

THE ROLE OF INNOVATION IN DESIGN IN THE 21ST CENTURY AS A CONTRIBUTING FACTOR TO OUR ECONOMIC AND SOCIAL GROWTH

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Abstract

New Zealand has a rich history of innovation and pioneering leadership in the use of technology which continues to echo through our economy. As society changes, we require a much broader platform of support for innovation which facilitates technology transfer, investment in research, and opportunities for collaboration. This platform includes the use of design thinking which focuses on the user and results in more significant innovation, adding value and meaning to products, services and activities. As educators our role is to ensure that students have the capability and adaptability to contribute to a creative economy and face the challenges of the 21st century.

When I was born in 1961, New Zealand had one of the highest per capita incomes in the world, ranked the fifth most productive country in the Organisation for Economic Co-operation and Development (OECD), the NZ dollar was worth more than the Australian dollar and more Australians emigrated to NZ than vice versa. Now New Zealand has slipped to 22nd out of 30 OECD countries in terms of productivity, there are 500,000 New Zealanders living in Australia and they are 35 % better off than us.

Why has our per capita income fallen below countries we used to be better? Why do we work harder for less than the rest of the developed world? What impact will our low productivity have on our economic and social growth and our ability to compete globally and with our closest neighbour, Australia? How can we address our underlying lack of productivity?

“New Zealand is a small, open economy that is far from most of the world’s markets. In common with other advanced industrialised countries, New Zealand has a high share of its economy devoted to services and manufacturing. By OECD standards, New Zealand also has a relatively large agricultural sector, and a substantial proportion of exports based on primary production. A relatively small share of New Zealand’s exports, come from high-tech sectors such as ICT and pharmaceuticals”. (Economic Development Indicators Report, 2011, p.19).

In economic terms productivity is about how efficiently inputs, such as labour and capital can be turned into outputs in the form of goods and services. Gross Domestic Product (GDP) per capita and income per capita are the commonly used measures. At a personal level productivity is about output per worker or output per hour worked. Productivity growth is essential to our long term future and our economic and social well-being.

To grow our economy we could focus on the areas that are already performing well. Tourism is our top export industry, with manufacturing close behind. Dairying continues to do well with production doubling between 1990 and 2005. However while commodity prices are high at the moment the long-term future for primary products is trending downwards. Primary production and tourism also have adverse effects on our environment. (Callaghan, 2009).

The concept of an economy based on the production and distribution of knowledge and information, rather than the production and distribution of things, was first proposed by economist Peter Drucker as long ago the late 1960’s and is widely known as the knowledge economy (Wikipedia). This thinking has driven innovation frameworks and government policy in the OECD countries for at least the last decade. New Zealand's Growth and Innovation Framework (GIF), established by the government in 2002, identified creative design, information and communications technology (ICT) and biotechnology as sectors with potential to innovate. Funding and support have been focused on these sectors with mixed success. Just because we are good at farming, it should not be assumed we will be good at bio-technology (Callaghan, 2009).

The Economic Development Indicators Report (EDI) 2011 provides a useful comparison of performance across a range of economic and social indicators including innovation and entrepreneurship with the OECD countries. It concludes that “innovation is at the heart of aggregate productivity growth, and entrepreneurship drives innovation. Indicators in this report present a mixed picture for entrepreneurship and innovation in New Zealand” (EDI Report, 2011, p.4).

While New Zealand has a history of technological and social innovation, anecdotal evidence would suggest that this innovation has been driven by single-minded individuals like Bill Hamilton, Gary Paykel and Sir Peter Jackson. Sawyer (2005, p.41) cites Florida (2002) and Romer (1990) who argue that an innovative economy cannot be built by individual entrepreneurs alone. It relies on a broader platform of support for creativity and innovation ensuring that they are as intrinsic to the economy as labour and capital.

What needs to change to allow this to happen? Entrepreneurial businesses in this country have been accused of having low horizons, preferring to deal with established markets and opportunities rather than exploiting new ones (Frederick & Chittock, 2005). New Zealand tends to produce small businesses which focus their innovation on the domestic market, but not so successfully on international markets. There are very few large companies in New Zealand earning between \$100 to \$200 million revenue per year and only some of these could be considered truly innovative (Callaghan, 2009).

