# Expert Opinion on the Barriers to Communicating Excellent Research in Commercially-Driven Design Projects

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## Abstract

Effective university-industry collaboration has become a major focus for governments in recent years. Universities are increasingly expected to play a greater role in the innovation system and evidence their contribution to economic development. At the same time, the growth in research quality assessment exercises makes it imperative that the excellence of research conducted in commercially-driven activities can be appropriately evaluated. This paper explores the challenge of reconciling commercially-focused activity and research quality assessment in design. Semi-structured interviews were conducted with thirteen experts including representatives from the design discipline, other applied academic disciplines, research quality assessment leaders and commercial designers. The interviews identified a number of barriers to demonstrating research excellence in commercially-driven projects. These were classified as barriers resulting from: the nature of industry/academic relationships; the nature of the project; and the nature of the research quality assessment. It is concluded that there is a need to build a simple, easily usable framework for assessing the research potential of commercially-driven design projects from the outset to ensure that the appropriate processes are put in place to communicate research conducted within them.

*Keywords: Design, Industry, University, Collaboration, Research, Assessment.*

"… Today, the boundaries between basic and applied research are blurring, and more and more fundamental research is conducted in the context of application..." (European Research Council, 2015); this can be seen as part of a move within the research environment towards increasing levels of applied output. About a third of scholarly submissions to the 2014 UK REF, Research Excellence Framework - a system used in the UK to assess research in higher education institutions-, were non-standard outputs, including performance, composition, design, artefacts, exhibition and digital or visual media (REF results, 2014).

Therefore, there is a need to evaluate non-standard academic outputs in any assessment of research quality is increasing. The process of understanding and disseminating research from non-traditional outputs is thus facing difficulties and one way to better understand the issue is to

try and identify these difficulties.

## Literature review

Increasing attention is paid in universities to the development of effective industry/university collaborations. In many countries, universities are considered to be key contributors to wealth generation and economic development. The economic and social impact of universities on industrial innovation through creating new knowledge and educating the 'future professionals', has long been recognized (Cohen et al. 2002; Mansfield 1991; Pavitt 1991; Salter and Martin 2001) and policies are being developed that promote and sustain university-industry collaboration. (Dowling, 2015; Dooley & Kirk, 2007) Meanwhile, the role of design as a driver for innovation is also becoming more recognised. (Verganti, 2013). As such, design providers within universities are well-positioned to engage with industry.

In recent years, change in the Higher Education landscape across a number of countries in Western Europe, the UK and Australia has seen the integration of many art and design schools into universities. (Rodgers & Yee, 2016). There has been a long history of commercial activity within art and design colleges. Many designers were employed on the basis of their professional reputation and continue to practice both to maintain that reputation and to remain abreast of developments in commercial design. (Rust, Mottram & Till, 2007). More recently, however, designers undertaking professional practice within universities have been experiencing tensions between the need to evidence their contribution to industry with their contribution to the research quality of the university. (Kuys *et al.* 2014) Research quality assessment exercises are increasingly being implemented by governments across the world. In the UK, the Research Excellence Framework (REF) is the basis of research quality assessment and serves a number of roles: it contributes to the decision-making about the distribution of national research funding; it provides evidence for governments in setting national research priorities; it shows the outcomes of public investment into research; and it may be used by universities to inform their resource allocation policies (Stern, 2016; Ratcliffe, 2014). As such, it is important that design research is appropriately represented within research quality assessment frameworks to attract continued support and investment from universities and governments. Within the REF, research is defined as "*a process of investigation, leading to new insights, effectively shared*" (REF, 2011). The excellence of research is based on three main criteria: *originality, significance* and *rigour*. *Originality* in research is defined as "*a creative and/or intellectual advance that makes an important and innovative contribution to understanding and knowledge*"; *significance* as "*the enhancement or deserved enhancement of knowledge, thinking, understanding and/or practice*"; and *rigour* as "*intellectual coherence, methodological precision and analytical power; accuracy and depth of scholarship, awareness and appropriate engagement with other work*" (REF, 2011). To demonstrate research excellence, a commercial project must feature some degree of originality, significance and rigour, and moreover, the commercial partner must be willing to share evidence of this. Further, since 2014, the impact of research has played an important part in assessing research quality.

