

Innovation is not only STEM! The value of strategic and entrepreneurial approaches in Art and Design Education.

Keywords:

Art & Design Education, Strategic Design, Entrepreneurship, Innovation, STEAM.

ABSTRACT:

The government has recently proposed Australia as an Innovation Nation, trying to promote the commercialization of science and research. However, this focus on 'innovation' is usually linked to STEM (Science, Technology, Engineering, and Maths), and priorities are given to Science, with fields as Biomedical or Information Technology (IT) receiving most of the government funding. This view neglects the role of the creative disciplines such as Art and Design, which are sometimes perceived as having 'cosmetic', or 'maker' roles, rather than 'tactic' and 'strategic' ones.

In this context, traditional Design disciplines (Graphic, Industrial, Built Environment) have evolved from merely the conception of 'things' (be it a print magazine, a piece of furniture, or a building), to broader creative problem solving, management and strategic approaches to achieve predetermined goals, in what becomes a 'dematerialisation' of design. New design disciplines, such as Service Design, User-Experience Design (UX) and Business Model Design are increasingly important.

How can design education better prepare designers to play value-creating roles in the Innovation Nation, when non-design professionals are the ones increasingly practicing 'design thinking'?

This paper describes various educational projects by the authors, which incorporate strategic and entrepreneurial approaches in education. Projects range from ones that explore design of systems, services and user-experiences, to projects that enhance entrepreneurial skills. The paper offers ideas for educators, exemplifying new and increasing values of strategic and entrepreneurial approaches in Art and Design education.

A/Prof. **Carlos Alberto Montana-Hoyos** (PhD) is an Associate Professor of Industrial Design (ID) in the University of Canberra since 2010. He has developed award-winning, multidisciplinary design projects while living in Colombia, Italy, Japan, Singapore and Australia. As an academic, Carlos was Adjunct Assistant Professor in the Product Design Engineering course of EAFIT University in Colombia (2001-2003). He was also a Fellow and Assistant Professor in the ID Program of the National University of Singapore (2006-2010). His research interests are on multidisciplinary and cross-cultural approaches to design, and include topics as Design for Health and Sports, Biomimicry and Design for Sustainability.

Camilo Potocnjak-Oxman is an Industrial Designer from the Universidad de Chile with a Master of Management from the Australian National University. He has worked as an independent designer in a range of industries, including education, games, food and the mining sector. Over the past eight years he has been involved in business education, focusing on innovation and entrepreneurship. This experience has enabled him to work as part of an interdisciplinary team designing and delivering "InnovationACT", Canberra's largest entrepreneurship competition, and more recently "Stir", an online grants platform aimed at drawing emerging creatives to engage with the local innovation ecosystem.

Introduction: Australia's 'Innovation Nation' ignores the roles of creative disciplines

Innovation is a shared topic in national policies in many countries around the world, including Australia, where the recent 'Innovation Nation' plan focuses on areas of: 1) collaboration, 2) skills and talent, 3) culture and capital, and 4) government as exemplar, with the ultimate goal of creating an 'ideas boom' with valuable IP and inventions that will set Australia apart as an economy leader (Osborne, 2016). Von Stamm (2008) proposes that creativity, or the generation of new ideas is a starting point in the design process, and innovation is the application or 'implementation' of these new ideas to products or services. The National Innovation and Science Agenda (NISA, 2016) states that 'in the next decade an estimated 75 per cent of jobs in the fastest-growing industries will need skills in Science, Technology, Engineering and Mathematics (STEM).' This poses some questions for Art and Design practitioners and educators: where are the creative disciplines placed in this innovation agenda? What is the role of 'design' in the context of this national strategic goal? Unfortunately, the role of the creative disciplines in innovation is almost non-existent. Anecdotally, a quick search for the word 'design' in the NISA website only retrieves results related to: *policy design, programme design, medical drug design, email design*, and others (<https://www.innovation.gov.au/search/content/design>) none of which are related to any of the creative disciplines of design, such as industrial and product design, graphic design, fashion design and others. On further exploration of the NISA website, other than STEM, main topics are: *business, start-ups and entrepreneurs, investors, and accelerators*, among others. (Figure 1)