Technology transfer is broadly defined as the ability to transfer new ideas and technologies between the research sectors, where they are often generated and the commercial sector where they can be converted into wealth and high skill, high wage jobs. Compared to the OECD countries most research and development (R&D) in New Zealand is concentrated in the higher education sector and government. This research needs to be ‘unlocked’ and aligned with industry needs so it can be converted into commercial value and drive economic transformation. The Technology Transfer Voucher scheme announced in last year’s budget will help create these important linkages between higher education and business and will inject \$234 million into business R&D over four years. To date fourteen publicly funded organisations have signed up as R&D partners including Otago Polytechnic and the University of Otago.

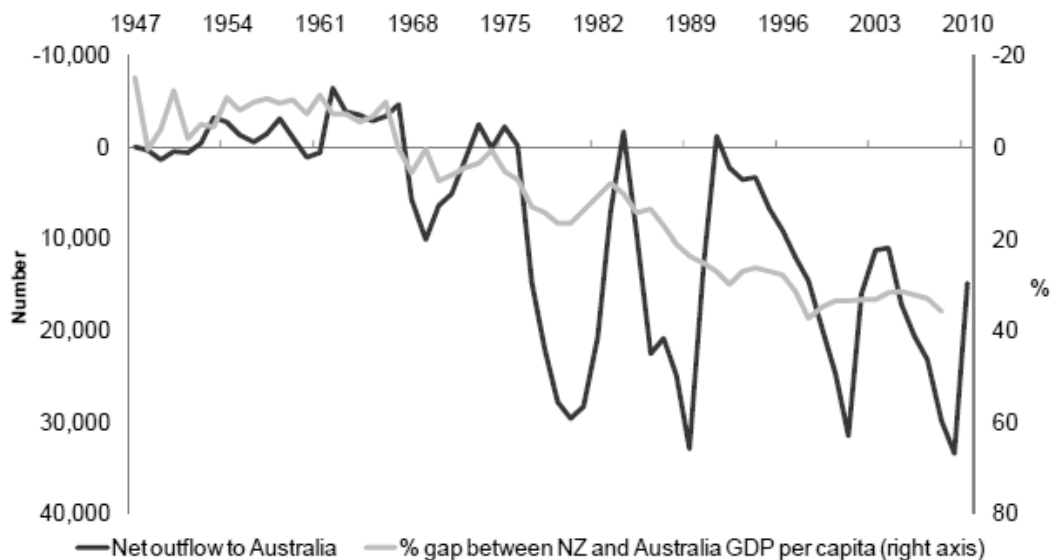
The recent merging of the Foundation for Research, Science and Technology and the Ministry of Research, Science and Technology into the newly-created Ministry of Science and Innovation (MSI) should improve support and coordination of R&D activities by providing funding for companies at all stages of growth.

Statistics about the rate of business failure in New Zealand can be interpreted in different ways but the Economic Development Indicators Report (2011) highlights a higher rate of business entry and exit in the New Zealand market than in OECD countries. There are few regulatory barriers to setting up in business in this country which encourages new enterprise but New Zealanders tend to enter business with limited skills and experience and a poor connection to networks and opportunities.

Our relationship with Australia

While Australia is our closest neighbour and natural trading partner, China and India are forecast to be the world's largest economies by 2050 with Indonesia, Vietnam and South Korea in the top 20. Australia is forecast to fall out of the top 20 (Asia New Zealand Foundation, 2011). Currently New Zealand performs as well as Australia on many of the underlying determinants of growth and innovation. Income per capita and GDP per capita however are lower and getting relatively worse. The income gap is driving large numbers of New Zealanders across the Tasman as this is graphically represented in Figure 1 below which is taken from Focusing on growth: Closing the income gap with Australia by 2025 - 2025 Taskforce report. Their skills and enterprise are a huge loss to the New Zealand economy. These people are needed to drive the economy and the government has set an Economic Growth Agenda to match Australia's per capita income by 2025. To achieve this New Zealand will need to grow two percent faster on average than Australia every year.

Figure 1: Net emigration to Australia and the income gap



We can look to other nations who rank creativity and knowledge as vital to the economy as labour and capital (Sawyer, 2005). It is no surprise that Finland and Sweden consistently feature at the top of the global innovation rankings. (Economic Intelligence Unit, 2007). Finland, with a population of four million has implemented public policy which stimulates innovation, specifically in education and training to build a highly skilled labour force, support for ICT and R&D, and specialisation in innovation-intensive industries. Sweden with nine million people also invests heavily in research and development and produces high tech products like Saab jets, Volvos and Ericsson cellphones. Sweden manufactures pharmaceuticals and is the home of Ikea, the world's largest furniture retailer. New Zealand occupies 23rd place in the global innovation rankings.

