Mapping Design Research @ RMIT

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ACKNOWLEDGEMENTS

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EXECUTIVE SUMMARY

Design is being situated as a key cultural and economic driver locally and around the world. RMIT has an established reputation as a provider of high quality design education at an undergraduate level. Perhaps less known outside of disciplinary communities, however, is the nature and extent of the research that is also occurring through the medium of design.

Understanding the nature of these activities, the key capabilities and aspirations, as well as where design research activities overlap or interrelate, is essential to promoting networks amongst design researchers and determining how to build on existing capacity.

The study involved interviewing a sample of RMIT's academics who do design research or who form part of our design research community. It found that RMIT's design research community has two key components: firstly, design researchers, and secondly, collaborators and facilitators of design research.

The largest concentration of design researchers and the strongest existing leadership is centred in the School of Architecture and Design, including SIAL. Significant, yet dispersed, design research activity also occurs in the Faculty of Engineering, with pockets of activity within the Faculty's of Art, Design and Communication, Applied Science and Business. However, different communities are at different stages of development.

Significant differences in approach to design research exist across different disciplinary groups. The focus in engineering and science disciplines tends to be on solving problems and usefulness, whereas the design disciplines focus on addressing needs and / or at meaning making – cultural, social or political expression or critique.

Synergies are most apparent across traditional disciplinary affiliations – science and engineering as distinct from design and the creative arts. Despite this, the study also identified a number of trans-disciplinary projects, as well as evidence of emerging convergences across disciplinary groups in relation to research approach and interests, particularly in regards to the role of new information and communication technologies. This has the potential to engender interesting new directions in research.

There is a strong need, however, to further develop linkages between RMIT's design researchers and for a better-informed research community in regards to the activities occurring, and corresponding opportunities that exist, locally. The impediment design researchers face in building capacity is having the contacts, time and support to enable projects to happen. This includes immediate access to networks, enabling the establishment of research teams on a project-by-project basis. But it also involves having the support of research enablers, or managers and facilitators, who can instigate projects and follow them through to completion.

Promoting a community of practice around design research, however, should not be confused with seeking or imposing singularity. Accepting this also requires recognising that some disciplines are, and will remain, better disposed toward attracting external research funding than others. While collaborations can work to mitigate this to some extent, on-going support for pure, or disciplinary, research also needs to occur. Trans-

disciplinary collaborative research needs to grow out of the kind of research that promotes core disciplinary knowledge. Research support for the two needs to operate in tandem.

RECOMMENDATIONS

1. Design research needs to be recognised and promoted as an essential element of RMIT's research capability through: (a) defining a select number of refereed research outcomes in addition to the four DEST publication outcomes; (b) including these measures in the RMIT collection of research outcomes collection and; (c) defining and promoting design research at RMIT by expanding the research outcome collection and, finally; (d) seeking to shape the DEST definition of research outcomes and the national 'Higher Education Research Data Collection'.

2. A strategic planning group needs to be convened with the aim of promoting design research at RMIT. Promotion activities should include the establishment of on-going events, such as a design research conference, and other mechanisms, such as publications and exhibitions, for profiling RMIT's design research activities and promoting dialogue amongst stakeholders, both internal and external. Strategies also need to be formulated for building-up and supporting RMIT's design research community by drawing on the ideas expressed by participants of this study and documented in this report.

3. An Internet-enhanced mechanism is needed to help facilitate the emergence of networks and collaborations across RMIT's design research community and to promote design research both internally and externally. Such a mechanism is needed to profile and add value to existing facilities and services provided both internally, such as through I-Cubed, and via partners such as Lab3000 and VPAC. This is being addressed through the proposal to develop an online 'Alterative Map of design Research at RMIT' as phase two of this project.

4. Researchers in the design fields face barriers to building up research track records due to the lack of recognition of research outcomes by Federal Government funding agencies. Strategies need to be devised to address this and demonstrate discipline specific scholarly activity by ensuring that design clusters have appropriate peer review mechanisms for research outcomes. The institution, in turn, needs to give parity to these outcomes in the way that it recognizes achievement and in the distribution of internal research funding. This should include project based design research, design research publications and exhibitions, and peer reviewed design awards.

5. Access to external research funds across RMIT's design research community is disproportionate, with researchers in the engineering and science fields attracting significant funds compared to those in the design fields. Existing externally funded grant holders, such as Mark Burry and Shane Murray, indicate the potential for the design disciplines to attract such funds. Research enablers, or facilitators and managers, are required to support this activity and seed further projects. Moreover, existing strategic partners, such as Lab3000, and other Universities, should be utilized in seeking linkage grants and large infrastructure grants for major

equipment.

6. The profile of design research within the engineering and science disciplines needs to be enhanced. A design research cluster is required to promote informal linkages amongst researchers and to promote design research across these disciplines. Given evidence of emerging convergences between the respective design approaches of the engineering / science and design fields, leadership is required that is aimed at forging dialogue and collaborations between design researchers across these communities.

7. Capacity building needs to be directed at supporting and further consolidating existing initiatives. The School of Architecture and Design's Graduate Research Conference now involves all the design disciplines from across the University. It should be provided with additional funding for enabling visiting professors to participate from across the disciplinary groups and programs now involved.

PREFACE

Introduction by Professor Leon van Schaik

> Design is the key to research. Research has to be designed. Considering design carefully (making theory from or even researching it) can reveal how better to act, do research-to design research. And how better to acknowledge design in research: as a way of understanding, acting, looking, and searching. But design should be studied on design's terms. For, design is the form, the basis. And research is a design act. Perhaps that is why it is beautiful. (Ranulph Glanville)

The word 'design', like the word 'architecture', is used by people in so many different ways. Our strategy in this investigation has been to capture the work of all who use the word as an integral part of their research language. The result is - I think you will find – compelling reading. We have worked hard to understand the range of what we have discovered, and Robyn Barnacle has sifted through the findings with a number of different frameworks, each revealing in its own way.

There are signs that there is an emerging convergence in ways of describing, understanding and using design as a medium for research. At least in part this is a result of converging technologies, at least in part it is because there is a paradigm-shift taking place in the world of work. As the nineteenth century models of the professions unravel, it is becoming apparent that practice cannot any longer be sustained on a normative model of professional association around known ways of problem solving. Sustainable practice is increasingly derived from research, research conducted within a wide range of mediums and in an increasingly wide range of modes. Recent changes in the ARC understand this, and place the emphasis for quality control on forms of peer review appropriate to each mode, much as Boyer argued that all scholarship be peer-reviewed (Sue Rowley, AASA Conference Sept/Oct 2003).

This paradigm-shift is, I believe, enabling people to work together in different ways – ways that the integrated scholarship model first articulated. Fears expressed in this document about 'discipline identity' are real, and we must acknowledge that in order to fuse the horizons of our knowledge with the horizons of knowledge in other disciplines, we need to have a firm grasp on our own knowledge base. What is new is a growing awareness that what we do to establish our knowledge bases is not to erect boundaries, but to embrace our own scholarship responsibilities. Successful creative cities depend on this. So too does the future of the university as an integrator of scholarship within its arms and also in partnership with the wider community.

This report takes us towards a new understanding of how we can address the challenge of being research–led practitioners in design and research.

ABOUT THIS PROJECT

This project was initiated by the Pro-Vice Chancellor (Research and Innovation) Prof. Neil Furlong.

Project Team:

> Project leader: Prof. Neil Furlong
> Principle researcher: Dr Robyn Barnacle
> Project reference group: Prof.'s Neil Furlong, Belinda Probert, Leon van Schaik and Robin Williams

CONTEXT

Design is being situated as a key cultural and economic driver around the world and is increasingly on the agenda at a State level. The Victorian State Government has commissioned a report, due to be released shortly, aimed at developing strategies for the promotion of design in Victoria. They have also invested considerably in promoting digital design through Lab3000 in partnership with RMIT.

AIMS AND SCOPE

RMIT has an established reputation as a provider of high quality design education at an undergraduate level. Perhaps less known outside of disciplinary communities is the nature and extent of the design research activities that also occur. Little is known about how these activities might relate or interrelate or whether any common ground exists. Gaining an understanding of this is essential to promoting networks amongst design researchers and determining how resources can be best deployed in the area.

This project aims to evaluate RMIT's design research capability by identifying and mapping the key capabilities and aspirations of RMIT's design research community. Following initial consultations a second phase of the project has also been proposed that involves developing a digital repository and interactive model of RMIT's design research activities. The aim of this, second phase, is to help facilitate networks and linkages amongst RMIT's design research community. This report addresses phase one of the project. A proposal for the second phase has been developed by Prof's Leon van Schaik and Mark Burry, of SIAL, and is awaiting approval.

RESEARCH QUESTIONS

The study addresses three key questions:

1. What are the components that make up RMIT's design research capability?
2. What are the key capabilities and aspirations of RMIT's design research community?
3. How do RMIT's design research activities overlap or interrelate and where is the common ground?