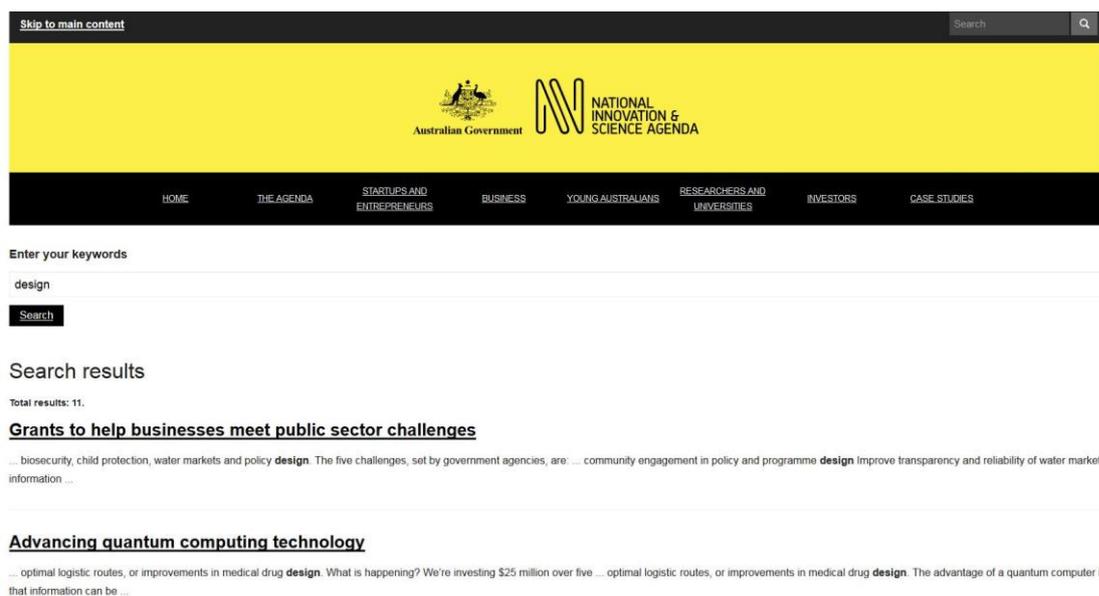


Figure 1. National Innovation and Science Agenda, main topics and search for 'design'

As Art and Design educators, we have to do something about this! We have to demonstrate to the government and other stakeholders that Art and Design are important, and that the creative disciplines are an integral part of innovation. So, how can we do this?

On one hand, internationally there is a strong movement for changing the notion of STEM into 'steAm', where the added 'A' stands for 'Arts and Design'. As explained by the STEMTOSTEAM movement, 'Art + Design are poised to transform our economy in the 21st century just as science and technology did in the last century (STEMTOSTEAM, 2016).'

However, another option is to explore new strategic and entrepreneurial approaches, integrating many of the business and entrepreneurship topics into the Arts and Design curricula.

From cosmetic, to tactic, to strategic: changing roles in design

It is evident that worldwide the design disciplines are changing with the evolution of society and technology, and a 'dematerialisation' of the creative disciplines is seeing a growth in new ones, such as service design, user experience design, digital design, strategic design, and others. An interesting example of this evolution of design disciplines is the new orientation of the former International Council of Societies of Industrial Design (ICSID), which has now been rebranded as the World Design Organization (WDO). Not only the new focus is important (which addresses the validity, or not, of the name 'industrial' design, within a post-industrial and digital era), but also the revised definition of design clearly states the new and changing roles of the discipline. WDO (2017) proposes that *'Industrial Design is a strategic problem-solving process that drives innovation, builds business success, and leads to a better quality of life through innovative products, systems, services, and experiences'*.

This also evidences a change in roles within design, from cosmetic 'beautification' or decoration of products exemplified by the styling movements in the 1950s, to more tactical roles such as making products and services more functional and desirable through aspects such as interaction design, experience design and brand-driven innovation. Today, the broader role of contemporary design acquires new value as a strategic resource capable of fostering innovation, sustainability, and the creation of new business models, which are shaping and changing society.

Are designers and creatives 'design thinkers'?

A review of the literature shows that an interesting development in the field of design education is the emergence of schools providing design-related programs for non-design professionals (Glen, Suci, Baughn & Anson, 2015, p.182; Hasso Plattner Institute, 2017; Melles, Howard & Thompson-Whiteside, 2012, p.163-164; Stanford d.school, 2017). These attempts to position the value of design in the worlds of business, industry and technology are not new, but rather reminiscent of post-war development of the discipline at the HfG Ulm (Bonsiepe & Cullars, 1995, p.15; Fernandez, 2006, p.4).