The changing higher education context coincides with shifts in the industry. There has been increasing attention paid in the industry to new forms of value creation from design. The rise of

participatory, user-centred, service, sustainable, socially-responsible and innovation management design in industry has given rise to the need for new skills in the design community that are more focused on new research and design processes. (Rodgers & Yee, 2016). Therefore, the range of activities that might be conducted by design practitioners in a university-industry collaboration has expanded enormously. To illustrate this, in 2013 design practitioners at PDR (an award-winning design innovation and research centre based at Cardiff Metropolitan University) undertook 369 projects with 69 companies, generating a turnover of £687,000. These projects ranged in time and complexity from simple CAD manipulations to large-scale projects that required innovative approaches to user research, concept development, mechanical engineering, design for manufacture, rapid prototyping, usability testing, in- house low-volume production, and management of the handover for full-scale production. In some cases, the knowledge required to undertake the work was readily accessible, based on the experience and training of a single designer, whilst in other cases the work required larger teams dealing with complex new problems that necessitated rigorous exploration for the creation of innovative solutions. It is clear that significant novel research may have been conducted within some of these commercial projects.

However, in practice it can be difficult to identify, evaluate and communicate research excellence conducted within a commercial project in any discipline. (Elmuti *et al*. 2005). To demonstrate research excellence, a commercial project must feature some degree of originality, significance and rigour, and moreover, the commercial partner must be willing to share evidence of this. Further, the discipline must provide some evidence of its broader impact. This paper explores the barriers to extracting research excellence from commercial projects.

## Research methods

The study adopted a grounded theory methodology (Charmaz, 2006; Glaser and Strauss, 1967). Extracting research excellence from commercial projects was identified as the main process of concern, and stakeholder analysis was conducted to identify key viewpoints that should be represented in the study. The stakeholder group identified are presented in Table 1.

Table 1- Overview of the interviewees.

| Field of the interviewees | Interviewee's reference | Reason for selection |
|---|---|---|
| Design and Design research. | A<br>B<br>C | The opinion of experts, practitioners and researchers, in the design field is crucial for this research. These interviews were secured through contacts at the university department and conferences attended. Their opinions as researchers with valuable ties to the commercial world gives a real life, practical view about the matter at hand. Their research, academic backgrounds, and current commercial work positions them in the centre between the two fields. |
| Surgical prosthetics and lab management. | D | Referred to by interviewee E; it was important to look at this collaboration from the practical perspective. D's collaboration with E on multiple projects, including award winnings ones, was a big motive for this interview. |
| Surgical prosthetics design and research. | E | Although different in nature from commercial design, surgical and prosthetic design still shares basic themes and processes with commercial design research. This interview was based on the possibility of extracting techniques from the former to adapt them for the latter. |
| Arts and Arts research and REF administration. | F | Art and Design shares the same unit in the REF assessment process. There is a lot in common, yet many differences that play a big role in creating glitches in the assessment process. Having an insider's point of view was important for a better rounded perspective. |
| Design communications management. | G | Getting a close look at communication basics between consultancies and current or potential clients; an important factor in bridging the two fields. |
| Design research and REF administration. | H | H is a major role player in the REF submissions. From collecting all the necessary documentation to putting together a portfolio in the arts and design department, H's opinion about the process gave an insider's look at the submission process and difficulties it faces. |

| | | |
|---|---|---|
| REF administration and funding allocation. | I | A big part in a research project is research assessment, and knowing about the administration process of the submissions to UK's assessment exercise (REF). |
| Management research and practice . | J<br>K | The school of management, like art and design, has a great deal of work with the commercial and business world. This relationship, compared to the commercial design/design research one, can create many parallels to draw upon. |
| Sports research. | L<br>M | Sports education and practice are heavily reliant on theoretical work such as biomechanics and physics. The communication between practice and research is thus inevitable. Looking at this field's practices and ways of communication can lead to a transferrable set of skills or methods to the design world. |

Preliminary unrecorded interviews were conducted with representatives of the stakeholder groups to locate the main challenges. This process led to a number of interviewees and the relevant questions to ask. According to Charmaz (2006) the key elements of the grounded theory are the simultaneous involvement of analysis, data collection and the development of the theory during each step of the process, and the use of sampling as a tool for theory construction rather than population representativeness. Therefore, interviews were each transcribed almost immediately after, which helped in further understanding of the context, in focusing the next interviews, and in the choice of the next interviewees.

