corporate environment with a strong design vision.
- **Pan-supply chain innovation:** This study has demonstrated design-led innovation might be achieved through collaboration with customers and companies across the supply chain value.
- **Multidisciplinary collaboration:** Design in aerospace requires many technical skills; strong collaboration between disciplines covering technology, manufacturing, sales and marketing are vital.
- **High market share:** This report has shown industrial design contributes to the creation of new markets and the increase of market share of existing ones. According to UK Design Council, design alert companies in the UK were able to increase their market share by 6.3% through design in 2007.

UK Design Council. Leading Business by Design, High Value Manufacturing²¹

This study presents Design as the driving force of the entire manufacturing process due to its use from concept to manufacture, to maintenance and repair, right through to the end of life processing. This report is about how and why companies in the UK's high value manufacturing sectors are investing in design. For the purpose of this report, the UK Design Council conducted more than one hundred interviews with individuals from over thirty companies across high value manufacturing from well-known manufacturers, such as Bombardier and Aston Martin, to their suppliers, including Rolls-Royces, Wipac as well as design agencies.

A broad understanding of design was adopted, covering a continuum from design focused directly on end-user experience to design in a more technical sense.

As a result, this study has shown the perceptible impact of investing in design in the high manufacturing sector in response to emerging technologies and regulatory constraints.

The main findings of this report are grouped into four broad areas which are:

- **Innovation and growth:** This study shows businesses invest in design in response to emerging technologies and when faced with regulatory constraints. Manufacturers appear to be taking steps to ensure they get the highest yield from their design investment by embedding design-led approaches in their organizations through proximity to end user, product lifecycle and technological developments.
- **Collaboration:** As a key finding of this study, design appears to be most effective when used collaboratively across the supply chain. Building strategic design relationships with smaller suppliers is necessary to allow innovation to come up through the supply chain as design requirements are pushed down the chain and the designers can collaborate by facilitating the exchange of design information among multiple partners using a common design language.
- **Designers' skills and competencies:** The study has demonstrated that high value manufacturers are extracting design-led innovation from their supply chains and are also investing in their design teams' skills. However, they are concerned about shortages of key skills. As they seek to embed design within their organizations, some designers' roles are becoming strategic as well as technical, creating demand for collaborative and interdisciplinary skills. The report concludes designers in manufacturing are most effective when they find the right balance between people-centric and technical engineering approaches, while still producing a product or service that is financially viable.
- **How design could be affected in the future:** The study shows that manufacturing companies expect the arrival of new digital industrial technology, referred to as Industry 4.0, to particularly affect design's future development, as machines and systems will be interconnected along supply chains. This could significantly alter the design process in manufacturing, turning it from an isolated top-down approach to something more integrated and seamless, spanning the entire supply chain. Changing consumer preferences will also play a role as users become more familiar with advances in connectivity and high value manufacturers will also supplement the products they currently manufacture with experience and services.

²¹ UK Design Council (January 2015). Leading Business by Design, High Value Manufacturing.

Quebec’s Ministry of Economics, Science and Innovation Design Tax Credit for industrial Design in Quebec.²²

This report assesses the impact of a design tax credit program on industrial and fashion design in Quebec. The Quebec government has implemented a tax credit program for both industrial and fashion design whose aim is to help small-and-medium size companies use design to improve their competitiveness. This tax measure's main objective is to support companies that use design to improve competitiveness of their products and generate maximum economic benefits in Quebec by taking account into the constraints linked to global competition. From 2009 to 2013, the cost of the tax credit for design totaled \$CAD 74.2 million for both industrial and fashion design.

According to an estimate from Quebec Consumer Goods Industries Association, the costs associated with Industrial Design represent about 20% of total costs of the tax credit for both industrial and fashion design. The key findings of this assessment are the following:

- From 2009 to 2013, the demand for the tax credit has increased up to 17%;
- 82% of recipient enterprises are satisfied by this tax measure;
- The ratio of return is 3.34, which means that every Canadian dollar of tax credit generates \$3.4 of direct economic benefits; and
- The recipient enterprises have noticed value added 29% higher than their peers operating in comparable industries during the evaluation period from 2009 to 2013.

