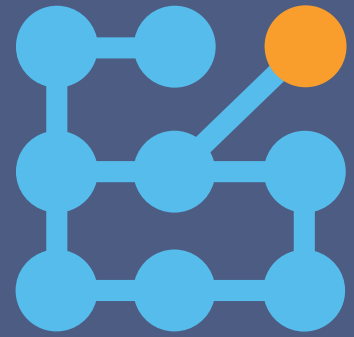


INNOVATION BY DESIGN: DIFFERENTIATOR IN THE DIGITAL AGE

Sara Diamond and Linda Lewis



Canada's poor innovation record has been exacerbated by a reluctance to acknowledge design as a key component of innovation. We have the key ingredients for design to make a difference to Canadian innovation — a strong and varied sector, a base of university and college programs, exemplary firms, and proof that design matters. By including design as part of the innovation paradigm (research and development and design), we could radically transform Canada's lacklustre innovation record into a leadership position.

Le design est un facteur clé d'innovation, et la réticence du Canada à reconnaître son importance ne fait qu'aggraver son maigre bilan en la matière. Nous avons pourtant tout ce qu'il faut pour faire du design un accélérateur d'innovation : un secteur dynamique et varié, des programmes universitaires et collégiaux, des entreprises modèles et des données confirmant son rayonnement. Il suffirait d'intégrer le design au paradigme d'innovation (et donc à la recherche-développement) pour redorer le ternes bilan du Canada et en faire un pôle mondial d'innovation.

With great power comes great design.

Mercedes-Benz commercial for 2012 CLS 550, July 2011

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Design is a multidimensional and crossfunctional activity that addresses the entire system of production and its life cycle, from ideation through to marketing, offering a critical path for successfully addressing complexity at key points of the value chain. As Bill Buxton, chief scientist of Microsoft and formerly of the Canadian high-technology firm Alias/Wavefront, reminds us, products are the individual, social and cultural experiences that they engender and the value and impact that they have on others — hence design is about the experience of a product, system or service. Design is an interdisciplinary interpretive force that is able to analyze inventions to suggest paths for actual products and services that either meet or create consumer demand, bridging between raw invention and application. Design knowledge matches human capacities and needs, in all their variability and complexity, with technologies, leading to the creation of new value-added products.

Designers allow companies to stay ahead of where customers are by anticipating and addressing human needs and behaviours in the context of our complex and changing world. "Hard problems" in research are called "wicked problems" by designers; these challenges require intensive collaboration and multilayered solutions. Designers are multilingual — that is, they are able to facilitate dialogues between very diverse disciplines such as business, engineering and materials science, and between researchers and investors. Design thinking marries systems analysis with outcomes-oriented problem solving. Design thinking is particularly relevant to creating efficiencies in services, products and business methods. Communication design creates key messages and brand identity to shape demand. Design redirects and refines existing products to address new markets. Simply put, design transforms knowledge into products, services and processes that consumers want, need and will pay for.

Design has become the differentiator in the digital era, a period when technology and the expression of human needs and comfort through excellent design are tightly intertwined. Apple is the ultimate design company, successful at every stage along this journey, taking research technology at its point of maturation and redesigning it for mass consumption, creating successful user experience and building a marketing chain and brand aesthetic. Apple designers

strategically developed products that users want, use and cherish. Apple understood users' desire for a seamless desktop experience, adopted Xerox's invention of the GUI (graphic user interface) and spun it into massive dis-

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tribution. Having already triumphed with the iPod — an invention that used design to build on earlier Korean applications of MP3 audio technology on mobile devices, Apple analyzed the disintermediation of the music industry, recognized users' desire to manage their own music or media, tracked the emergence of peer-to-peer downloading technologies — and created iTunes, providing ease of downloading and an easy price point and reintroducing profitability into music distribution. Apple intuited users' desire to combine an audio device, multimedia richness, tactility, aggregated communications functions, personalization through a wealth of applications and a mobile phone — hence the iPhone was born, revolutionizing the smartphone market. Apple designers understood the pent-up demand for light, portable, easy-to-use tablet computers, equally comfortable in the bedroom, the nursery or the boardroom, hence the iPad. We can see from the Apple example that the discipline of design requires a deep understanding of people, their differences, their desires and their needs as well as creative skills to imagine, represent and prototype products and services. As promoters of innovation, we need to bring design thinking and skills to the forefront of every stage of product and process development.