A semi-structured interview template was developed based on the findings and data collection proceeded through semi-structured interviews with thirteen experts with different perspectives on the relationship between universities, industry and research excellence.

Interviewees were drawn from applied academic disciplines (design, sport and exercise studies, business and management), university research and enterprise administration and Art & Design REF panel leaders (from two of the top 25 ranked art and design universities in the UK according to The Guardian's University guide 2017: league table for art(2017). Interviews were transcribed and an open-coding method was employed in which the data were separated into segments and interrogated to identify common themes by three members of the research team. Three transcripts were coded by one researcher and the emerging themes were sense-checked by two other members of the research team. The analysis was used to further develop the theory and inform further interviews until no further themes emerged. The themes were reviewed and clustered to produce an affinity map of themes related to barriers encountered in evaluating, evidencing and communicating research excellence in commercial projects.

The identified barriers were clustered into three main themes: the nature of the

commercial/academic relationship; the nature of the project being undertaken; and the nature of the research quality assessment process. Table 2 provides an overview of the identified barriers for each theme.

Table 2: Barriers to identifying, evaluating and communicating research excellence in commercial projects emerging from expert interviews

| Nature of the commercial/academic relationship | Nature of the commercial/academic project | The nature of the research quality assessment process |
|---|---|---|
| - Willingness to engage<br>- Commercial confidentiality<br>- Trust and credibility<br>-Ethical considerations<br>- Impartiality<br>- Cost of research<br>- Commercial environment<br>- Risk aversion<br>- Resistance to change<br>- 'Appropriate' research<br>- Communication | -Academic relevance and/or commercial relevance<br>-Transferability<br>-Building evidence of impact<br>- Scale<br>-Speed | - Academic metrics of success<br>- Accessibility of information<br>-Generalizability, Quantification and Validity of outcomes<br>-Appropriate evaluation criteria<br>- Subjectivity and bias<br>-Timescales for impact<br>-Originality of incremental innovation<br>-Originality and commercial success<br>-Evidence<br>-Peer Review<br>-Reach |

## Discussion

### The nature of the commercial/academic relationship

While the value of the collaboration between academics representing universities and commercial stakeholders is indisputable, the increase in cooperation brings with it a rise in conflicts between the two fields. Commercial projects conducted within a university context have to manage a number of concerns related to ***commercial confidentiality***. In some projects fear that the dissemination of the academic research component may jeopardise competitive advantage or intellectual property rights can influence the commercial partner's ***willingness to engage*** or support the output. This is related to the level of trust that exists between the two partners. Talking about commercial partners' willingness to give away information, J (2016) explained that "…*even if they are going to allow you to publish, they will try to sensor what you are about to say, and that is a huge issue…*". If the ***trust and credibility*** of the researcher is not clearly established in the minds of the commercial partner, then the perception of the different objectives of partners can be a problem in establishing an effective relationship. L (2016) pointed the trust issue out, when he spoke about how hard it is for commercial partners to decide to let a research partner get involved; "*Once they accept that they can't develop this skill, maybe then a scientist comes in and does the research question and says 'oh, these are the three options that you have. Then yeah they have to trust you, and know the information you are giving them are meaningful and correct*". The commercial partner may fear that the university partner will prioritise research outcomes over commercial needs. One interviewee cited this, explaining that the need to make research generalisable may lead a researcher to simply deploy an existing framework, rather than conduct the ***appropriate research*** for the situation at hand.