Although 'design thinking' was first described almost fifty years ago (Simon, 1969), it gained prominence as an innovation process during the 2000s (Johansson & Sköldböck, Woodilla, & Çetinkaya, 2013, p.123). Design thinking currently has many loose definitions, ranging from 'what designers do' (Carr, Halliday, King, Liedtka and Lockwood, 2010, p.62); to 'approaching management problems as designers approach design problems' (Dunne and Martin, 2006, p. 512); and 'design practice [...] used beyond the design context, for and with people without a scholarly background in design, particularly in management' (Johansson & Sköldböck et al, 2013, p.123).

Although lacking a standard definition, researchers have attempted to categorise the characteristics of design thinking in several different ways. One such categorisation stems from the management discourse, and states that design thinking includes: 1) Practices closely related to concrete activities and ways of working - human-centred approach, thinking by doing, visualising, combination of divergent and convergent approaches, and a collaborative work style; 2) Thinking styles and methods of processing information - abductive reasoning, reflective framing, holistic view and integrative thinking; and 3) Mentality, or mindsets, both in individuals and as part of an organisational culture - experimental and exploratory, ambiguity tolerant, optimistic and future-oriented (Hassi & Laakso, 2011, p.5-10).

This combination of practices, cognitive processes and mindsets commonly present in design thinking, although not as explicitly prevalent in design education, have already been recognised as strategic tools in the field of management (Dunne & Martin, 2006, p.512; Johansson & Sköldböck et al, 2013, p.123; Kotler & Rath, 1984, p. 17; Prandelli, Pasquini & Verona, 2016, p.297). At the core of design thinking is abductive reasoning (Dorst, 2011, p.522-524), defined as 'the process of forming an explanatory hypothesis. It is the only logical operation which introduces any new idea' (Peirce, 1960). People trained in design use complex forms of abduction that are particularly useful when tackling open-ended or

'wicked' problems (Dorst, 2011, p.523-524), defined as 'a class of social system problems which are ill-formulated, where the information is confusing, where there are many clients and decision makers with conflicting values, and where the ramifications in the whole system are thoroughly confusing' (Rittel, cited in Buchanan, 1992, p.15).

Designers' ability to use abductive reasoning and 'framing', or 'the creation of a novel standpoint from which a problematic situation can be tackled' (Dorst, 2011, p.525), emphasises the importance of the discipline in the innovation process. The practices, thinking styles and mindsets of design thinking are already common in established organisations, national institutions and entrepreneurial ventures. It is now important for designers to use these capabilities and take their place in this new context where innovation is at the forefront of national competitiveness.

Examples of strategic and entrepreneurial approaches in design education

In line with current developments of the design profession, and as part of a curriculum renewal in the design disciplines in the University of Canberra (UC) in 2012, a new unit called 'Design Strategies' was developed by one of the authors, as a core component of the industrial design programme. This was proposed after a review of current industrial design education trends, as well as in consultation with a professional advisory board which included industry, design professionals and members of the former ICSID. A key aspect to support the introduction of this unit into the curriculum was the increasing number of UC industrial design graduates who were recently working with the government in Canberra, in divisions like the Australian Tax Office (ATO) doing design-related jobs such as 'user-experience design'. Introducing this, and other new units, meant that some compromises had to be made. For example, in this case, a former and more traditional 'furniture design' unit, popular in many industrial design courses around the world, had to be closed in order to fit this new unit.

The 'Design Strategies' unit was first taught in 2013. The unit aims and overall process are summarized in its syllabus, as follows: "this unit explores emerging approaches to design which aim to deliver solutions which are not exclusively physical and 3-dimensional. A combination of theoretical and applied knowledge will expose the students to strategic projects, which use design techniques (such as user & context research, co-design, envisioning, prototyping and testing) with potential applications in the design of services, systems, interactions and user experiences. This wider scope of projects will provide the

students with tools which enable a broad variety of employment opportunities, not only in manufacture sector but open to other industries or services”.

The aim of the main project of the unit has always been to expose the students to real-life problems and also to open their eyes to opportunities for design to collaborate with diverse institutions, putting them in touch with their very own ‘local community’. This also helps simulate a ‘professional-client’ relationship.

This 3 credit point, level 3 (third year undergraduate) unit is open as an elective to different courses, so it is usually conducted in a multidisciplinary way, with students mainly from industrial design, architecture, interior architecture and graphic design, but also sometimes with students from education, history, bachelor of arts, and other disciplines.