The report *State of the Nation 2010: Canada's Science, Technology and Innovation System* lists critical several growth sectors of R&D capacity. Of these computer services, software, telecom services and the banking and

financial sector could and should be particularly reliant on design to gain a competitive edge. These service enterprises depend on their positioning with end users, whether business-to-business or consumers. Canada's four key science

and technology (S&T) areas — environmental S&T, clean energy technologies, information and communication technologies (ICT) and health research and life sciences — include user-facing dimensions that could be greatly enhanced by excellent service as well as product design. Excellent service design ensures efficiency and provides powerful aesthetics and utility that focus on the end-user experience. Porter Airlines stands out as a service-oriented company that is design savvy and user-centric with its slogan "Flying Refined." Design is relevant across the spectrum of Canadian firms because it extends into business process analysis, an approach that is also called transformation design. RED, a Danish firm, emphasizes the interdisciplinary qualities of this approach — the reliance on participatory design (where end users are brought into the design process), the goal of "building capacity, not dependency," in relation to specific markets and the encouragement of out-of-the-box thinking and solutions with the result being fundamental change for companies. Given that the Canadian economy remains dominated by SMEs (small and medium-sized enterprises), such business-oriented design approaches and skills are exactly what is needed in order to build innovation capacity in Canada's challenged manufacturing and small service industries.

We need to redefine and broaden our understanding of the levers in the innovation process. *State of the Nation 2010* noted that research and development performed by business in Canada is low by international standards. The

report acknowledges the Frascati Manual's (2002) definition of R&D and the Oslo Manual's (2005) definition of innovation. It advises that "innovation is more than research and development (R&D) — it is transforming knowledge into products and services that Canadians and others... need, want and will pay for." Roger Martin, Chair of Ontario's Institute for Competitiveness & Prosperity, has suggested that

the focus on science and technology as the key to innovation has created a national stranglehold on invention. Upon the release in June 2011 of the Institute's report *Canada's Innovation Imperative*, Martin aptly noted that "Canadians are among the leaders in developed economies in work effort, hours per person, but we are laggards in creating economic value per hour worked" and further that we are not leading the world in creating innovative products, services and processes in our businesses and workplaces. This is the very essence of design innovation as it aims to transform inventions into something useful, desirable and accessible.

Our assertions about the efficacy of design are evidence-based. The importance of design to innovation capacity and productivity growth is well documented in a number of international reports from Europe, New Zealand, Denmark and the United Kingdom as well as Canadian studies, all measuring design intensity and linking it to innovation growth and capacity building at the regional and national levels. These studies show that design operates as a critically important source of economic value, raising firms' levels of profitability and productivity, and contributing to national economic competitiveness and performance. The UK Design Council's Design Index (2009) tracked 63 firms that used design as quality leverage to compete. These firms outperformed the London Stock Exchange FTSE Index by 200 percent in variable economic conditions. Countries such as Finland with a high innovation and competitiveness ranking invest in

design. Finland has a strong focus on design, with an annual investment of some \$40 million, and rates fourth in global innovation and second in competitiveness (2007). A report commissioned by International Enterprise Singapore (2003) showed that investment in product and visual design brought a return on investment 26 percent higher than investment in banking services and 20 percent higher than investing in computer technology.

Canadian quantitative evidence proves that excellent design has a positive economic impact. A 2008 report by Industry Canada, the Design Exchange and Canadian Manufacturers & Exporters identifies design as the critical element in achieving better productivity. *Product Design and Development: A Canadian Manufacturing Perspective* uses Statistics Canada data to show how time-to-market measures for Canadian design and manufacturing lag behind those in the US, but clearly accelerate when design capacity is added to a firm. A faster time to market reflects better integration of the design and manufacturing processes, as well as more effective application of design and design management principles.

STATE of DESIGN: The Canadian Report 2010 (another collaborative publication of Industry Canada, Design Exchange and Canadian Manufacturers & Exporters, produced after the recession) analyzed Canadian firms and found that “in today’s complex business environment, the extent to which firms invest in product design and development (PD&D) is a key determinant of their competitiveness.” PD&D provides the means to create new products, innovate with existing products, access new markets and commercialize successfully. Design was shown to help companies meet changing customer preferences, shorten the time-to-market window, increase product capability and performance, control product

and technology development costs and get best-in-class products and services to consumers.

Pierre Beaudoin, the president and CEO of Bombardier Inc. since 2008, has declared a passion for product design and is actively pushing product innovation within the company. This strategy has allowed Bombardier to address customer needs in Canada and abroad, to enhance customer experience and to customize design for customers’ needs regardless of locale, whether it is Toronto or Beijing. It has found environmentally sound solutions by seeking ways to improve aircraft and train performance through reducing energy consumption, weight, emissions and noise.