Teaching for creativity

Professor Yong Zhao from the Centre for Advanced Technology in Education (CATE) at the University of Oregon described a “Framework for 21st Century Living” at the Secondary Principals’ Conference in Napier in April 2011 (Iona College Newsletter, 2011). He identified five key skills areas for the future:

- Core subjects – English, reading, maths, history, languages, arts, geography, economics, science, government, civics
- 21st century themes – global awareness, financial, economic, business and entrepreneurial literacy, civic literacy, health literacy
- Learning and innovation Skills – creativity and innovation skills, critical thinking and problem-solving skills, communication and collaboration skills)
- Information, media and technology skills – information literacy, media literacy, ICT literacy
- Life and Career skills – flexibility and adaptability, initiative and self-direction, social and cross-cultural skills, productivity and accountability, leadership and responsibility

In order to foster creativity and innovation, it is necessary to address some common misconceptions:

Creativity is not confined to special people - everybody has the capacity to be creative but like all skills, it needs to be nurtured.

Creativity is not confined to special activities - like art or design. Creativity is a function of everything we do and can be applied to every activity and sphere – relationships, parenting, business, science, education, sport.

Creativity is a disciplined process - not a random unstructured process, not an idea, not a rare insight, not a lightbulb moment, not a flash of inspiration. It involves research, visualization, reflection, critical thinking, selection and refinement. Tim Brown (2009) is quoted on the IDEO website saying, “The myth of innovation is that brilliant ideas leap fully formed from the minds of geniuses. The reality is that most innovations come from a process of rigorous examination through which great ideas are identified and developed before being realized as new offerings and capabilities”.

Creativity is a social activity. According to Sawyer (2004, p.19), “in collaborative classrooms, new knowledge and insights emerge from exploratory discussion among learners. Students and teachers are both creative, and students learn how to participate in collaborative creative groups, an essential skill in the knowledge economy”. Collaboration, diversity, the exchange of ideas and building on other people’s achievement are at the heart of the creative process. The popular idea of the ‘lone inventor’ struggling away in isolation ignores the process and collaboration that led to the “discovery” of much of modern day technology that we all take for granted . Thomas Edison was one of the most prolific inventors in American history with over 1,100 patents in the U.S. Patent Office but Edison's great talent was pulling together cross-disciplinary teams who worked collaboratively.

Creativity can be taught. Creativity can be taught in two ways. Firstly by learning to think creatively in the same way as we learn to read and write. Creative thinking involves using analogies, metaphors, visual and divergent thinking skills. Secondly by promoting personal creativity and allowing people to use tools and techniques which help them to visualise and test their ideas using drawing, modelling and prototyping.

There is a difference between teaching creatively and teaching for creativity. Robinson (2009, p.24) explains that “teaching creatively means that teachers use their own creative skills to make ideas and content more interesting. Some of the great teachers we know are the most creative teachers because they find a way of connecting what they're teaching to student interests. But you can also talk about teaching *for* creativity, where the pedagogy is designed to encourage other people to think creatively. You encourage kids to experiment, to innovate, not giving them all the answers but giving them the tools they need to find out what the answers might be or to explore new avenues”.

Teaching for creativity at a tertiary level

The focus of all our programmes is to give students confidence in their own creativity using a range of creative thinking tools and techniques. They learn that design is a process which can be employed repeatedly and in any discipline. The context, materials, skills and techniques may vary but the process remains the same. To help students understand this we teach across the disciplines of communication, fashion, product and interiors at times. This also serves to encourage students to look outside their discipline, to observe human behaviour and consider new contexts and cultures. Students draw, build prototypes, models and garment toiles to think with their hands. At a fundamental level this allows for play and experimentation but also solves problems and leads to accidental discoveries which can feed into designing.

Students record their design process using a workbook so we can see how their ideas have developed –what was the inspiration or starting point, what informed their decision making, how did they select and refine their ideas? This is the research process as it is applied to a creative activity. Whiteboards and pinboards are also used for design thinking and inspiration. Using a workbook reminds students that there is a process and also allows us to reward creativity and risk-taking as part of the assessment process. The workbook also means that everything is saved in one place and that discarded ideas are not lost. The workbook is not about being tidy or presenting only finished work. The best workbooks are bulging with clippings, photos, writing, notes, fabric samples, material quotes, pricing – everything that has informed the final design. Elements of a workbook are developed for presentation purposes. In a commercial environment, designers continue to use this process but often adapt the format to suit their constraints.