During the first 3 years, the unit had a strong focus on Health, through 2 subsequent collaborations with the Calvary Hospital and 1 with Ochre Health Clinic. In 2013, students explored problems and issues in the waiting room of the Emergency Unit in Calvary Hospital, as designs of systems, services and user experiences. (Figure 2)

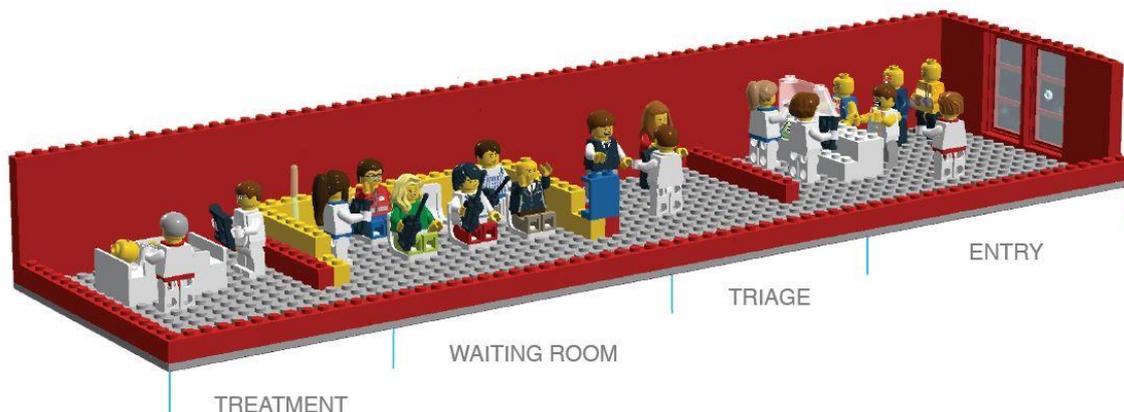


Figure 2. Lego representation of a new system to improve triage in Emergency units of hospitals (by student Tim Frommel)

In 2014, we also collaborated with Calvary Hospital, and students explored new technologies with a focus on improving simulation in health training.



Figure 3. Use of virtual reality for enhanced medical student training experiences (by student Daniel Koenigs)

In 2015, students looked at improvements in the waiting room of Ochre Health, a project attached to the development of a Health pod to be deployed in the waiting room of the clinic. 2016 encouraged the creation of simulated small companies, through collaboration with the Mobile makers project. The 2017 unit established the collaboration with Stir (<https://causeastir.com.au/about/>), a local business accelerator focused on engaging youth in entrepreneurship, part of the Canberra Innovation Network, CBRIN. This current collaboration is also tied to a PhD research project in the Australian National University (ANU) School of Business, which also intends to explore and further understand entrepreneurial intentions and activities in designers.

The current version of the unit integrates methods from design thinking, service design, and entrepreneurship. Well known design thinking frameworks, such as the ones developed by IDEO and Stanford are combined with service design tools, such as systems maps, customer journey maps, and experience prototyping. Finally, in its latest version, the 'user-centred' design approach favoured by service design thinking has been adapted to a 'customer-centred' approach, in line with business and entrepreneurship education. Some of the entrepreneurship tools, which have been integrated to the design thinking and service tools, are widely used tools in entrepreneurship education, start-ups, and business accelerators, such as customer validation and the business model canvas.

While still in progress and no evaluation or assessment can be made on this teaching experiment of mixing service design thinking and entrepreneurial tools in a single unit within the arts and design curricula, informal comments by students hint the value some are seeing in this approach, with comments such as ‘why didn’t we see this since the beginning of our courses’? In the 5 years it has been taught, the ‘strategic design’ unit has received a range of both negative and positive, formal and informal feedback from students. In general, design students initially struggle with open ended briefs, and the idea of designing a system or an experience, and in many cases students persist on solving a problem by designing a more tangible ‘product’ according to their discipline (for example, an electronic device if students are industrial designers, a brochure or website if students are graphic designers, or a space if students are architects). As such, some of the feedback by design students has been harsh against the unit, with comments as; ‘why do I have to study this unit? It has nothing to do with my course. I joined design because I like to make things’. However, on the other hand, many students and especially graduates have appreciated the new skills learnt in the unit, which they have been able to apply in different ways. A former student commented: ‘this was the most important unit of my course, and it gave me a job in the public service’.

Entrepreneurship Education in Design or Design of Entrepreneurship Education?

Another perspective on the relationship between design and entrepreneurship education is that design, through its user-centred skill set, is capable of developing learning experiences within and beyond the context of the design school. By thinking of a ‘course as a service’, with the ‘curriculum as a design brief’, a designer’s capabilities become valuable to a wide range of disciplines, in particular those of management and entrepreneurship education.