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The shift in manufacturing from First to Third World economies has strengthened the need for national design initiatives, allowing countries to remain competitive. In the recent Toronto Regional Research Alliance publication *The Race for Global Leadership in Innovation: An Analysis of National R&D Strategies*, the authors remark upon China’s dramatic movement from “the workshop of the world” to a country concerned with design specifications, intellectual property (IP) and knowledge. It notes that “emerging markets are coming up with new and innovative products at an astonishing pace.” The same can be said for India, where the drive is to eradicate poverty,

build internal market capacity and urbanize as well as compete for international capital.

In fact Australia, Brazil, China, Denmark, Estonia, Finland, Hong Kong, Iceland, India, Japan, Korea, Norway, New Zealand, Singapore, the European Union and the United Kingdom all have sophisticated design policies in place that encourage and support homegrown industries to compete globally, always linking design to national innovation and commercialization capacity. These countries through their joint government/industry/education agencies have evaluated their capacity to compete not only on their gross domestic product (GDP) but on their GDP — good design policy. The most successful countries have analyzed their strengths and weaknesses and adopted a four-pronged approach to ensure their ability to compete through design — education, promotion, support and policy. In many nations the potency of design to solve wicked problems has meant that, as Tara Vinodrai of the Martin Prosperity Institute suggests in *The Place of Design: Exploring Ontario’s Design Economy* (2009), “design holds the promise as an arena for both creativity and sustainability-led economic development thereby making it attractive to business leaders, policy-makers and communities.”

India created a national design strategy in 2007 that is driven by making the slogan “Designed in India, made for the world” a reality. It has now included design as part of the mandate of its Innovation Council. Measures include the strengthening of IP policy, a focus on the export of Indian design rather than India focusing on service provision, enabling SMEs to apply design to improve their products through tax and direct funding, branding Indian design and a large-scale investment in education and research at the National Institute

of Design, sectoral design schools and digital media schools. Bringing design education into early grades, an upswing in design focus at India's world-class institutes of technology and public sector procurement of designed-in-India goods are also part of the mix.

Denmark adopted a design policy in order to raise productivity — it ranked seventh in the world competitiveness ranking in 2010-11. The European Union has developed a plan for design as a driver of user-centred innovation as well as service design. The EU's 2009 working paper *Design as a Driver of User-Centred Innovation* argues for the need to recognize complementary factors that propel innovation and that can be low-cost and not technology intensive such as design. "Addressing innovation drivers that are close to the market and the user may help the conversion of research results into wealth-generating innovations, and thus increase the efficiency of R&D and innovation spending." Korea has pursued three five-year plans that were a response to the drop in demand for Korean goods in the 1990s. The goal was to bring Korea's design capacity to that of developed nations. Samsung invested millions in improving its product design, hiring fleets of designers and effectively leaving behind it a history of reverse engineering American goods to become a world leader in its own right. Korea is now almost on par with Canada in innovation and global competitiveness.

In stark contrast to the global design initiatives described earlier, Canada has few policies and initiatives in place to encourage design excellence or competitiveness. It wasn't always so. The Diefenbaker government got it right 50 years ago when on June 1, 1961, it passed *An Act for the Establishment of a National Design Council* to, among other measures, "plan and implement programs to create an awareness by industry and the

general public of the need for good design." The National Design Council, established by Industry Canada, included all design disciplines and built on its predecessor the National Industrial Design Council, created after the war to help Canadian firms compete in the growing international market.

Expo 67, with its focus on design and electronic media, owed its success and acclaim in no small measure to the initiatives of the National Design Council. Architects, urban planners, industrial designers, graphic designers, landscape architects, photographers and filmmakers joined together with colleagues from around the world to celebrate Canada's 100th birthday and demonstrate its accomplishments. Expo innovations included the first use of what was to become the technologically innovative IMAX projection system, the radical Habitat 67 housing project and the access-driven pictographic way-finding system, as well as the first extensive use of computer animation. Some said that Expo '67 was so successful that Canada's designers had proved themselves to the world and no longer needed government policy, support or interference to help them make their mark. More likely government volition to establish Canadian design capacity

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was eclipsed by other national policies within an economy still focused on commodities or branch plant manufacturing. The National Design Council, a joint industry-government body, and its public arm, Design Canada, were dissolved in 1988. There was and is a national failure to acknowledge that design policy is not solely about designers but about innovation and Canada's capacity to compete through design.