The design outcome is assessed in conjunction with the workbook, looking for a strong connection between the process and outcome. Research, exploration, risk-taking, technical skill, resolution and presentation are assessed using an assessment rubric which establishes a set of criteria linked to the learning outcomes of the project or paper. Assessment criteria are discussed with students at the start of the project or paper and at higher levels, students will also play an active role in establishing assessment criteria.

The first half of the degree programme is focused on allowing students to feel confident in their creativity and free to respond to a creative challenge or problem using tools and techniques which allow them to execute their ideas through projects. The more technical learning is typically structured around 3 hour blocks and simple projects can be delivered in the same way or in a 3-4 week block if more complex. In the second half of the degree, students are applying their knowledge, skills and experience in more integrated projects, often working with external clients and retailers. Team projects, business and enterprise skills, work experience, internships and exchange programmes are introduced at this point to give students a better understanding of how their industry works and their place in it. The final year starts with a reflective project, giving students the chance to think about their personal design philosophy, strengths and future direction after graduation. Smaller and then larger projects with student and client driven briefs are the focus of the final year, culminating in a major exhibition of work or fashion show.

Participation in external competitions is encouraged throughout the programmes to give students the opportunity to have their work judged alongside their peers and to promote themselves to industry. Collaborative and inter-disciplinary projects expose student to different approaches and mimic the professional environment in which designers work. Presentations are held in large open spaces so that other students and staff can observe how to give and receive feedback and how to present with confidence.

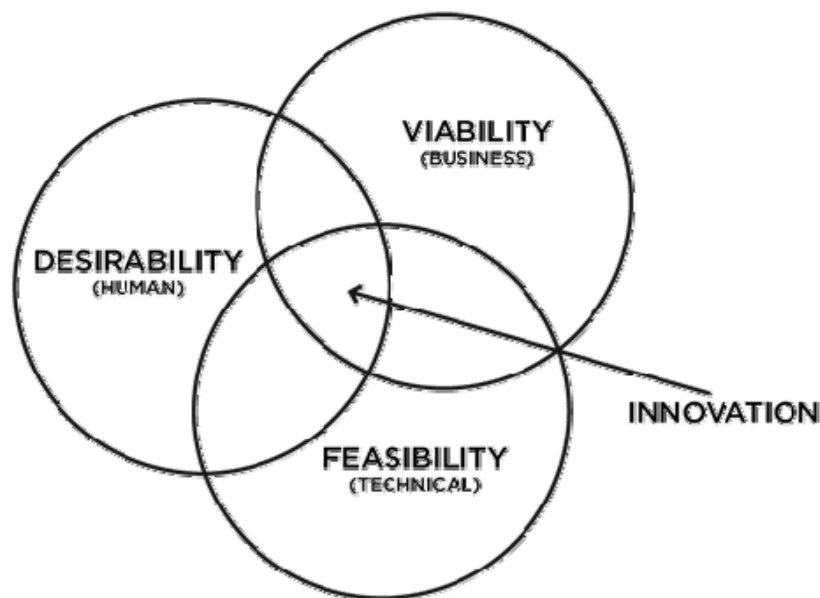
All learning at the school is built around trying to give students a feel for the commercial environment while at the same time nurturing creativity and developing confidence and a strong personal design philosophy. The philosophy behind our programmes has developed over time, through consultation with the various sectors of the design industry at a local, national and international level, through making mistakes and learning from them and through the visions and leadership of strong individuals.

Design thinking

The terms design and creativity are often used inter-changeably but whatever term is used, the concept of creativity is not confined to special people and the tools and techniques that are described above are not confined to an educational environment. Design thinking can be applied to anything that we do and to any environment and design thinking is the most powerful tool at our disposal when it comes to economic and social innovation. Nathan Shedroff (2008, p.41) describes design “as the process of meaningful innovation”. He heads an MBA in design strategy at California College of the Arts in San Francisco and specialises in experience design. Shedroff, along with David Kelley and Tim Brown of IDEO design consultancy is helping companies and organisations use design thinking to add value and meaning to their products. Although design thinking is not really a new concept, it has been somewhat sidelined as design became focused on the object during the latter part of the 20th century. Design thinking starts with the fundamental premise that “design is human-centred - it may integrate technology and economics but it starts with what humans need, or might need, what makes life easier and more enjoyable, what makes technology useful and useable” (Brown, 2009).