Research into entrepreneurship education highlights the importance of action-based, or ‘learning by doing’ approaches (Laukkanen, 2000, p.36-37; Rasmussen & Sørheim, 2006), with emphasis on stakeholder engagement, use of game mechanics, and the development of an entrepreneurial identity. More importantly, management scholars talk about the importance of including design practices in entrepreneurship and management education (Dunne & Martin, 2006, p.513; Neck & Greene, 2011, p.62). This provides an opportunity for designers to take an active role in the development of entrepreneurship curricula.

Examples of this already exist in Canberra, with one of the authors (trained as an industrial designer) having designed and delivered innovation and entrepreneurship courses at the Australian National University (ANU) Research School of Management since 2013. This author is currently the convenor for the undergraduate ‘Entrepreneurship and Innovation’ and the postgraduate ‘Entrepreneurship and New Venture Creation’ courses, both focused

on practical approaches to conceiving and developing entrepreneurial opportunities through use of the business model framework (Concourse, 2017a; 2017b). In addition, along with a team led by designers, they have since 2014 been part of the design and delivery of InnovationACT, Canberra's largest entrepreneurship program (InnovationACT, 2017). Through the use of practices common in design education, the InnovationACT program has moved from a commerce degree-oriented business planning competition, to a multidisciplinary innovation process that involves use of many design thinking practices (Hassi & Laakso, 2011, p.6) and development of entrepreneurial competencies (Morris, Weeb, Fu & Singhal, 2013, p.352;358). During their first intervention in 2014, the program received close to 30 teams. This number has doubled since then, to over 60 in 2017.

The learnings gathered designing these entrepreneurship education programs are the driving force behind the Stir platform, aimed at engaging people from creative industry backgrounds, in particular design, to engage with the entrepreneurship ecosystem (Stir, 2017). As designers begin to play increasingly diverse roles in the global entrepreneurship community (Maeda, 2016), it is important that this include students and graduates from Australian design schools.

Conclusions

It is regrettable that programs such as the National Science and Innovation Agenda (NISA) in Australia do not consider the creative disciplines as a main driver and key component for innovation. As Art and Design educators, we have to do something about this!

It is our disciplines' responsibility to demonstrate to industry, the government and other stakeholders that Art, Design and the other creative disciplines are an integral part of innovation, cultural exchange and economic development. One way to do this is to explore new strategic and entrepreneurial approaches in the Arts and Design curricula. Integrating design thinking and innovation methods with business and entrepreneurship topics into 'Arts and Design' education is one possibility. Another is to improve the recognition of the design discipline by integrating aspects of 'design thinking' in the context of business and entrepreneurship education.

It is understandable that a majority of students who join Arts and Design courses can mainly be interested in the physicality, materiality and specialties of the course they chose. Anecdotal evidence suggests that many students join Arts and Design courses because they like to 'make' and 'draw', and precisely because they don't like to 'write'. While 'drawing',

'making' and 'doing' are still integral in Arts and Design disciplines and are also a core of creative explorations in the application of the design thinking process, it is becoming increasingly necessary to provide our students with avenues to explore more contemporary and strategic approaches to design.

We are convinced of the value of this educational approach in contemporary society and argue that, while predictable that many Arts and Design students may struggle more with strategic, systems-level units than they would with practical ('making') units, these studies are important for a well-rounded preparation of any future professional in Art and Design related disciplines. At every point in their career, artists and designers will have to deal with aspects of business, 'selling' their design, a work of art, or just even 'selling an idea' in any other form of employment. Furthermore, the design professions as we know them are changing. Many of the traditional job opportunities are disappearing, such as those associated with manufacture in a country like Australia where, over the last decade, industrial activity has moved overseas.

The approaches we have described here aim to prepare students for this changing job landscape. By equipping them with the tools to deal with the open-ended, complex, and 'wicked' challenges of the future, we will hopefully increase their employability, make them suitable to a wider range of jobs, or even better, allow them to create their own companies or businesses.

These initial teaching experiments raise many questions for further research, which we intend to explore. Do artists and designers engage with entrepreneurship? Why, or why not? Are designers better prepared to become entrepreneurs? Does engagement of artists and designers in entrepreneurship depend on personality traits? Should art and design education prepare students to be strategic thinkers and entrepreneurs, or not?