According to Kirk and Dooley (2007), trust in university-business partnerships are strengthened by longer relationships, increasing the likelihood that the commercial partner will engage in the development of research outputs. However, where new partnerships are being developed, or commercial partnerships are particularly lucrative, the opportunity to translate the commercial project into an academic output may be passed over, even if there is no chance of breaching confidentiality. There are, however, times when the ***ethical considerations*** can bring partners into conflict; examples were given of industry-business collaborations in the health and sports sectors that had revealed patterns of injury or ways of avoiding illness that the academic considered it essential to communicated to the wider environment, irrespective of commercial sensitivities.

The ***cost of research*** can also be a limiting factor. Time, financial cost and the way projects are scaled and justified differently in commercial and academic contexts are major problems faced in building effective university-business collaborations. Alongside concerns arising from potential loss of competitive advantage, overhead costs mean that the cost of working with universities on company-funded projects is relatively high. Commercial partners may be concerned that formalising the academic research component of a project will lead to longer projects and more incurred costs. This can lead to commercial partners limiting the form or extent of research conducted within a project prior to commencement which may, in turn, have an impact on research quality and validity. The problem that many commercial parties swipe under the rug, is

that the time saved on research could have resulted in better product development. The *StreetScooter* and *Raven the surgical robot* are examples of commercial success facilitated by academic skills and inputs (Jones & Clulow, 2012).

The commercial environment can also affect the likelihood of being able to conduct academic research within a commercial project. ***Risk aversion*** related to the application of 'unproven' techniques can limit the extent to which a project can demonstrate new research. Risk aversion may also manifest itself in an unwillingness to communicate unsuccessful research activities. This does not sit well with the academic concept of ***impartiality***. Acknowledging failure, and more, being given the space to fail makes an important contribution to a discipline. It challenges existing knowledge and helps to shape future research activity. However, when failure is translated into a dissatisfied client, customer or user then commercial organisations may not be inclined to bring it to the attention of a broader audience. Another cultural factor within commercial organisations that affects the research potential of collaborations is ***resistance to change***. Companies that are unwilling to change may not adopt the outcomes of a project, making it difficult to evaluate effectiveness and evidence impact.

***Communication*** between partners is a very common barrier to developing mutually beneficial commercial projects. In particular, the communication of the value of academic research to commercial partners can be very difficult at the early stage of project development. Where applied research is communicated through journal articles, the availability and accessibility of the information is a concern to commercial partners. Commercially involved interviewees in the project commented that there was often an expectation that their colleagues would read and fully understand academic texts. K, the business and management researcher stated that "... *An American driven journal in operations management, the only 4-star journal in OM, and it is very quantitative, and it is written in a very academic style. Right, there's a direct inverse relationship between that and the accessibility of that material to the practitioners, because they cannot understand what the they are talking about*." (K, 2016). The challenge of communicating important information and research value to multidisciplinary partners in projects is a common challenge. For example, in the medical field, the Critical Reading of Research Publications (CRRP) tool has been developed to help nurses to understand academic articles (Johnson *et al*., 1995).

## The nature of the commercial/academic project

As previously discussed, university-industry projects can take a range of forms. The extent to which there is scope for original research within the project depends very much on the form that it takes. Unfortunately, ***academic relevance*** of commercial projects ***or commercial relevance*** of research is not always guaranteed. This is not to say that commercial projects that cannot be exploited for research outcomes are not valuable in their own right, just as both 'exogenous' (curiosity-driven) and 'endogenous' (market-driven) research have a place in the modern university (Dooley & Kirk, 2007). It simply means that there is no benefit of trying to evidence research significance in every commercial project. Equally, the enormous variety of different projects that may be conducted can mean that the outcomes of one project have limited ***transferability*** to other situations and contexts. If innovative research has been conducted within the project, it may prove challenging to prove the validity of the approach if a further case

of its application cannot be identified. Therefore, demonstrating rigour in research approach may be challenging. A related issue is the difficulty in ***building the evidence base***. Processes, methods or inputs that have worked within one project can be used to show evidence of impact in one specific case; however, building an evidence base that supports the application of methods and practices in different areas requires a critical mass of projects. The ***scale*** and ***speed*** of projects can also limit their effectiveness as carriers of academic research excellence. Commercial organisations often have very different time frames to university-based practitioners. These differences are difficult to reconcile so designing a project that can deliver commercial and research benefits is challenging.