For design to be human-centred, designers must have the ability to empathise, to put themselves in other people’s shoes and then use that experience to fuel solutions. IDEO consults worldwide with businesses who want to develop new, innovative avenues for growth, grounded in business viability, technical feasibility and market desirability as represented by Figure 2 below. Companies like Air New Zealand and Fisher and Paykel are embracing design thinking as a strategy for promoting innovation and reducing reliance on low-cost manufacturing. China is equally enthusiastic about its potential to transform its economy.

Figure 2: IDEO’s 3 approaches to design



IDEO uses practical design thinking tools which can be applied in any situation – tools like brainstorming and mind-mapping to generate ideas and sketching and prototyping to develop and test ideas. Prototyping as a way of building to think and “if a picture is worth a thousand words ... a good prototype is worth a thousand pictures” (Kelley, 2001, p.39). The company has developed a set of Method Cards as prompts to help understand the people they are designing for. Inspired by playing cards, the cards are classified as four suits—Ask, Watch, Learn, Try—that define the types of activities involved in using each method. Each approach is illustrated by a real-life example of how the method was applied to a specific project. These cards can be used in a business or educational environment.

In New Zealand companies like FormwayDesign and Icebreaker are local examples of companies who have successfully incorporated design thinking into their business strategy. FormwayDesign director Mark Pennington believes that “good products are all about how people relate to them, and the better you understand people the better the solutions. It’s not enough to make products that are just okay, they have to be designed to be world leading” (Macfie, 2011, p.2). His company is expected to double their earnings from designing and licensing new products in the next five years despite the recession.

Design thinking is equally effective when applied to the service industry and role-playing is often used to enhance the user experience. To prepare for the launch of the new Boeing 777-300 aircraft in November 2010, Air New Zealand enlisted the help of IDEO (2009) to rethink the long-haul travel experience from the customers perspective. Every aspect of the experience was scrutinised – from the cabin’s layout and equipment to the in-flight service and entertainment and the customer experience inside and beyond the terminal. A team from IDEO spent a month in New Zealand running collaborative workshops, brainstorming ideas and prototyping and testing new solutions.

Looking to the future

Our education system is arguably one of the best in the world with capable, confident teachers who know how to collaborate, design and implement assessment and classroom content. Despite its shortcomings the National Certificate in Educational Achievement (NCEA), allows for greater diversity in terms of subject choices and gives teachers more autonomy (Philips, 2008). Evidence of this can be seen on the Techlink website where teachers are actively contributing to the curriculum, sharing ideas and examples of best practice. In my opinion, NCEA recognises that intelligence is diverse and the broadened range of subject choices allows students to customise their learning.

The introduction of National Standards in primary schools has met with widespread opposition from academics, principals and teachers. In an open letter to the Minister of Education, Hon Anne Tolley, ‘Warning about the new National Standards system ‘ (2009) leading education academics from the Universities of Otago, Waikato and Auckland expressed their fears that students who fail to meet the standard for their age will see themselves as failures which will impact on their success in other curricula areas. Since their introduction in 2010, schools have continued to oppose the standards with at least 140 primary schools failing to meet the compliance deadline. A recent report on Radio New Zealand (15 July, 2011) announced that the government has threatened to cancel the integration agreements for the eight Steiner schools in this country if they failed to include national standards targets in their charters. Steiner philosophy is different to mainstream schools and advocates later introduction of literacy. Sir Ken Robinson speaking in 2010 at warns that “standardisation is the enemy of innovation”. He believes national standards create a narrowed focus, generating a climate of fear and a culture of risk aversion which stifles creativity and innovation. Creativity is as important in education as literacy and should be treated with the same status.

Innovation and creativity are vital to our economy and our hopes for the future. If we promote diversity rather than homogeneity, the ability to approach problems from unusual angles and to borrow ideas and apply them in fresh contexts in education and in business, we can become a strong and vibrant economy and society. Professor Yong Zhao (2011) gives valuable advice to students who want to succeed in a global environment:

Have Something that Others Want and Be Great at It. Have the Confidence and Passion to Innovate. Capitalize on Strengths and Uniqueness. Have a Global Perspective.

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