RESEARCH DESIGN

The study sought to identify and interview a sample of RMIT's academics who do design research or who form part of its design research community. The primary form of data collection for this project consisted of interviews. An electronic survey was also developed in an effort to reach a larger number of researchers, particularly research degree candidates. These responses will be utilized in phase two of the project. Finally, a literature search was undertaken to identify current issues in the area of design research.

The meaning of design research was left deliberately open in this study so as to include the broadest possible range of fields of inquiry and trans-disciplinary research. Researchers were sought whose activities either involved designing something – anything, whose research involved collaborating with designers, or who were involved in supporting or promoting design research.

DATA COLLECTION AND ANALYSIS

34 individuals were interviewed in this study. Every effort was made to ensure that the sample included the key design researchers from as wide a range of disciplinary fields as possible. Exclusions, however, are inevitable, and this study does not claim to be comprehensive. Rather, it is hoped through the dissemination and discussion of this report, along with the realisation of phase 2 of the project, additional researchers will come forward and the features of RMIT's design research community will continue to emerge.

As the aim of this project is to assist networking and community building, interview participants are not anonymous and nor are their comments confidential, except for where specifically requested by the interviewee. Participation in the study was voluntary. Interviews were recorded and transcribed verbatim, except where the interviewee declined to be recorded (David Mainwaring and Tom Kovac). A project log, providing details of participants and a summary of their comments, is available as an appendix to this report. It will also be utilized in phase two of this project.

WHAT IS DESIGN RESEARCH?

The question of what constitutes design research is highly contestable and has occupied scholars for some time, particularly through the work of Nigel Cross and Donald Schön, and locally, Leon van Schaik, Ranulph Glanville and Peter Downton.

Design

Design is both a noun and a verb, and has multiple senses. As a noun, it denotes a field as whole, an end product, or a thing – a designed object or entity – as well as a concept or proposal. As a verb, design denotes an action or process (see Heskett, 2002). Etymologically it originates from the Latin *designare*, meaning to 'mark out,' 'devise', or 'designate'. Today it tends to be linked to notions of planning or fashioning, or broadly, to making. Most commentators agree, however, that it is very difficult to attempt a definitive account of what constitutes design. Some have tried, of course, with John Heskett

claiming:

> Design, stripped to its essence, can be defined as the human capacity to shape and make our environment in ways without precedent in nature, to serve our needs and give meaning to our lives. (2002: 7)

More specifically, Alberto Perez-Gomez addresses the role of design as 'giving meaning', below, in relation to architectural practice:

> The issue for design is not merely "aesthetic" or "technological," if by these terms we understand exclusive, autonomous values. Rather, the issue is primarily ethical. Architectural practice must be guided by a notion of the common good, preserving a political dimension understood as the human search for stability and self-understanding in a mutable and mortal world. (1999: 73)

The notion of research is historically more political than that of design as it carries with it orthodoxies of epistemological authority. Since the Enlightenment, the domain of research has tended to be claimed by rationalist and empiricist interests, and this continues today with a tendency to equate research with the scientific paradigm – where the notion of science itself has also been equated with empiricism and the natural and theoretical 'sciences.' Like the term design, research is also a noun and a verb, denoting both inquiry, as a domain of human endeavour, and the act of inquiring, or to inquire. Etymologically, the term research is derived from the Middle French *recherché*; the 'act of searching closely', which continues to resonate today in the idea that doing research involves careful, diligent and perhaps also systematic activity.

Design research

Treating design as a research activity, while not without precedent, is nevertheless also not without controversy. Indeed, many of the participants in the study spoke of an ongoing struggle for recognition of what they do, with Federal Government funding agencies, particularly the Department of Education, Science and Training (DEST), effectively not recognising design research *as* research. While the DEST (2003) definition of research – in line with the OECD definition – is broad enough to accommodate design research activity, the criteria it uses to measure research outcomes are not. DEST criteria only recognise text based research outcomes in its definition of research publications and therefore exclude artefact-based research. For the participants in this study, however, the question of whether design research should be recognised and rewarded as a research activity is not an issue. In his forthcoming book, Peter Downton makes the point succinctly:

> Design is a way of inquiring, a way of producing knowing and knowledge; this means it is a way of researching. (2003: 1)

Design research is also often recognised for its role in professional practice, particularly through the work of Schön (1983), and locally through the pioneering work of Leon van Schaik (2003) in developing a postgraduate program that invites architectural practitioners to undertake scholarship on the 'practice of practice.' van Schaik suggests that through this practice based research model, and the fifty or so practitioners from Australia and around the world who have participated over the last fifteen years:

> …'Research' as a mode of practice is now tending to replace 'profession' as the paradigm for practice (2003b: 1)

The reflective practice model has sought to transform the way that research is perceived within professional practice from an academic add-on to something integral to the work of practitioners.

More recently, the activities of creative people, broadly, including designers, have been cast as a key element of economic development and prosperity. This point has been made in the work of Richard Florida (2000) on the 'rise of the creative class'. Similarly, in what has become known as the 'creative industries', which include the broad range of art and design fields, creative activities are recognised for their capacity to generate new ideas and then transform them into applications and commercialisable outcomes. The UK Government's Creative Industries Mapping Document, for example, describes Creative Industries as:

> Those industries which have their origin in individual creativity, skill and talent and which have a potential for wealth and job creation through the generation and exploitation of intellectual property. (2001: 5)

Similarly, the website of the recently established vehicle for promoting digital design in Victoria, Lab3000, defines design in the following way:

> Design is a vital step in transforming ideas into practical and commercial realities. Design optimises the value of products and systems and is therefore an important key to economic development. (2003)

As will become evident from the findings of this study, design research encompasses a broad range of activities, aspirations and goals. No single definition can account for this variety. Differences are apparent, however, in the ways in which design research is conducted and the purposes to which it is directed. These are explored below.

DESIGN RESEARCH AT RMIT

The study found that design research activities are centred in the disciplines traditionally associated with design: architecture, fashion, graphics etc, but that design activities are also occurring in other disciplines, most notably, engineering. Unlike in the former, however, where design as a research practice is the dominant model, design researchers within engineering are the exception. By taking a broad conception of design research, such activity could be said to occur in five of RMIT's seven faculties. The highest concentration occurs within the Faculty of the Constructed Environment, principally the School of Architecture and Design, including the Spatial Information Architecture Laboratory (SIAL), and the Centre for Design. Significant pockets of design research also occur in the Faculty's of Engineering and Art, Design and Communication. Limited design research also occurs in the Faculty's of Applied Science and Business. The study did not identify design research activities or linkages in the Faculty's of Life Sciences or Education, Language and Community Services. This is not to claim, however, that it does not occur.

RMIT'S DESIGN RESEARCH COMPONENTS & CAPABILITY

This study was deliberately inclusive by taking as its population any individual or organisational unit at RMIT whose activities are design research related. As a consequence, the relationships to design of the various participants that make up the sample differ. Some are designers, some support designers, some collaborate with designers, and finally, some are involved in promoting and facilitating design research. For some participants, design research is the core component of their research activity, for others it is one element amongst others, while for others it is not something that they do, but rather, what they promote or become involved with through collaborations. All, however, could be said to form part of RMIT's design research community.

Much of the design research activities that were described by participants can be understood as concerned with artefacts, understood as objects, entities, schemes or environments. Design research can be related to artefacts directly, in the sense of making an artefact, or indirectly, in the sense of evaluating or speculating about artefacts. It may involve designing architectural models and drawings, furniture, garments, sporting equipment, urban planning schemes or digital environments. Alternatively, it may involve supporting such design, by, for example, providing software or visualisation mechanisms, and demographical or geographical information.

In some disciplines, particularly engineering, the priority for design research is usefulness.

> …The definition of engineering design is developing something novel that does some useful work and that meets some needs better than any previous cases. The design research ends up in an artefact that has to meet some needs, has to be useful – do some useful work for the benefit of humankind. So, clearly, by this definition design is aimed at working for the community, helping with some need, whether that's an industrial need, whether that's a community need, whether that's a personal domestic need. (Aleksandar Subic, Mechanical & Automotive Engineering)

As the following comment illustrates, however, designing something useful, or meeting a brief, does not necessarily dominate to the exclusions of other concerns.