Despite the lack of coherent policy Canadian design capacity has grown, a response to the changes in Canada's industrial ecology. Studies as recent as the 2009 *The Place of Design: Exploring Ontario's Design Economy* have indicated that Canada has a large and well established design service sector (located primarily in Ontario, Quebec and British Columbia) with high levels of employment relative to the overall population. Its designers work as small-business people with their own firms and are integrated into many kinds of industries. Compared to other countries Canada has an average number of World Intellectual Property Organization (WIPO) designs and a low relative number of trademark registrations. Canada has a strong post-secondary design education system — from west to east — but few graduate design schools. Yet we produce more graduates than Canadian industry is either prepared or willing to absorb and exploit. While within the academies there is a willingness and desire to engage in advanced design research there are no opportunities or funding mechanisms in place to encourage this. With the exception of National Science and Engineering Council (NSERC) Industrial Design Research

Chairs, the tri-councils and the Canada Council do not acknowledge design as a category for advanced research or artistic support.

While the Design Exchange (DX) in Toronto is a national design museum and centre for design promotion, it is underfunded and there is no national promotion strategy for design in Canada, nor is design used as a

| Action | Benefit |
|--|---|
| <p>Business and design</p> <ul style="list-style-type: none"> • Create incentives for businesses to hire designers • Provide design awareness seminars for SMEs in manufacturing and service sectors • Incentives for company design audits and strategy development • Support firms' use of design through IRAP program, direct investment through design voucher and designer-in-residency programs for SMEs. • Provide tax incentives for companies that invest in design as well as R&D • Undertake study to monitor impact of design use by participating firms. | <ul style="list-style-type: none"> • Stimulate Canadian firms' use of design. Introduces potential SME clients to the value of integrating design into their strategies. • Identifies areas where design (in developing products, environments and communications) can address specific goals and improve commercialization • Enhances innovation and productivity. • Supports design as part of innovation • Supports design as part of the innovation cycle. • Measures impacts of introducing design methods, processes and products on firms' competitiveness |
| <p>Promote design</p> <ul style="list-style-type: none"> • Establish design standards of excellence for products, businesses and services | <ul style="list-style-type: none"> • Promotes the use of design industry capabilities • Heightened urban and rural quality of life • Attracts international and national firms that require design |
| <p>Use design for strategic planning</p> <ul style="list-style-type: none"> • Hold burning issue think tanks (design charrettes) that develop solutions for the core challenges facing Canada, working with design researchers and firms, key verticals and government | <ul style="list-style-type: none"> • Mobilizes design intelligence to solve problems • Develops scenarios, sketches and prototypes that industry and government can implement and then scale up |
| <p>Government role in procurement</p> <ul style="list-style-type: none"> • Establish priority procurement and project management processes by government for Canadian design firms (SMEs and international headquartered in Canada). | <ul style="list-style-type: none"> • Supports Canadian designers and retains them in the province. • Positions government as a living laboratory of excellence in design. • Ensures quality design in government products and systems. |
| <p>Design research and innovation</p> <ul style="list-style-type: none"> • Include design research and support for design innovation in research funding programs (SSHRC, NSERC, CIHR, CFI) and commercialization networks by adding design to subject areas that can be funded across and within all specific themes. • Invest in Centres of Excellence in Design Research and Commercialization. | <ul style="list-style-type: none"> • Ensures science and technology innovation reaches market place. • Accurately positions design as an enabler. • Links design to ICT/digital media as well as other key priorities. • Builds Canadian research and commercialization capacity in design across sectors. |
| <p>Design talent support</p> <ul style="list-style-type: none"> • Develop high-level skills in design to support a competitive creative economy and thriving Canadian design sector, including businesses, HQP and school children • Invest in PSE design education, identifying it as a key priority | <ul style="list-style-type: none"> • Prepares the next generation of designers and interdisciplinary innovators |
| <p>Environmental sustainability</p> <ul style="list-style-type: none"> • Include design within green ICT funding mechanisms | <ul style="list-style-type: none"> • Creates a living laboratory for sustainable design • Stimulates invention in green design, clean systems and technology • Sets government practice as a model |
| <p>Design for inclusion</p> <ul style="list-style-type: none"> • Support Canadian expertise in inclusive and accessible design; use government procurement to establish standards of excellence | <ul style="list-style-type: none"> • Makes Canada an exemplary jurisdiction for digital inclusion • Stimulates invention in inclusive design, systems and technology and growth of SME sector • Sets government practice as a model |
| <p>IP protection</p> <ul style="list-style-type: none"> • Modify the patent process to reflect the types of intellectual property of designers, encourage patenting | <ul style="list-style-type: none"> • Builds Canadian-owned IP |
| <p>Design promotion and heritage</p> <ul style="list-style-type: none"> • Support national and regional design centres such as DX; support national design centre network | <ul style="list-style-type: none"> • Promotes design and access to designers among manufacturers and small businesses • Promotes Canadian design quality and preserves design heritage |
| <p>Strategy implementation</p> <ul style="list-style-type: none"> • Create a national design secretariat in Industry Canada | <ul style="list-style-type: none"> • Promotes, monitors design strategy and inclusion of design in economic recovery • Promotes design in Canada and abroad |
| <p>Design and digital economy</p> <ul style="list-style-type: none"> • Include building design capacity as part of digital economy strategy | <ul style="list-style-type: none"> • Sustains cutting-edge innovation capacity in key digital sectors; builds market potential for Canadian inventions; encourages consumer engagement |
| <p>Intergovernmental</p> <ul style="list-style-type: none"> • Partner with initiatives at the provincial level that can create a Canadian design strategy | <ul style="list-style-type: none"> • Creates leverage for federal/provincial design expertise. |