References

- BONSIEPE, G., & CULLARS, J. 1995. The Invisible Facets of the hfg ulm. *Design Issues*, 11(2), 11-20.
- CARR, S. D., HALLIDAY, A., KING, A. C., LIEDTKA, J., & LOCKWOOD, T. 2010. The influence of design thinking in business: Some preliminary observations. *Design Management Review*, 21(3), 58-63.
- CONCOURSE a 2017. *May Concourse | Entrepreneurship & Innovation*, retrieved 23 August 2017 from: https://anu.campusconcourse.com/view_syllabus?course_id=3361
- CONCOURSE b 2017. *May Concourse | Entrepreneurship and New Venture Planning*, retrieved 23 August 2017 from: https://anu.campusconcourse.com/view_syllabus?course_id=3362
- DUNNE, D., & MARTIN, R. 2006. Design thinking and how it will change management education: An interview and discussion. *Academy of Management Learning & Education*, 5(4), 512-523.
- FERNÁNDEZ, S. 2006. The Origins of Design Education in Latin America: From the hfg in Ulm to Globalization1. *Design Issues*, 22(1), 3-19.
- GLEN, R., SUCIU, C., BAUGHN, C. C., & ANSON, R. 2015. Teaching design thinking in business schools. *The International Journal of Management Education*, 13(2), 182-192.
- HASSI, L., & LAAKSO, M. 2011. Design Thinking in the Management discourse; defining the elements of the concept. In *18th International Product Development Management Conference, IPDMC*.
- HASSO PLATNER INSTITUTE SCHOOL OF DESIGN THINKING 2017. retrieved 23 August 2017 from: <https://hpi.de/en/school-of-design-thinking.html>
- HASSO PLATNER INSTITUTE OF DESIGN AT STANFORD UNIVERSITY 2017. *About – Stanford d.school*, retrieved 23 August 2017 from: <https://dschool.stanford.edu/about/>
- INNOVATIONACT, 2017. 'About / InnovationACT' retrieved 23 August 2017 from <http://innovationact.org/program/about/>
- JOHANSSON-SKÖLDBERG, U., WOODILLA, J., & ÇETINKAYA, M. 2013. Design thinking: past, present and possible futures. *Creativity and Innovation Management*, 22(2), 121-146.

KOTLER, P. AND ALEXANDER RATH, G., 1984. Design: A powerful but neglected strategic tool. *Journal of Business Strategy*, 5(2), pp.16-21.

MAEDA, J. AT KLEINER PERKINS CAUFIELD & BYERS 2016. *Design in Tech Report 2016 v2 [PDF Slides]*. retrieved 23 August 2017 from <http://www.kpcb.com/blog/design-in-tech-report-2016>

MELLES, G., HOWARD, Z., & THOMPSON-WHITESIDE, S. 2012. Teaching design thinking: Expanding horizons in design education. *Procedia-Social and Behavioral Sciences*, 31, 162-166.

MORRIS, M. H., WEBB, J. W., FU, J., & SINGHAL, S. 2013. A Competency-Based Perspective on Entrepreneurship Education: Conceptual and Empirical Insights. *Journal of Small Business Management*, 51(3), 352-369.

NISA (National Innovation and Science Agenda). 2016. 'Young Australians,' retrieved 23 August 2017 from: <http://www.innovation.gov.au/audience/young-australians>

OSBORNE, P. 2016 'Turnbull Seeks Innovation Nation,' *The Australian*. retrieved 23 August 2016 from <http://www.theaustralian.com.au/news/latest-news/government-to-unveil-innovation-plan/news-story/69dd53d6a344a633ea41f2d26f94a50d>.

PRANDELLI, E., PASQUINI, M., & VERONA, G. 2016. In user's shoes: An experimental design on the role of perspective taking in discovering entrepreneurial opportunities. *Journal of Business Venturing*, 31(3), 287-301.

RASMUSSEN, E. A., & SØRHEIM, R. 2006. Action-based entrepreneurship education. *Technovation*, 26(2), 185-194.

STEMTOSTEAM. 2016 'What is STEM to STEAM,' retrieved 23 August 2017 from <http://stemtosteam.org/>

STIR, 2017. 'Stir / Crowd-voted Grants for Creative Projects / About' retrieved 23 August 2017 from <https://causeastir.com.au/about/>

VON STAMM, B. 2008 'Managing Innovation, Design and Creativity' chapter 1" retrieved 23 August 2017 from: http://media.wiley.com/product_data/excerpt/85/04708470/0470847085.pdf

WDO (World Design Organisation) 2017 *Definition of Industrial design*. retrieved 23 August 2017 from: <http://wdo.org/about/definition/>