> There's a question within design practice …of the aspirations of the brief or the intentions for the design effort. In what we might consider a traditional fee for service client / designer relationship it may be said that the designer dedicates their resources to meeting the aims that are defined by, for instance, the manufacturer… Now, I guess there's a question in industrial design practice about whether the designer goes, 'yes, I will do what you ask, and not question what you ask of me,' or, alternatively, question what is the guiding motivations of the design effort. Now, increasingly, a reflective design practice is involved as a key player in formulating the intentions of the design project, ie; that the designer believes that it's worth doing and that they've reflected upon why it's worth doing in some way, that may differ from them simply offering a service. (Michael Douglas, Industrial Design)

Moreover, in the design disciplines, usefulness may not be a key criteria at all. Researchers may also be involved in speculating about design as it relates to spatial, social and cultural issues, as the following example illustrates:

> [We] have an interest, not just in producing design outcomes or products, or whatever it may be, but actually [addressing] the question of what constitutes design research and what it tells us about knowing and knowledge… It's a conceptual interest in design… The outcomes are not necessarily a product, or visible, but more to do with spatial and temporal events. (Suzie Attiwill, Interior Design)

Design research may be applied, in that application issues inform the research, but then again, it may not. Indeed, the outcomes of design research can also be speculative, offering ideas rather than solutions, whether text or project based. The design research activities that occur at RMIT span the continuums of applied to speculative, practical to theoretical, and project to text based. This will also be reflected in aims. The aim may be to produce an outcome that meets an external need, brief etc. Alternatively, it may be to further understanding, either of a design problematic, or set of spatial, cultural, technical or other conditions. As the following quotation suggests, design often exceeds neat categorisation:

> I feel that an awful lot of what we could call 'good design' is probably both at once. I mean, it cannot be anything but applied if it's a real job, but if you… take Storey Hall, for arguments sake, …its quite a speculative piece at the same time. (Peter Downton, Architecture & Design)

Another important dimension of design research is its role in teaching and learning activities. Particularly in the School of Architecture and Design, and the Department of Fashion and Textiles, design research is an essential element of particularly postgraduate but also undergraduate learning. Additionally, some academics in traditionally non-design related areas conceptualise their teaching and learning activities in design terms. Adrian Miles, from the Department of Applied Communication, and Allison Brown, from the School of Electrical and Computer Engineering, both foreground educational design as a key element of their teaching approach.

Given the breadth of activity that has been described as constituting or relating to design research in this study, a key question becomes that of discerning the synergies and differences. This analysis utilizes two approaches. Firstly, it identifies differences within design research practice on the basis of type, or research aims, approaches etc, and secondly, according to broad disciplinary and structural factors.

1. Types of Design Research at RMIT

In his recent book, Peter Downton differentiates between three kinds of design research activity: research *for* design, research *about* design, and research *through* design. This nomenclature is used widely in the literature for its convenience in distinguishing between the often-subtle differences that exist between different types of design research. Descriptions of each are provided below with selected examples. A fourth

category, collaborators and facilitators, has also been included which addresses those participants in the study for whom design does not constitute, or occupy, their core research activity, but instead, who collaborate with designers or are involved in promoting design research.

Research for design

Researching for design encompasses those activities or projects that aid and support design or the activity of designing. Such projects may also involve designing but their main goal is to inform or support the design process.

Examples: Helen Lewis and colleagues from the Centre for Design provide evaluations of environmental impact, and information, tools and strategies, for use by designers.

> …We're a bit different in terms of design research to other designers because, overall, we're not designers, we do some design, but it's more about evaluating products and buildings and services in terms of the impact on the environment …-supporting design. We provide information and tools and strategies and approaches and so on that help designers and others… (Helen Lewis, Centre for Design)

Dr Supriya Singh from the Faculty of Business who is undertaking research within the Co-operative Research Centre (CRC) on Smart Internet Technology into 'user centred design' in an effort to promote the user in the projects conducted within the CRC.

> The aim of the present user centred design project …was to encourage a culture of user centred design, so that we start designing technologies [by] keeping the user at the centre, right from the beginning to the end… (Supriya Singh, Business)

A/Prof Cees Bil from Aerospace Engineering is developing a methodology that will enable designers working in different places to work seamlessly on a single project.

> It involves looking at the computer systems you need, the infrastructure that you need and the procedures that you need to actually transfer an object to the next person so that they can work with it… (Cees Bil, Aerospace Engineering)

Prof Mark Burry, Andrew Burrow and colleagues from SIAL are undertaking an ARC funded project on design ontology, or understanding and aiding the tansdisciplinary communication that occurs when collaborating on design problems.

> It's …the fundamental structures of ideas and their communication that are being looked at. The way that a mechatronics expert would look at a design problem and its articulation would be quite different from say an architect or a

> product designer, but particularly if these people haven't worked together before. But now we're increasingly being asked to… What tool would need to be developed to speed it along so we're not constantly misunderstanding each other? (Mark Burry, SIAL)

Research about design

Research about design concerns itself with meta-level analyses of the nature of design practice. This can take the form of epistemological and pedagogical inquires, investigations of design models and ways of improving design outcomes, strategies and techniques.

Examples: A/Prof Peter Downton, from the School of Architecture & Design, has written a book, titled Design Research (2003, RMIT Press), that examines the relationship of design to research as a way of inquiring about the world and contributing to knowledge.

> The publications program in the School of Architecture and Design provides a vehicle for publishing and disseminating various kinds of research into design, including historical, project based, and pedagogical.
> > …We have a strong tradition of publishing history and theory research, particularly through Transition which was a journal that was published by the architecture program over a twenty year period and ceased publication in the year 2000, and we've built on that publication tradition through a series of monographs that are effectively archiving a local canon of practice and engaging in research on emerging practice concerns, contemporary practice problematics, and design research issues. There's an ongoing cycle of publications…
> > (Brent Allpress, Architecture)

> The School of Architecture and Design also have a long track record in mounting public exhibitions that play a key role in disseminating design research to a broader community of interest.

Research through design

Researching through design is perhaps the most complex and least understood of the three classifications, as it involves disciplinary specific practices where design is itself utilized as a research practice, constituting both the means and outcome.

> A/Prof Shane Murray from the Architecture program is undertaking an ARC Linkage grant that investigates dwelling prototypes for aging Australian's using architectural design methodologies.

> > What's innovative about the research is the fact that it tries to deal with the physical implications of these things, and while it's got a twofold platform – it has one base in conventional socio-economic research and the use of ABS data – it's real innovation is that it seeks to use architectural design methodologies for most of the project. (Shane Murray, Architecture)

The practice–based research model in the School of Architecture & Design is an invitational Masters program where architects with already established mastery examine and reflect upon their body of work within a scholarship framework.

> …[This] approach turns out to underpin a newly emerging mode of practice that is particularly prevalent amongst the next generation of architects: …research-led practice. (Leon van Schaik, 2003b)

The Masters program in the Communication Design program provides an opportunity for practitioners to undertake research by project and the creation of a critical design practice within a professional context.

> The idea is that we work out a way of conceiving of research topics that will actually allow [candidates] to become reflective practitioners within their practice to ultimately enhance their professional experience. (Lisa Grocott, Communication Design) A/Prof Aleksandar Subic, from Mechanical and Manufacturing Engineering, designs patentable products and artefacts using systematic design research methodologies.

> Our design research focuses on developing innovative and novel tools to enable systematic design innovation, which guarantees that you're going to come out of this process with a novel artefact, with a novel product, with a novel design solution. Basically, the point is that a novel design solution and novel artefacts don't just happen, it's not a fluke, it's not just someone sits in the backyard and comes up with an idea. That may be an invention, but ninety percent of inventions never became useful innovations. What we're dealing with in our research design is coming up with innovations which are real, feasible, efficient, appropriate, inventions turned into innovations, into useful products, into useful design artefacts. (Aleksandar, Mechanical & Automotive Engineering)

Prof Mark Burry from SIAL undertakes ongoing practice-based design research as a consultant architect to the Temple Sagrada Família, in Barcelona, Spain, which involves untangling and interpreting Gaudí's compositional strategies for the ongoing construction of the Temple.

A/Prof Cees Bil from Aerospace Engineering undertakes 'virtual design' research by investigating complex systems and designing software and design methodologies.

> Using computer tools to design an object or a system without actually building it. So, using computer-aided design, computer aided engineering, simulation, visualisation, that sort of thing. (Cees Bil, Aerospace Engineering)

Collaborators and facilitators

There are a number of participants in the project who do not fit into any of these three categories. This is because they do not necessarily do design research, but rather promote such research, or design does not constitute their core research activity. It has to be recognised, of-course, that most research involves some element of design activity. Interestingly, as Ian Bates' reflection on his own research practice indicates below, some researchers in non-design fields are finding that convergences are beginning to emerge between disciplinary approaches. It is worth speculating on the potential of such convergences to transform disciplinary research models.

> I'm not sure how I can describe it as design research or non-design research. It's really looking at the problem in a way that's appropriate, some of which will require some design tools to be developed. Some requires use of existing design tools. Others require really a question – like I think all research will have a design element to it. (Ian Bates, Electrical & Computer Engineering)

Research that has an affinity with design can be distinguished from the kinds of design research outlined above by not necessarily constituting the core research activity. Most researchers in this study who fit into this category have an interest in design because they see it as offering the potential for collaboration. A number of participants were already collaborating with designers:

> Prof Mike Berry from AHURI, in the School of Social Sciences, is working with Prof Shane Murray on an Australian Research Council (ARC) Linkage Grant exploring housing needs for aging Australian's. Berry is providing demographical and related analyses for the project. He is also currently working with Lab3000.

> Dr Chris Pettit, from Geospatial Engineering, collaborates with designers, such as from SIAL, by providing prototypes and spatial visualization models.

> David Mainwaring and colleagues from the Department of Applied Chemistry are undertaking polymer research in collaboration with the Department of Fashion and Textiles and the Australian Institute of Sport to design a jacket that minimizes heat stress in elite athletes.

Other participants in the study were seeking to foster collaborative opportunities with designers.

> Prof Ian Bates from the School of Electrical & Computer Engineering is interested in collaborating with designers seeking to utilize micro-mechanical devices.