Design Industry Advisory Committee (DIAC) & Martin Prosperity Institute (MPI). Why Invest in Design? Insights from Industry Leaders.²³

This report presents highlights from the findings of a research study on the impacts and benefits of investing in design conducted by DIAC and MPI, and includes a discussion of challenges and determination of economic value created by design, which can raise the level of firm profitability and productivity and contribute to national economic competitiveness and performance.

The report includes case studies and testimony from industry leaders whose organizations are internationally recognized and who connect design to their business strategy. Interview questions focused on the role of design in corporate strategy, financial investment, innovation and new product development, manufacturing process and corporate culture.

The organizations interviewed operate in different sectors, but leaders talked about a common set of design-related activities that are important to the sustainability of their organization, to the successful commercialization of innovation, and to the engagement of creative talent at a high level.

The best indicator of successful investment in design identified in this research is a long-term perspective on innovation.

Ten positive indicators of design investment have been identified in this study:

- **Long-term & Short-term:** The positive impacts of design come with long-term investment and some short-term risk.
- **Disruptive:** All of the interviewees talked about using design to realize significant change with positive financial implications and to create differentiation in their industry.
- **Embedded:** Design is integrated with other disciplines and is embedded in the organization culture.
- **Intensely focused:** These organizations are intent on getting to know their clients and customers and identifying the unmet needs of users. They invest in ethnographic research to track behaviors and workflows and then conceive solutions to address needs of their customers.

²² Quebec’s Ministry of Economics, Science and Innovation (December 2014). Design Tax Credit for industrial design in Quebec

²³ DIAC & MPI (June, 2014). Why Invest in Design? Insights from Industry Leaders.

- **Owned:** The design leaders interviewed are passionate about innovation and they own the design vision and the implementation of that vision within their organizations.
- **Tested:** Early stage prototyping, attention to detail, and continuous testing and evaluation feedback ensure that usability and resilience are built into the end products by the time they reach the marketplace.
- **Technology & Materials:** This study shows that there is a symbiotic relationship between design and technology. Design makes new technology work; it makes technology accessible to users and ensures that the specific technology products are matched to user needs. Sourcing, testing and integration of new materials are source of competitive advantage closely aligned with design.
- **Process:** Designing the process is as important as the end result, process design is linked to sustainable business practices in operations, facilities, manufacturing and product life-cycle management.
- **Holistic:** These organizations take a holistic approach to the design discipline, going beyond product to invest in brand management (often with in-house graphics teams).
- **Diverse:** Interviewees talked about the diversity of their creative talent pool comprised of staff and external consultants. Diversity is key to achieving the vision. Attracting and retaining top creative talent is both a priority and a challenge for these organizations.

Design Industry Advisory Committee (DIAC) & Greater Toronto Marketing Alliance (GTMA). Greater Toronto Area (GTA) Advanced Manufacturing Case Studies.²⁴

This study was commissioned by the Greater Toronto Marketing Alliance and conducted by the Design Industry Advisory Committee (DIAC). Three companies were researched with the objective of exploring how leading advanced manufacturers, in various industry sectors, are working with Canadian designers to establish competitive advantage.

The companies researched were Umbra, D&V Electronics and Zenon Membrane Solutions (now part of GE Water & Process Technologies). Each of these advanced manufacturing companies based in the Greater Toronto Area (GTA) started small and grew quickly. Two of the companies were started by university professors with a vision for commercializing cutting-edge technologies. They have used design thinking to bring their ideas out of the lab and into the marketplace.

These companies have a strong appreciation for user-centered design and its ability to transfer knowledge to the advanced manufacturing sector. They have leveraged next generation technology to create innovative products and services supported by strategic brand management. All three of these companies draw on the local talent pool in design.

These companies have worked with designers to improve the functionality and performance of their products, reduce their cost in manufacturing process and create distinct aesthetics for their products.

In integrating design with competitive business strategy, these companies demonstrate seven best practices:

- **Entrepreneurial Leadership:** These companies have a strong vision of how to make products better by design.
- **Focus on R&D linked to design thinking:** They have conducted cutting-edge research that integrates advanced technologies with new materials and design thinking
- **Adding value through User-Centered design:** These companies have worked with local designers to reduce costs in production and to enhance the performance, quality, adaptability and aesthetic look of their products to maintain a competitive advantage in the global marketplace and pass this advantage on to their customers.
- **Long-term relationship with designers:** The companies have developed long-term relationships with design consultants. Umbra also maintains a large multi-disciplinary in-house design team comprised of industrial and graphic designers and one engineer.