branding strategy for Canada abroad. Design promotion has been left to individual cities. Toronto's Economic Development Department includes design and fashion as part of its mandate while Montreal has recently positioned itself as a member of the

• Overall ranking: 5th
The study concludes that although Canada has the third-largest design service sector in the world, there is no design policy despite the existence of an innovation policy "The innovation strategy recognizes the

the United States, work seamlessly across borders as do design-focused retail/manufacturers such as Lululemon and Umbra. There is a design brain drain — our best and brightest are leaving Canada and setting up shop elsewhere. Industrial designer Karim Rashid and graphic designer Bruce Mau, both renowned for their innovative capacity, have settled for larger markets in New York and Chicago respectively. Canadian fashion graduates are in demand around the world.

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UNESCO Creative Cities Network, celebrating design as a strategic force in the city. Unlike film or new media, design is not acknowledged as a national export industry.

The 2008 *National Design Competitiveness Report* was created by the Korean Institute of Design Promotion and Chung Jai-hak of Sogang University to examine three sectors (government, industry and the general public) of 17 countries and rank them in terms of their design competitiveness from a performance-oriented perspective, from an investment/environment perspective and from the human resources perspective. Italy ranked first, followed by France and the United States. Korea and Denmark shared eighth place while Canada ranked 12th — just ahead of China. Cambridge University's Institute of Manufacturing also ranked countries in relation to their design capability in 2009. Canada achieved the following results:

- Enabling conditions (total public investment in design (N/A)
- Inputs (total number of design graduates) (5th)
- Outputs: (WIPO numbers of design registrations filed) (6th)
- Outputs: (WIPO number of design registrations in force) (5th)
- Outcomes (numbers of design firms and employment in design service sector) (3rd)
- Outcomes (turnover of the design service sector): 3rd

importance of developing and exploiting new products, but does not comment on the role of design in this process. Indeed there is very little mention of design in the innovation strategy." They found that businesses in Canada have not received any incentives to include design as part of their research and development strategies. Few companies have reached the point where they utilize design beyond styling or appearance, integrate it into the R&D process or consider design as a key strategic element.

As Canada does not promote the integration of design into all aspects of Industry Canada's innovation agenda, design graduates are working all over the world and Canada exports more design services per capita than any other country. Others are taking advantage of Canada's innovation capacity.

Interior designers Yabu/Pushelburg have established an international export practice with major projects throughout the United States and Asia. Their designs for hotels, department stores and restaurants have become the gold standard for design innovation for companies such as Tiffany's, W hotels, the Bay and Laine Crawford. Export design services are offered by large architectural practices such as B+H that have projects throughout Asia and the Middle East. Graphic designers, because of the free trade agreement between Canada and

Most national design strategies incorporate the following elements: 1) Encouraging public appreciation of their nation's designers; 2) Mechanisms to encourage businesses to adopt design and design practices; 3) Talent and skills production through strengthening design education from K-12 through post-secondary; 4) Creating centres of excellence for design research, development and promotion; 5) Design knowledge management including design patent legislation; 6) Support for design research; 7) Integration of design knowledge in solving national challenges such as environmental sustainability, public services and productivity.

We have used these guidelines and added a "made in Canada strategy."

We have the key ingredients for design to make a difference to Canadian innovation — a strong and varied sector, a base of university and college programs, exemplary firms and proof that design matters. Design could help Canada turn the corner on innovation and productivity.

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