> > …Smart designs invariably need sensing of some particular nature and to do that economically you are looking for something that you can design on a simple science basis and replicate millions of times and make it a two-cent or a five-cent thing that people can

place around the house, for example. The smart design of a house, like a temperature sensor, that could be a reason for us to look at new ways of sensing temperatures. So, that just gives you an example of the synergies of improving design by having some functional item that we could come up with. (Ian Bates, Electrical & Computer Engineering)

Prof Arun Kumar who leads the Centre for Infrastructure Research and Management in the Engineering Faculty is seeking to collaborate with designers on the development of an infrastructure capability at RMIT.

[The Centre for Infrastructure Research and Management] would not [have] …people sitting in offices and all that. It would only be very [lean]: the director, business manager and then a couple of assistants or secretaries. …What we would be doing is pulling multidisciplinary teams, and people would continue to work where they're working but would become part of a team… to resolve or solve issues. (Arun Kumar, Engineering)

David Thomas from the School of Art and Culture explores duration through various forms of art practice:

What we can do is provide a really relevant critique of both cultural issues and thinking issues and those sort of creative issues within this University…. Often people think of fine art as really about decoration. It's really about thinking and it's really about providing models for thought and models for ethics and models for politics and action and that's where contemporary art practice can overlap into areas of design. (David Thomas, Art & Culture)

Adrian Miles, from the School of Applied Communication, is seeking access to collaborative teams that bring together researchers from different disciplines - ie; computer sciences, communication design, and architecture, to enable the realization of various research projects.

Another group of participants in the study are not focused on undertaking design research, but instead, on promoting design research and facilitating the establishment of projects.

A/Prof Di Fleming and colleagues within Lab3000 promote digital design in Victoria through public exhibitions, teaching programs, and mapping digital design research activities.

…What I think we're doing with design link is creating an angle of incidence and through creating the angle of incidence we're actually creating a place where people get together, hear about what each others' unique qualities are – what they're doing, leading edge things – so people go; 'oh my gosh, we have to talk.' …Lab3000 is a matchmaking union, that's what we're on about. (Di Fleming, Lab3000)

Grace Lynch, also within Lab3000, promotes careers in digital design within Victoria.

> …I have three major tasks that I do. One is looking at the mapping out [design programs, then] looking at those graphs and then developing curriculum. The other part is looking at digital …careers. Which is encouraging young people to study in the design area and to seek employment in the design area… (Grace Lynch, Lab3000)

Norbert Nimmervoll, as director of I-cubed, supports collaborative, inter-disciplinary applications of information technologies through its Virtual Reality Centre, by incubating projects, assisting start-up companies, and providing a catalyst for developing large University projects that involve IT and interaction with industry.

> …Its very much about connecting, you know, this is a really emergent environment in terms of getting people to come and have a look at what we do. …What we've been trying to do is do some development work for industry …so that the research projects [at RMIT] get informed by what actually is in real demand out there, rather than sort of saying, concentrating on, what we might do in research. (Norbert Nimmervoll, I-cubed)

Shane Wallace & Michael Armatage from Silicon Graphics supply the infrastructure for the Virtual Reality Centre at I-cubed. They are keen to have increased involvement with RMIT's design research community in order to promote discussion of the possibilities of advanced visualising technologies for research, and also, collaboration & commercialisation opportunities between RMIT and other Universities and companies.

Finally, some participants in the study are not designers in any of the senses explored above yet borrow from the design lexicon to foreground the role of design in pedagogy.

> Allison Brown from the School of Electrical and Computer Engineering is an advocate of design research in education and actively incorporates User Centred Design principals into educational programs.

> Educational design is all about marrying teaching and learning together; it's like understanding and improving the teaching and learning process and that means having appropriate learning objectives, having an understanding of how students learn and designing a course that focuses on that. It's actually designing a course, it's not just picking up chapters. (Allison Brown, Engineering)

2. Design Research by Disciplinary and Structural Factors

The second set of factors that differentiate the design research community at RMIT are structural and disciplinary. Design research communities can be distinguished by their

differing stages of development. This study has identified three groupings.

Nascent

Research activity tends to be nascent in the programs included in the study from the Faculty of Art, Design and Communication. In the design related programs in this Faculty; Fashion, Communication Design and Animation and Interactive Media, there is only one academic holding a Doctorate, and while Masters degrees are present in some areas, in others there are large numbers of academics without research degree training at all (ie; academics who neither hold nor are undertaking research degrees). Academics in these areas often engage in their own on-going professional practice and consultancies, but there are no large research projects being undertaken in the context of external research grants. The lack of established and senior researchers is also particularly evident within these programs, where the highest academic level is that of Senior Lecturer.

A notable development is that the Fashion and Communication Design programs have both sought to establish stronger links with the School of Architecture & Design's graduate program in an effort to benefit from their more established research community and activities. For example, all research candidates from these programs now participate together in the School of Architecture and Design's biannual Graduate Research Conference. Supervisory capacity is also being increased and enriched through such cross-fertilizations.

Emergent / Established

The research activities of academics in the Faculty of the Constructed Environment, principally the School of Architecture & Design, including SIAL, and the Centre for Design, centre on three, often inter-related, activities; the undertaking of a research degree program, teaching, and on-going professional practice, in the case of the former, and consultancies and limited teaching in the case of the latter. Many academics in these areas already hold a Masters degree and are undertaking a PhD, usually within their own program. The academic profile is relatively young with the majority of academics at a similar stage of development as researchers. At the same time, however, and excluding the Centre of Design, an established professoriate exists, particularly in the form of the two design related Innovation Professors: Leon van Schaik and Mark Burry. Reflecting the emerging nature of most of the programs that comprise the School, however, the professoriate is concentrated in the more established Architecture Program. In terms of research income, external funding for consultancies is the norm in the Centre for Design, while small, and often teaching related projects, attract external funds in the School. Two researchers, Shane Murray and Mark Burry, hold ARC funded research grants.

While some aspects of the research environment are emergent within the School of Architecture and Design, other aspects are well established. For example, it has a highly developed and established model for incorporating research into undergraduate teaching through studio-based teaching. Moreover, the School has a large and established post-graduate program – consisting of around 200 research degree candidates – and is a world-leader in project based research, as utilized in Leon van Schaik's invitational Masters stream, and Shane Murray's Urban Architecture Laboratory, for example. Design research has been promoted within the School of

Architecture and Design for at least the last fifteen years and a strong culture of practice-based research currently exists.

Established / Emergent

The situation in both Faculties just discussed contrasts with the academic profile of design researchers in the Faculty's of Engineering and Applied Science. Here, researchers are established in the conventional sense: they hold professorial positions, have PhD's, and are often working on large externally funded research projects. They are also likely to hold patents. The researchers in these Faculties are senior and established members of broader research communities within their Faculties. Unlike the first two Faculties discussed, however, design research, as a model, tends to be the exception within this Faculty and the engineering discipline more generally. While the researchers themselves are established, therefore, their research model is not. In addition, there also appears to be less emphasis on building research into undergraduate teaching, excluding perhaps at honours level, and the project model is only just emerging as a practice within the post-graduate area.

AREAS OF COMMONALITY & DIFFERENCE

Differences across the sample of researchers included in the study are often reflected in disciplinary groupings. Design research in engineering tends to be product focused, whereas design research in the School of Architecture & Design may take this form but is also likely to be critical, speculative or conceptual, where the focus is on furthering knowledge. What is common to all areas is the lack of a pre-determined outcome, although degrees of difference exist in regard to this also.

Interestingly, a similarity across RMIT is the struggle for recognition of design research as a legitimate research activity. Design researchers from within Engineering have had to defend what they do in relation to traditional research models, just like their peers in the design disciplines, and all struggle to improve understanding of what constitutes design research.

> There's a lot of misconception or misunderstanding in the broader community, even among engineering colleagues, in terms of, what is design research, because they see that, for example, each design project, or design research activity, may end up in a different design or a different product, and they're saying, ok, where is the research here because they're all different? For example, a traditional engineering researcher …sees his or her research as… proving that theory or that concept, …whereas design research doesn't identify itself only with one particular artefact. The artefact is an outcome of design research. Design research focuses on different artefacts, on different innovations. (Aleksandar Subic, Mechanical & Automotive Engineering)

> The end product is part of it but it's not the most important part of it. I think one of the difficulties that a lot of people have, like the public perception around design, is they look at the end product and measure that rather than looking at the process that you went through to achieve it. (Karen Webster, Fashion)

Even within RMIT's design research community, views on the status of design as a research activity are not always consistent.

> It's fairly straightforward. You've sort of got research followed by development followed by production. That's the process, I'd say. Design is the bit between having researched a need and developing a solution to that need… (Norbert Nimmervoll, I-Cubed

On the whole, however, there is little dispute as to whether design can be a research activity in its own right.