²⁴ DIAC & GTMA (June 2010), Greater Toronto Advanced Manufacturing Case Studies

- **Investment in brand and communication Design:** The companies have invested in state-of-the-art communication designs to build global awareness for their brands. This investment is reflected in their product branding.
- **Research relationship with local university and college networks:** All of these companies employ co-op students and have built research and advisory relationship with faculty and students in the strong university and college network in the region.

British Columbia Premier’s Technology Council. The Industrial Design Advantage.²⁵

This study was presented by the British Columbia Premier’s Technology Council to examine the effect industrial design can have on the growth of local industry. The report identified Industrial Design as an important aspect of successful technology commercialization.

The report showed that Industrial design can help companies gain increased margins through higher prices and lower costs. Higher prices can arise from designing products and services with superior features, usability, aesthetics or quality compared to those of competitors. Costs can be lowered by designing products and services that maintain quality and functionality but have lower development, materials, and manufacturing and transportation costs.

The report has highlighted the positive impacts of Industrial Design, which include:

- **Increased product utility:** Design is a source of increasing product utility by better interpreting customer needs.
- **Usability and user experience:** This report has shown design as a process that favors user-oriented innovation models.
- **Environmental sustainability:** One of the outcomes of this report is that design philosophies such as Life Cycle Assessment and Cradle to Cradle can minimize materials, waste and energy in the production phase, and decrease the negative impact of products on human health and environment.
- **Differentiation in the market:** This study has shown design is a source of competitive advantage on the market through brand equity, customer loyalty, price premium or customer orientation.
- **Improved business performance:** Design is a source of increased sales and better margins, more brand value, greater market share and better return on investment.

By using design as one of the key methods for companies to gain a competitive advantage, this study has shown that the economic benefits that accrue from Industrial Design are distinct and measurable. This includes:

- **Increased revenue:** Investment in design contributes significantly to improve companies’ revenue.
- **Improved profits:** A seven-year (2001-2008) study among almost 200 manufacturing companies submitting filings to the US Securities and Exchange Commission (SEC) demonstrated that companies with more effective industrial design (ranking done by design managers globally) outperformed their counterparts systematically. For “effective design” companies, the EBITDA (Earnings before interest, taxes, depreciation, and amortization) to Net Sales was on average 75% higher than the industry average over the seven years.
- **Better stock performance:** Share in design-led business has outperformed key stock market indices (FTSE 100 and FTSE All-Share) about 200% from 1998 to 2008.

Asia Pacific Foundation of Canada. Design as an Instrument of Public Policy in Singapore and South Korea.²⁶

This report examines the role of design as an instrument of public policy in Singapore and South Korea. This study was conducted to assist Canada in crafting its own approach to design by learning from the experience of the two countries which are as follows:

²⁵ British Columbia Premier’s Technology Council (2008). The Industrial Design Advantage

²⁶ Asia Pacific Foundation of Canada (October 2007). Design as an Instrument of Public Policy in Singapore and South Korea.

- Singapore has developed the Design Singapore Initiative, its first national collaboration design strategy in 2003. The main objective of the five-year strategy was to build a foundation for a strong design culture in Singapore by placing equal emphasis on supply-driven policies and developing a local market for good design. The strategy was establishing design test beds to facilitating the use of design by business, hosting and participating in international design festivals and educating the public.
- South Korea has one the most comprehensive national design strategies. When Korean goods became less competitive in late 90 the government began to develop its national design agenda. The aim of this plan was to put the country's design industries on par with those of developed countries by 2007, with dramatically increased employment opportunities for designers and general increase in design awareness by the general public. The goal underlying this strategy has been to improve the competitiveness and brand reputation of South Korea's major export firms through better design. The government played a major role through its funding of public programs and research and its partnerships with the private sector.
- The overall recommendation of this report is that Canada should immediately begin the development of its own national design strategy in order to remain competitive. As evidenced in this report, design may well be the most important and cost-effective means of addressing Canadian sustainability and productivity. Singapore and South Korea provide a prominent contrast to Canada in terms of their support for design as an instrument of public policy, and the design investment is bearing fruit in terms of the growing capacities for innovation and competitiveness in these two countries.