> Design is research full stop. If a design is not research then it's not a design it's a pattern: …any translation of an idea to an artefact, if it doesn't have a research mode to it, then it's not design, it's a pattern or it's a copy. …I think that's why design sits very comfortably in a university context. I mean, it's only a new, it's Johnny come lately really, but it's because all good design has a research input to it. (Peter Downton, Architecture & Design)

1. Relationship Between Teaching and Research

The integration of design research into the curriculum is particularly evident in the design related disciplines – architecture, fashion, etc. This integration is a manifestation of the pedagogical models at work in these disciplines, particularly the studio-teaching model, where a culture exists of building research into learning at all levels. In the Architecture program, for example, industry partners have sponsored undergraduate studios to undertake research projects leading to award winning, built, outcomes. The integration of research and teaching also provides a vehicle for academics to explore and develop their own research through teaching activities.

> …A lot of the research that people do is conducted through undergraduate teaching [in] …studios, electives, all sorts of things. (Suzie Attiwill, Interior Design) …For us the undergraduate is very much the lab, if you like, it's where the experiments take place, it's where a lot of the postgraduate studies and professional studies and that sort of higher end of the thinking gets tested. (Ross McLeod, Interior Design)

> …There are certain research concentrations that we've established that link through from undergraduate to postgraduate. There are a series of educational offerings at the undergraduate level that have underlying them a series of research concerns and activities… That then seeds a pathway for those students [into] the Masters area… (Brent Allpress, Architecture)

Design is also understood as a key element of innovations in pedagogy broadly.

> When we move into these [new media] formats one of the things that happens is that we de-familiarise those assumptions about what constitutes literacy, what constitutes writing or what

constitutes academic writing. As soon as we do that design becomes a fundamental issue… (Adrian Miles, Applied Communication)

…If we're trying to develop individuals in society with a design focus and feature, if we don't teach them in those ways then your skill base is not going to [be adequate]. It's fundamental to where we're heading with these students to be functioning, creative members of the design agenda in society. If they're taught in ways that disempower them – say that talking is not good, don't give them enough chance to collaborate and experiment – then their skill base is not going to be relevant for industry. (Allison Brown, Engineering)

…What we were designing in Business Online is a new way of interacting with staff and students and actually designing business processes that include that interaction …[through the model of] the Virtual learning Concourse. I found it a really student centred way of thinking through what I was doing… (Lois Fitzgerald, Business)

2. Integrative Nature of Design

Another area where agreement is evident across the participants of this study is in regards to a perception that design research is integrative. Almost all participants commented on the often team based and cross-disciplinary nature of design research.

Design research is now really a team-based activity, compared to many other areas, and the artefact is really in many cases a product of a team. For example, when my team develops a new artefact, or product, you rarely see one person on the patent, there's four or five of us on the patent, because we've jointly as a team developed that innovation... (Aleksandar Subic, Mechanical & Automotive Engineering) …The area we are in, Multimedia, is diverse in terms of the
skill sets: programmers, musicians, animators artists, designers, all sorts…(David Atkinson, Animation & Interactive Media)

When you talk about design it has to be multi-disciplinary… If you look at aerospace design we're combining aerodynamics, dynamic structures, performance cost, all the elements have to be combined somehow and then the challenge is to have a trade-off between all these disciplines. …So the term systems engineering comes in which is a very popular term nowadays, looking at the whole system. (Cees Bil, Aerospace Engineering)

There are also significant affiliations developing across the new Design and the Social Context Portfolio at the postgraduate level, as well as the undergraduate level through

the development of the Bachelor of Design.

> …We set up a series of pilot elective courses that involve the seven main design disciplines at RMIT: architecture, interior design, industrial design, landscape architecture, fashion and graphic design… What we're interested in there in having all of those disciplines mix together is one particular mode of collaboration across those disciplines, but we're also particularly interested in the adjacencies between disciplines, where project based research or project based teaching is the vehicle through which a relevant relationship might be formed across the disciplines. (Brent Allpress, Architecture)

A cautionary tone also appears in some comments regarding the trans-disciplinary and collaborative nature of design research.

> …Collaboration is a very important thing but we've got to be careful. Most of the applied disciplines, they're certainly collaborative, like architecture, I mean there's this pressure on it to be more multidisciplinary, but it's like telling a bowl of minestrone that it's not variegated enough: it already is by its very nature. We have to be careful that we're not applying false or artificial structures to research. (Shane Murray, Architecture)

> …One has to understand what the boundaries are before you start breaking them down. So you've got to have something to give before you can start taking from somebody else, and I believe that at the post-graduate level there's every opportunity to do this because you take with you the knowledge of your discipline and you are able to engage. …There are wonderful things to be gained from cross-disciplinary stuff. (Andrea Mina, Interior Design)

4. Relationship to the Creative Arts

The difference between art and design is difficult to quantify and is an area in which there is considerable greyness. The relationship is perhaps more akin to a continuum than a stark opposition. The consensus seems to be that design research is brief driven in that a brief will be developed in advance to guide the project. Creative art practice, by contrast, tends to be considered as more emergent. Mark Burry, below, suggests that aesthetic considerations mark the site of coincidence between the two.

> …A personal interest of mine is where art and design are together. So, if you like, the art of the design might be the embellishment of the design beyond the actual expediency. So, a practical design is something that works in terms of problem solving - you need some shoes and these shoes work. The difference between my shoes and your shoes is that your shoes look a lot better than my shoes, even though the look of them has got nothing to do with their function, that's the art …So you could

> argue that a well designed pair of shoes might not look great but they work well. You could argue that shoes that look good may not work well as shoes, a poor design you might say, but a well designed pair of shoes, from my point of view, are ones that are not only functioning well but look great too. …A design object isn't necessarily an art object, but an art object may be a design object… (Mark Burry, SIAL)

Participants in the study from the creative arts also expressed concerns about the status of research in the arts within the research agenda, both locally and nationally.

> There's a real difference between the role of design and the role of art. What RMIT has to be careful of is that in its definition of design it doesn't get too involved with that direct connection with industry. …The most interesting design has always been that stuff that overlaps and has that fuzzy edge with art anyway. …So we've got to be cognizant, I think, of the fact that fine art can enter into this sort of discourse with other areas. It won't have the same sort of funding capabilities, because of the tradition of fine art sponsorship in this country… We've got to get extra [grants] …, which most of us are happy to do, but it still is distorting the pure research that we are able to do within our own discipline in order to make that happen. (David Thomas, Art & Culture)

> I do think naming is a problem. I think [if there are] resources for design a lot of the artists will be disenfranchised. I don't personally feel that but that's because my PhD is in design, …but I know that a lot of people from the fine art end of the spectrum have a problem. [We] …have to think of something else to call it. (Marie Sierra, Art & Culture)

RESOURCING

The way that the design research community is resourced tends to reflect broad disciplinary differences. In the design areas, research is often resourced through time, consisting of a combination of the time made available through the Academic Award and a large additional contribution in terms of ones' personal time. Small amounts of industry funding are also common across these areas. SIAL, the Architecture Program, and the Centre for Design are the exceptions in terms of accessing funds competitively through the ARC. In the science disciplines, on the other hand, research is resourced almost exclusively through Commonwealth research grants and industry. I-Cubed, Lab-3000 and to some extent also SIAL, are different again. As strategic initiatives, they are all recipients of large internal and external investment. Despite these differences, some resourcing issues are common to all groups.

Recognition of design research

Participants from across disciplinary groups commented on impediments facing design researchers due to the way DEST defines research outcomes and the ARC's conception of research. Shane Murray's current ARC Linkage grant with Mirvac is, he believes, the

first project that has been funding by the ARC that uses an architectural design methodology as its basis (ie; research through design).

> Design research is not really well suited to the way the Australian Research Council sees research. They see research, I would say, more from a traditional scientific research point of view, and that polarization happens everywhere. That's fine, but on the other hand, our research attracts more than half of the Schools budget…(Aleksandar Subic, Mechanical & Automotive Engineering)

> The other important thing we do in terms of dissemination is exhibition and that isn't recognised by DEST anymore… They will recognise individual exhibitions but they don't recognise group exhibitions and within our discipline the individual exhibition is less relevant and certainly in terms of research cohorts and communities it's even less relevant again. But they're an important activity within our profession and discipline and it's a key interface with the community and with practice. (Brent Allpress, Architecture)

> [We have a] weakness in terms of being able to [attract] DEST …income, because most of it is applied consulting sort of research. We're not really, we're not starring in terms of publication. …Part of that is the discipline and part is this constant struggle to bring in funding, to pay wages and things, meet the budget… (Helen Lewis, Centre for Design)

> I think one of the other things that RMIT needs to do is to make a decision about whether or not it will really recognise non-DEST outputs as having value. That's not just a rhetorical interest, that's an actual auditing interest. I think it needs to have some parity… (Julian Raxworthy, Landscape Architecture)

Limited internal support for research

The other key issue raised by participants is the limited resources devoted to research activity that does not attract funding, whether internal or external. This was particularly in an issue in those nascent and emerging areas, where many academics are undertaking research degrees but are not supported with a reduced teaching load, for example.