Appendix B – Interview Guide

INTERVIEW GUIDE

The focus of this interview is on Industrial Design and Graphic Design. The following definitions are provided for the benefit of the respondents to ensure that the return on investment of industrial and graphic design is measured independently.

Industrial Design starts by understanding user needs and desires via design research, and then reflects those needs and desires in the way products look and how they interact with users. The industrial designer is responsible for making products unique, compelling and desirable to consumers and other users and customizing products for export to other markets.

Graphic Design contributes to product success through branding, and a clear and compelling articulation of product features, benefits and uses in on-product labeling, print material, packaging and an online presence.

Section A: Organization Information

Organization name :

Contact person :

Title :

Phone number :

Email :

Interview date :

1. Which primary manufacturing industry sector is your organization involved in? (Select only one)

- | | |
|--|--|
| <input type="checkbox"/> Motor vehicle and parts manufacturing | <input type="checkbox"/> Consumer products manufacturing |
| <input type="checkbox"/> Aerospace product and parts manufacturing | <input type="checkbox"/> Textile, clothing, leather and allied product manufacturing |
| <input type="checkbox"/> Pharmaceutical and medical manufacturing | <input type="checkbox"/> Furniture and related product manufacturing |
| <input type="checkbox"/> Food and beverage manufacturing | <input type="checkbox"/> Other |

If other, please specify:

2. Where are your company's headquarters located? (Select only one)

- Canada Other
- U.S.

If other, please specify: _____

3. Where are your operations located? (Select all that apply)

- B.C. Quebec
- Alberta Prince Edward Island
- Saskatchewan Nova Scotia
- Manitoba New Brunswick
- Ontario Newfoundland and Labrador
- U.S. Other

If other, please specify: _____

NOTE: All of the following questions pertain to **Canadian operations only.**

Section B: Strategic Use of Graphic and Industrial Design**4. What were your organization's total revenues for each of the last 3 years?**

2013 : █ 2014 : █ 2015 : █

5. How many employees (FTEs) did you employ during each of the last 3 years in total?

2013 : █ 2014 : █ 2015 : █

6. How many graphic designers (FTEs) did you employ during each of the last 3 years?

2013 : █ 2014 : █ 2015 : █

Please explain how and why this has changed : _____

7. How many industrial designers (FTEs) did you employ during each of the last 3 years?

2013 : █ 2014 : █ 2015 : █

Please explain how and why this has changed : _____

Section C: Product Design and Development

15. How many new products did you introduce in each of the last 3 years?

2013 :

2014 :

2015 :

16. For each of the products introduced over the last 3 years, what are the total development expenses (in \$) related to each one?

Product #1:

Product #2:

Product #3:

17. For each of the products introduced over the last 3 years, what are the total graphic and industrial design expenses (in \$) related to the development of each one?

	Graphic design	Industrial design
Product # 1:	<input type="text"/>	<input type="text"/>
Product # 2:	<input type="text"/>	<input type="text"/>
Product # 3:	<input type="text"/>	<input type="text"/>

Please describe the purpose of those investments:

18. What is the current % of sales (2015) that were generated by each product introduced over the last 3 years?

Product #1:

Product #2:

Product #3:

19. For each of the products introduced over the last 3 years, what % of sales was derived from exports in 2015?

Product #1:

Product #2:

Product #3:

20. For each of the products introduced over the last 3 years, how would you quantify the contribution of graphic and industrial design? (For example, does a 10% investment reap a 10% reward?)

	Graphic design		Industrial design	
	Investment	Reward	Investment	Reward
Product # 1:	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Product # 2:	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Product # 3:	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Please explain :

Section D: Return on Design Investment

21. Does your organization measure the financial impact of design investment?

Yes

No

If so, which metrics do you use and what are the results of this assessment?

If not, why not?

22. When do you expect to reap the benefits of your investment?

Less than 1 year

Between 1-5 years

Between 6-10 years

Ongoing

23. Does your organization use any of the following metrics to measure the return on investment of industrial or graphic design? If so, please explain how the measure is used and how it is impacted by design. If the measure is not systematically used, could you please estimate the potential impact of design investment on each one?

Sales

How is the measure used:

How is the measure impacted by design (For example, how many \$ of sales do you expect from a 1\$ investment in design?):

Comments:

Product costs

How is the measure used:

How is the measure impacted by design :

Comments:

Expenses allocated to design

How is the measure used:

Comments:

Cash flow

How is the measure used:

How is the measure impacted by design (For example, does the investment in design help you attain higher or faster cash flow?):

Comments:

Profits

How is the measure used:

How is the measure impacted by design (For example, how many \$ in additional profit do you expect from a 1\$ investment in design?):

Comments:

Shareholder value

How is the measure used:

How is the measure impacted by design:

Comments:

Other

How is the measure used:

How is the measure impacted by design:

Comments:

Section E: Competitive Positioning

24 Is design part of your organization’s competitive advantage?

Yes No

25. How does design contribute to your organization’s differentiation in the market and how can this be measured?

26. Does design impact your Global Value Chain?

Yes No

If so, how?

27. Does design weaken or strengthen the bargaining power of your suppliers?

Weaken Strengthen

Please explain whether design contributes to strengthening or weakening that power:

28. Does design weaken or strengthen the bargaining power of your clients?

Weaken Strengthen

Please explain whether design contributes to strengthening or weakening that power:

29. What is the relationship between graphic design and your branding strategy?

30. What return on investment do you expect from investments in graphic design as they relate to your branding strategy?

31. Does design positively impact your competitiveness?

Yes No

If so, how?

32. Does design positively impact your productivity?

Yes

No

If so, how?

33. Does your organization use any of the following metrics to measure the return on investment of industrial or graphic design? If so, please explain how the measure is used and how it is impacted by design. If the measure is not systematically used, could you please estimate the potential impact of design investment on each one?

Product demand/Market share

How is the measure used:

How is the measure impacted by design (For example, for each \$1 invested in industrial and graphic design, how much do you expect your market share to increase?):

Development of new markets

How is the measure used:

How is the measure impacted by design (For example, did your investments in design allow you to enter new markets that you wouldn't have been able to compete in without investments in design?):

Exports

How is the measure used:

How is the measure impacted by design (For example, for each \$1 invested in industrial and graphic design, how much of this \$1 do you expect to recoup or increase by increased exports?):

Selling price

How is the measure used:

How is the measure impacted by design (For example, for each \$1 invested in industrial and graphic design, how much of this \$1 do you expect to recoup or increase by increasing market price?):

R&D efficiency and brand value (consumer attitudes, trust and satisfaction towards the organization's products or services)

How is the measure used:

How is the measure impacted by design:

Sustainability

How is the measure used:

How is the measure impacted by design (For example, for each \$1 invested in industrial and graphic design, how much of this \$1 do you expect to recoup or increase through increased sustainability?):

Other

How is the measure used:

How is the measure impacted by design:

For each \$1 invested in industrial and graphic design, how much of this \$1 do you expect to recoup or increase?

Section F: Product Functionality

34. Does your organization use any of the following metrics to measure the return on investment of industrial or graphic design? If so, please explain how the measure is used and how it is impacted by design. If the measure is not systematically used, could you please estimate the potential impact of design investment on each one?

Product function

How is the measure used:

How is the measure impacted by design:

Increased utility

How is the measure used:

How is the measure impacted by design:

Appearance

How is the measure used:

How is the measure impacted by design:

Manufacturability

How is the measure used:

How is the measure impacted by design:

Other

How is the measure used:

How is the measure impacted by design:

35. Is there a relationship between design, R&D investments and your organization's level of innovation?

Yes

No

If so, how would you quantify this relationship? _____

36. Does design positively impact your organization's level of innovation?

Yes

No

If so, how would you quantify this relationship? _____

Section G: Policy/Regulatory Considerations and Supporting Environment

37. In your opinion, are there any policy topics or regulatory issues related to accessing global/regional value chains?

Yes

No

Please explain why?

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