> I think that the way research is …resourced, that the heavier teaching loads mean that there is actually no net change in anyone's workload on the basis of research. …So, there's an awful lot of actually very productive [activity], in terms of research outcome, that is effectively on top of our existing stuff. Now, we get our one-day a week research but, for instance, [but] I haven't got one day a week that's free this week. So I think that research is totally expected but not resourced at all. (Julian Raxworthy, Landscape Architecture)

The five per cent of staff that have undertaken higher degrees by research obviously feel like they're doing it at a huge personal cost… [ie;] being in two or three days a week doing research [when] you know other people getting their days are just doing something that realistically can be done in a day. ...Yes, I do feel completely exhausted by the idea that I'm going to spend a decade studying part time as well as doing a job that's more than point eight. …In terms of my actual time commitment, I haven't really had any time to do research on my own ...[for] basically over a year. (Lisa Grocott, Communication Design)

Well our staff are already stretched to capacity in their basic undergraduate teaching delivery and it's [only] through the kind of dedication of staff [that research occurs] …We're not really getting any support to invest in our research capability, it's just an extension of our existing resources. If anything, our existing resources are truncated at the very point at which we have demonstrably extended our research activities. Our publications output, for a start, has increased markedly in the last three years …but the investment that we've made, because of the particular funding arrangements, institutionally, it's not at all clear or transparent that an investment in research activities then seeds further resourcing of those activities. (Brent Allpress, Architecture)

Spatial resources

The other resourcing issue raised by participants is spatial. The lack of space to grow, to house new researchers or research degree candidates, and to engender culture building through informal interaction and exchange were all identified as issues.

Resource utilization

Finally, comments were made regarding the need to ensure design research facilities are appropriately utilized.

…For the first time in Western civilization, the same tools are being used by so many different [disciplines] and this is something that I don't think has been very well articulated. …If you've got a lot of shared tools then the first thing the University should be doing is making sure that all these tools are collected in one place so you haven't got duplication. …What would make me nervous is seeing resources being dissipated on lots of other new initiatives when you could have been consolidating. (Mark Burry, SIAL)

BUILDING CAPACITY

1. Strategies for Building Capacity

Participants in this study were overwhelmingly positive about the prospects for design research at RMIT and its value as a research endeavour. They were particularly enthusiastic about the initiation of this study and the message that it sends regarding the status of design research within RMIT's research agenda.

In thinking through potential strategies for building up and supporting RMIT's design research community a number of the factors that have been addressed above need to be kept in mind. Design researchers have often felt disenfranchised, as the comments that appear above regarding the difficulties they have faced receiving recognition through traditional funding agencies attest. Design research is also integrative, being by nature disposed toward trans-disciplinary and collaborative research. Finally, in some parts of the University there is a need to build capacity while in others the focus is more on identifying new directions for research. In response to these issues, participants' comments regarding capacity building can be summarised into four key areas. These are each addressed in turn.

Networking & facilitation of collaborations

▪ Greater networking opportunities and mechanisms – knowledge of who's doing what in order to identify new research opportunities

> …Some sort of interactive resource that we can use to know who's doing what and to look for synergies and opportunities… (Helen Lewis, Centre for Design)

> …I would urge Neil to keep thinking about how to support, strategically, design research in the University because I think it's a strength that we have that is dissipating and that is one of the reasons why Di Fleming is trying to have these design [forum] things, just to try and get people knowing each other… (Mike Berry, Lab3000 / AHURI)

> …This emerging design community, design research community, needs resources which bring it together as does the graduate research conference in the School of Architecture and Design every semester. It needs resources that bring it together on a more every-day basis to enable a dynamic community to grow…(Michael Douglas, Industrial Design)

> I don't think it's about equipment, I think it's about people, people collaborating. It's about the exchange of ideas… (David Atkinson, Animation and Interactive Media)

▪ Support for the emergence of project driven collaborative teams on an as needs basis.

> I would really promote establishing a proper RMIT design research

centre. [But] …it cannot belong to this area or that …it has to be integrated, it has to be multidisciplinary, and it has to have a really intelligent framework for that integration up front, rather than looking at individual fields; this is how we see design, this is how we see design, this is more important, this is more important, whatever, that's ridiculous… I don't think it really has to be physical because we've got everything around, but it has to have a structure, and the basis for it has to be this integration, it has to be multidisciplinary. (Aleksandar Subic, Mechanical & Automotive Engineering)

If you take the virtual concourse as a concept, its amazing - …there's the cluster in the middle, and there's the membership, the browsers, and there's the exhibits around the actual public space of the concourse. [When] …asking about where to invest in [design] research, and indeed, in innovation, I think that one of the [aims] should be investing in something that enables the interface between education, research and exhibition. Its about 'I learn', 'I share', and 'I learn from again'…(Di Fleming, Lab3000)

Leadership / professional networks

▪ · Design research leadership: visiting professors with disciplinary expertise; innovation professors; advocates.

I think one of the easiest ways and best ways of [progressing design research] would be to input intellectual property: input people. …If we could get this revolving group of international acknowledged leaders in their field, …for a week, two weeks, you know, to give their public lectures, do their master classes, do their tutorials, that's the way to progress design research… (Andrea Mina, Interior Design)

We began in 1987 with no research culture at RMIT, and we now have a vibrant, internationally imitated culture of practice-based research. We could not have done this without inventing a set of procedures for engineering peer group support and critique, for using up-and-coming International and interstate critics… (Leon van Schaik, 2003b)

I think there's room for …an advocate that represents design researchers. We have our innovation professors but I just wonder if it could be – it there's room for design. Well, lets say, in engineering, maybe that could be a person that takes care of design globally across the University. …It would provide recognition for design research and it would perhaps forever take care of this misunderstanding that design is not research. If you have an innovation professor then there can be no mistake… (Cees Bil, Aerospace)

…I think something like an innovation professor would be an important thing to do [who could work across] the design / arts

area. …That person has to be chosen very carefully, but there are enough people [around] who work on both sides of the fence. (Marie Sierra, Art & Culture)

…We need to be wary, and I don't know what the answer is, but there tends to be a tendency where there's an idea of a high-flying facilitator brought in. The nature of bringing a high flyer in is that they've already established a type of expertise and a track record in research and you need to make a decision about whether that is an issue in relationship to what type of grass roots research culture might be growing out of the culture of the whole discipline. (Shane Murray, Architecture)

Research support

- ▪ Dedicated research support: research managers / facilitators; post-doc's, research assistants, etc

I'm intrigued by the idea of expanding Innovation Professors because there's enough of us now to say that there's an Innovation Professor's program. I would say that every Innovation Professor you're speaking to would argue that funding for support roles would be far more beneficial to the University. …If there's resources to be spent the resources must go into helping us articulate what we're doing internally and externally, and that means a grant writing person who can also go out and press the flesh: communicate. (Mark Burry, SIAL)

…You probably need a two pronged approach where you also need someone, either from within or brought in, who doesn't come with an agenda but might say, well, what is it that you're doing, let's see how we can grow that into a strong research culture. I think that the strongest research will come from what the natural undertaking of programs are, or cultural groupings of researchers. …Facilitators have to be very special people because if they're just specialist facilitators they won't work. They actually have to have a stake in the discipline. So the facilitation has to be through an understanding of the discipline, not through the abstract application of a model of facilitation theory. (Shane Murray, Architecture)

…The model that [I think] must go throughout the University [is this.] We're literally employing a person who is what we call the director of micro-technology research and innovation. Now, we seconded him from Ericsson and basically what we're using him for is product development. …He really has his eyes on what it takes to turn [our research] into a practical outcome… (Ian Bates, Electrical & Computer Engineering)

In the design area I think there's been a fair bit of work done and some good recruitment. …I think probably a bit more emphasis [is needed] now on the younger researchers... (Mike Berry, Lab300 &

> AHURI) [What] has also happened a lot is where something comes across my desk and I think that is fantastic, that's a great project, but we can only do this little bit of it. Maybe we could project manage it but we'd need more, someone from business, social science etc. …It's a huge amount of work to actually put together a team and put together a program, which is then, I guess, another area [where] we need support for research. (Helen Lewis, Centre for Design)

> I think it would be good to get more people doing the actual work. As a post-doc I spend a lot of time running these grants and writing papers and the actual amount of research (at the end of the day after I've been in a lot of meetings and taking subjects and all that sort of stuff), the actual amount of research I can do is nowhere near as much as I'd like to. …I think there's enough people with ideas and things to get running, …we need either dedicated research assistants, programming and design people, or Ph/D students… (Chris Petit, Geospatial Engineering)

- ▪ Assistance for academics to undertake and complete research and research degrees.

> I think that to acknowledge, to actually have some kind of incentive for staff to do higher degrees is actually going to be the only way I can see [low numbers of research degrees] changing, unless it becomes mandatory for them to do it. (Lisa Grocott, Communication Design)

> …What I really need is facilitation, financially…I mean, the university is currently supporting, giving me some time to work on the project, for which I'm grateful, but obviously one of the big things for a researcher is that linkage grants don't come with big structural funds, they don't, they're not really supposed to cover staff time. Some heads of schools are reluctant to give staff the time off to actually acquit them. So I would imagine, at a time level, facilitating staff to actually do them, so you get time [to achieve] completions would really be the useful thing. I think it's … not necessarily about getting new researchers in, it might be getting new teaching staff so that people who currently do research can actually undertake it… (Shane Murray, Architecture)

Promotion of design

- ▪ Re-positioning of RMIT as a design institution:

> We need to be marketing RMIT as the premium design destination and in a number of ways, not only to our potential students but for organisations accessing us for knowledge and expertise so that they are actually using us for research projects that we can get dollars for. So, you know, if a telecommunications company like your Nokia or Ericsson, or an automotive company like Holden or

> Ford, are wanting to do some work on designing into the future we would be a key to come to because of the breadth of knowledge and expertise.
> And not just Australian companies, like, what we really want to do into the future is build up RMIT internationally. (Karen Webster, Fashion)

▪ ˌ Promoting design research through events, exhibitions and forums

> The idea of having design research awards nationally, or to have a post-grad. research …conference: …RMIT seems perfectly positioned to be the kind of, you know, design university that could lead those sort of initiatives, and that could strengthen that design [culture]. (Lisa Grocott, Communication Design)

2. Impediments to Capacity Building

A number of participants pointed to impediments to capacity building due largely to a lack of facilities and resources, difficulties in attracting / undertaking grant based research, and the lack of an established research community.

Networking & facilitation of collaborations:

▪ ˌ Limited networking opportunities as an impediment to identifying and undertaking research projects.

> Across RMIT there are lots of projects happening in – I guess they are silos – and I think one of the issues is that, for example, some of the Computer Science people might have great projects but from my point of view I don't think they have great content. They don't really know what to do with it. From my point of view, I often have some innovative ideas for content but I don't have the resources or the technologies to have a system. …At the moment I haven't had time or probably the professional abilities to know how to find those people and to establish those networks. (Adrian Miles, Applied Communication)

Track record & leadership

▪ ˌ The lack of a track record as an impediment to attracting competitive research funds.

> The idea is to put together a big team to…[go for] discovery grants, and all those sorts of things. As I said, that's down the track, because …everyone is working on their PhD but no-one's got them yet. To go for those larger grants you've got to have a track record… (Ross McLeod, Interior Design)

> Our other constraint is I guess the lack of senior academics in the centre… When we go for competitive grants we have this absolute

> barrier, …we had to beg steal and borrow academics from other areas. (Helen Lewis, Centre for Design)

Leadership

- ˌ Lack of established researchers within discipline to offer leadership.

> We have no associate professors we only have senior lecturers… It's fine most of the time but sometimes if you want to do fine grained research into landscape you have to spend two thirds of your time justifying base line, theoretical positions. This is an enormous problem we have because critics are being brought in for the mini-conferences that are actually stacked toward …Architecture. ...If I'm undertaking post-professional research, having to explain a basic landscape theorist in my 20 minutes to be able to even have the person then understand what you're actually talking about is a waste of time. (Julian Raxworthy, Landscape Architecture)

Lack of time to do research

- Teaching commitments as impediment to completion of research degree.

> I mean, it's just - you know, it's kind of impossible enough to get one's PhD stuff, you know, even to get half a research day to go and do that. We're just so caught up with undergraduate teaching, I mean, it's ridiculous. It's still very much - I think a lot of this kind of undergraduate focus still. (Suzie Attiwill, Interior Design)

> Most staff find that the most resource inhibiting factor preventing them form engaging more wholly in research is their time commitments to undergraduate teaching. (Michael Douglas, Industrial Design)

Spatial restrictions

- ˌ Lack of space to grow – office space, shared working spaces, informal spaces

> Fundamentally we're struggling and we're struggling on several fronts, not the least of which is accommodation… If we were successful at getting more ARC linkage or discovery grants, where the hell are we going to put the people? …One of the reasons we have as many students as we have …is that they're virtually all part-timers. There have been lots of people who have their own architect offices, providing their own accommodation and facilities. As soon as we start to build up the full-timers, whether they're ...funded or whether they're international fee payers or something, the harder it is to actually supply them with minimum requirements, you know, a place to work, a computer, those sorts of things. So there's financial [issues] but the biggest one is spatial. (Peter Downton)

Structural relationships

▪ ֗ Poor understanding of the role or relationship between different units
involved in promoting or undertaking design research.

> There's never been a properly articulated relationship between I-cubed and SIAL and I just don't know who's responsible for that. ...I still have no real knowledge of their business agenda, …and a lot of people have asked me in the past what is the difference between I-cubed and SIAL. I say, from my point of view, I-cubed is about commercialising research at RMIT. …I'm presuming there's expertise there to help do that. At the moment we haven't got anything that's immediately commercialisable but the moment it is I would like to think that I can go to [them] …for help. (Mark Burry, SIAL)

> My big disappointment with I Cubed was that I actually wanted I Cubed to be an institution where they would have some designers and some programmers and some project managers and some X, Y and Z so you could take a take project there and work as a collaborative team. I've never formally tried to take a project there but a couple of times I've said, 'what about this'? They've always said that's fantastic, you can come up here - this was years ago in the old I Cubed model - but all they could offer me was hardware. …What I need is access to collaborative work teams that bring together, you know, someone from computer science who can do X, Y and Z. (Adrian Miles, Applied Communication)

REFLECTION ON RESEARCH QUESTION

RMIT's design research community has two key components. These are, firstly, the design researchers themselves, distinguished by those who do research *for*, *about*, or *through* design, and secondly, collaborators and facilitators of design research. Within this second group there are, firstly, the collaborators and potential collaborators from a range of disciplines, and, secondly, those groups that promote design research and facilitate projects, such as I-Cubed and Lab3000.

In terms of aims and approach, it is possible to group the capabilities identified as belonging to the first group, the design researchers, into two broad categories: firstly, those who undertake design to solve problems and create something useful, and secondly, those whose design is directed at addressing needs and / or at meaning making – cultural, social or political expression or critique.

The research focus and projects that occupy the study's design researchers reveals breadth as well as commonalities. The main areas of focus can be summarised by the following:

▪ Design strategies for engaging with contemporary problematics:
→ Digital or virtual environments

- → Spatiality / inhabitation
- → Cultural values
- → Urban development
- → Trans-disciplinarity
- → Sustainability
- Product design
- Design history / theory
- Practitioner based reflective practice
- Visualization, imaging & animation
- Simulation, prototyping & modelling
- Design research pedagogy

Synergies and affiliations

Synergies are most apparent across traditional design / science affiliations, such as the architecture, fashion, and communication design nexus, or across engineering and the applied sciences. The former tend to undertake design with a view to cultural value – and therefore have a stronger affinity with the creative arts, whilst the latter tend to focus more on problem solving and commercial opportunities. This divergence reflects differences in methodology, motivation and criteria for success. It does not, however, necessarily preclude the potential for mutual interest in tools, techniques, and knowledge's. SIAL is a good example of a research group who have strategically positioned their research as trans-disciplinary, drawing on expertise from architecture, geo-spatial science and computer science, in particular. Moreover, evidence of emerging convergences in research approach between the engineering and design disciplines, for example, indicate the potential for interesting new directions in research.

An interest in the potential of new information and communication technologies is the one area where synergies are particularly evident across the disciplinary groupings. An obvious link exists in this regard between SIAL, I-Cubed, and Lab3000, all of which have an interest in digital design, as do other researchers who participated in the study, particularly from Engineering. Mark Burry and Tom Kovac, for example, both assert the need to question the potential of technology and to think 'postdigitally,' or beyond the computer, not just in terms of design but also in relation to society more broadly. Ian Bates is interested in the potential for micro-technologies to become embedded within designed artefacts, such as houses and cars. Mark Burry and Cees Bil are both working, independently, on projects aimed at assisting asynchronous, on-line collaboration and communication. Finally, Leon van Schaik (2003c) and Tom Kovac have developed the concept of a Virtual Learning Concourse and conducted projects with the cross-disciplinary User Centred Design group. Clearly, investigations into the potential of technologies and how they might transform design practices and outcomes are prevalent across RMIT's design research community.

The findings of the study also suggest that trans-disciplinary collaborations are already a feature of RMIT's design research community. Projects exist that cross between chemistry and textiles (David Mainwaring's 'smart jacket'), architecture and social science (Shane Murray's 'housing for the age of Aquarius'), and Centre for Design and Civil Engineering (Helen Lewis), to name a few examples. The CRC on Smart Internet Technology and the User Centred Design network is also providing a vehicle for researchers from across the University to come together on related projects, with involvement from I-Cubed, and the Faculty's of Business, Constructed Environment and

Engineering. The Practice Based Research Conference hosted by the Research and Innovation section that occurred earlier this year is another example of a cluster of scholars from across the University benefiting from cross-fertilization around a shared interest. Significantly, the practice based research model has emerged out of the design disciplines but is now being taken up within business, education, science and engineering disciplines, providing further evidence of emerging cross-disciplinary convergences in approach.

Potential remains, however, to further develop linkages between RMIT's design researchers and for a better-informed research community in regards to the activities occurring, and corresponding opportunities that exist, locally. Greater visibility and an on-going presence are required to support existing communities and networks and assist in the creation of new ones. Digitally supported community-building models such as the Virtual Learning Concourse need to be supported beyond the initial User Centred Design project to harness and carry through other design research activity – such as that which occurred around the Practice Based Research Conference. The role of existing groups dedicated to facilitating and supporting design research, such as I-Cubed, can also be enhanced by such mechanisms. The facilities of I-Cubed, in particular, appear to be under-utilized by researchers within RMIT and its role as a community builder, as well as research broker, needs to be further promoted. A lack of clarity also exists in regards to the relationship between groups such as SIAL, I-cubed and Lab3000. The role of Lab3000 in promoting linkages between higher education and industry and other stakeholders also needs to be made more explicit. At present, their focus appears to be exclusively on the compulsory education and TAFE sectors.

Building capacity / aspirations

The key to promoting potential collaborations across RMIT's design research community is knowledge. It is inevitable that researchers only have limited knowledge of what other research is being conducted, particularly across disciplinary groupings. Networking opportunities, dedicated to design research, need to be established to enable this to happen. Di Fleming from Lab3000 has begun to address this need through Design Link, a series of monthly face-to-face forums on digital design. It is also interesting to note the informal role that conducting interviews for this study has played in this regard, as the researcher was able to pass on information, where relevant, from one participant to another. In order to build-up and profile RMIT's design research community, however, more is needed. On-line mechanisms, in conjunction with face-to-face interactions, are needed that enable linkages between researchers to develop and grow organically over time and across a dispersed community, as proposed in phase two of this project.

One thing that is clear from this study is that there is no shortage of good ideas out there. The impediment facing researchers is having the contacts, time and support to enable projects to happen. This includes immediate access to networks, enabling the establishment of research teams on a project-by-project basis. But it also involves having the support of research enablers, or managers and facilitators, who can instigate projects and follow them through to completion. Access to networks and research managers / facilitators is particularly important for established researchers, particularly for attracting and extending research opportunities, but also for emerging researchers. The latter need assistance taking the next step into externally funded projects.

For those areas of the University where design research is nascent, particularly the

Faculty of Art, Design and Communication, impediments to building capacity need to be identified and remedial strategies developed, such as provision of incentives to encourage academics to undertake research degrees. Also critical is the dissemination, discussion and promotion of successful models that enable research to be incorporated into teaching and professional practice. Such leadership already exists in the School of Architecture and Design and it is encouraging that productive relationships are already emerging between the two areas. Leadership is also required internally, however, to drive a culture of research specific to the disciplines involved.

Where academics are already undertaking research degrees, support is required to facilitate research degree completion and enable researchers to move into other kinds of research. Support for the next generation of researchers is also critical, such as funding for post-doctoral fellows and research assistants, particularly in those areas where securing external funds for such positions is difficult.

Finally, strategies aimed at building up RMIT's design capability need to address the structural differences that exist across the Design Research Community. Communities at different stages of development need to be supported in different ways. Moreover, differences across academic communities need to be recognised – for both the advantages and disadvantages that they embody. The strong links to professional practice that exist in some areas, for example, as well as the integration of teaching and research, should be supported and encouraged. However, the limited external funding for research within the design disciplines, and the large amount of personal investment that follows from this, reveals significant inequities in research funding across the University. It is also important to promote understanding of design research and develop formal mechanisms for recognising research outcomes that do not fall into traditional conceptions of research and DEST recognised categories.

Where to from here?

If design research is to be profiled and promoted a key question that needs to be addressed is that of to what end, or purpose. What should our aspirations be for design research at RMIT?

Leadership in design research already exists, particularly in the School of Architecture and Design. The only two existing design based Innovation Professors, Leon van Schaik and Mark Burry, are both located within this School. Moreover, academics in this School have a long history of promoting and undertaking design research and are providing leadership to other areas of the University, as is evident from the emerging relationships between this School and other programs whose research cultures are more nascent. Moreover, this School has been a pioneer of innovative design research models:

> The Architecture Program developed a very innovative model of project based research that …has been taken up by other institutions, and in a sense that affirms the value of the model for us that some of the best institutions internationally have effectively adopted our model, as well as partner institutions in the region as part of the ATN group. (Brent Allpress, Architecture)

RMIT needs to support and build on this existing leadership. The areas of the University whose design research remains nascent can learn from the strategies and models developed and trialed by this School. Moreover, the emergent and established areas are well situated to engage in dialogues of mutual benefit. Tantalizing research opportunities exist, particularly between engineering, computer science and the architecture and design disciplines. With interest between the groups palpable, mechanisms are needed that will enable such enthusiasm to flourish.

Leon van Schaik, Tom Kovac and Di Fleming have all addressed the need to situate the relationship between design research and industry, particularly in relation to the role of education in professional practice and industry contexts. Integration of the two is a key aspiration of Leon van Schaik's practice based research model.

> In my view the relationship between practice and education will become even more integrated as our students and recent graduates discover the power of this new tendency in individually researched creative practice. (2003b)

Education and industry should not be treated as separate, and models, such as the above, that integrate the two without reducing either to the agenda of the other, need to be advanced and promulgated. Research by project at the post-graduate level is one way that this is occurring very successfully across the design disciplines, where established professionals undertake their degree by part-time mode (see Barnacle, 2002). While the research by project model has recently also been adopted in Engineering, there is potential for practice based research to be further explored as a model within the science disciplines broadly.

The other key issue that arises in relation to leadership is that of promoting understanding of design research. At one level this involves promoting design research within a disciplinary community. Engineering, in particular, would benefit from stronger linkages across its design research community as well as from promoting understanding of design research as a model. More broadly, promoting understanding of design research requires situating the different design research models that exist across disciplinary groups in relation to each other. It also requires locating design research broadly in relation to other research models. It is clear from this study that design research in architecture, graphics and fashion differs from that undertaken in engineering. Yet, they are not altogether unrelated, with an affinity between industrial design and engineering being particularly apparent. Areas of synergy and commonality are often best understood through clarifying differences. Moreover, the most productive synergies are also likely to occur through, or proceed on the basis of, complementarity.

Differences are important drivers of creativity and innovation. Promoting a community of practice around design research should not be confused with seeking or imposing singularity. Accepting this also requires recognising that some disciplines are, and will remain, better disposed toward attracting external research funding than others. While collaborations can work to mitigate this to some extent, on-going support for pure, or disciplinary, research also needs to occur. Trans-disciplinary collaborative research needs to grow out of the kind of research that promotes core disciplinary knowledge. Research support for the two needs to operate in tandem.

RECOMMENDATIONS

1. Design research needs to be recognised and promoted as an essential element of RMIT's research capability through: (a) defining a select number of refereed research outcomes in addition to the four DEST publication outcomes; (b) including these measures in the RMIT collection of research outcomes collection and; (c) defining and promoting design research at RMIT by expanding the research outcome collection and, finally; (d) seeking to shape the DEST definition of research outcomes and the national 'Higher Education Research Data Collection'.

2. A strategic planning group needs to be convened with the aim of promoting design research at RMIT. Promotion activities should include the establishment of on-going events, such as a design research conference, and other mechanisms, such as publications and exhibitions, for profiling RMIT's design research activities and promoting dialogue amongst stakeholders, both internal and external. Strategies also need to be formulated for building-up and supporting RMIT's design research community by drawing on the ideas expressed by participants of this study and documented in this report.

3. An Internet-enhanced mechanism is needed to help facilitate the emergence of networks and collaborations across RMIT's design research community and to promote design research both internally and externally. Such a mechanism is needed to profile and add value to existing facilities and services provided both internally, such as through I-Cubed, and via partners such as Lab3000 and VPAC. This is being addressed through the proposal to develop an online 'Alterative Map of design Research at RMIT' as phase two of this project.

4. Researchers in the design fields face barriers to building up research track records due to the lack of recognition of research outcomes by Federal Government funding agencies. Strategies need to be devised to address this and demonstrate discipline specific scholarly activity by ensuring that design clusters have appropriate peer review mechanisms for research outcomes. The institution, in turn, needs to give parity to these outcomes in the way that it recognizes achievement and in the distribution of internal research funding. This should include project based design research, design research publications and exhibitions, and peer reviewed design awards.

5. Access to external research funds across RMIT's design research community is disproportionate, with researchers in the engineering and science fields attracting significant funds compared to those in the design fields. Existing externally funded grant holders, such as Mark Burry and Shane Murray, indicate the potential for the design disciplines to attract such funds. Research enablers, or facilitators and managers, are required to support this activity and seed further projects. Moreover, existing strategic partners, such as Lab3000, and other Universities, should be utilized in seeking linkage grants and large infrastructure grants for major equipment.

6. The profile of design research within the engineering and science disciplines needs to be enhanced. A design research cluster is required to promote informal

linkages amongst researchers and to promote design research across these disciplines. Given evidence of emerging convergences between the respective design approaches of the engineering / science and design fields, leadership is required that is aimed at forging dialogue and collaborations between design researchers across these communities.

7.   Capacity building needs to be directed at supporting and further consolidating existing initiatives. The School of Architecture and Design's Graduate Research Conference now involves all the design disciplines from across the University. It should be provided with additional funding for enabling visiting professors to participate from across the disciplinary groups and programs now involved.

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