## The nature of the research quality assessment process

Assessing commercial projects for their academic objectives is perhaps where the differences between the needs of the partners is made most obvious. ***Academic metrics of success*** include two elements: further grant funding and traditional research outputs. Academia is about producing and communicating knowledge, which is not usually the intended result of commercial projects. The loop of knowledge-creating-further-knowledge is not a cornerstone aspect of business; this lack of information sharing community within commercial design, works as a barrier to the evaluation of the research since there is little documented history to draw upon. The gravity of this problem is compounded when there is limited ***documentation*** of a project, and where the ***accessibility of information*** is at the behest of the commercial partner. A lack of documentation throughout any commercial or art project makes any future attempt to try and understand the research value, or try to communicate that research value, a much harder task. This is particularly problematic when academic practitioners are attempting to build the evidence base; the need to revisit the project may come several years after its conclusion. As such, communication of the rigour and significance of commercial projects through processes that rely on the ***generalisability, quantification and validity of outcomes*** can be very difficult. This highlights the difficulty in identifying ***appropriate evaluation criteria*** which is further compounded by the variety of outputs that can result from a commercial project. Assessing diverse outcomes for research quality is not a new challenge; about a third of scholarly submissions to the 2014 REF were non-standard outputs, including designs, designed artefacts, exhibitions, visual media, digital media, performances and compositions (REF results, 2014). However, assessment of non-standard outputs in the REF is heavily dependent on peer review and the institution's reputation, which has led to claims of ***subjectivity and bias***. In 2006, a European Commission review of university provision across member states concluded that: "*...universities should be funded for what they do, not what they are...by focusing funding on relative outputs, rather than inputs*". (European Commission, 2006). In a recent assessment of university-based research across Member States conducted by the European Commission concluded: "*evaluators may be influenced by their competitive pressures, including possible implications for work of their own, or that of their colleagues. They may evaluate research in terms of what they know, and therefore they can act as conservative 'gatekeepers'*" (European Commission, 2015).

In defining the ***originality*** of a commercial project, it is important to note originality can be evidenced in the REF by proving that the research output shows "empirical findings, new

arguments, interpretations or insights, imaginative scope, assembling of information in an innovative way, development of new theoretical frameworks and conceptual models, innovative methodologies and/or new forms of expression." (REF 2011). As opposed to traditional research, in which researchers have 5000 to 10000 words to elaborate and explain their interpretation of how their output holds original value, artefacts have only 300 words. This, makes it impossible for some designers to communicate the research value in their work.

It is important to recognise that **originality** can exist in the process, in the communication between the partners or industries. Although it is tempting to consider commercial success and high sales as indicators to originality, originality is not necessarily a measure of commercial success, but can have a direct or indirect impact on the latter. Is incremental innovation original? In the commercial world, a small alteration made to a product can have a huge impact on its performance. Does that make the output original? Even more importantly, does this originality have a research value?

Researchers expressed a difficulty in defining **rigour** to a commercial partner; we could argue that this goes back to the resistance to change when a ''way of doing things'' worked just fine for years, even though it lacks rigour, why change?

**Significance** is defined by two factors Extent and reach. The different types of audiences (academic, art and commercial and ways to communicate research to them, as well as triggering the right audience can affect the assessment of a project.

According to the interviewees **Peer review** has by far been the most used research evaluation tool, but it holds a lot of bias. When it comes to evaluating the rigour of any output, peer review is one main method. We believe the problem in non-traditional outputs might be that the methods undertaken tend to be the ones accepted by the client or commissioner rather than the ones acceptable to the reviewing process. The extent of the reviewer's knowledge of a certain area as well and their subjectivity when reviewing a piece of work are crucial elements that play a role in the fluctuation of the assessment of significance using peer review. A major difficulty is in the ability of a reviewer coming from an academic context, to see the commercial significance and vice versa. Although originality is not necessarily represented by the market performance, in the cases where it is, using the market as peer-review can be hard to translate into structured academic evidence of significance.

The ability of the artists and commercial partners to locate their work within previous work or **Prior Art** is debatable, not all designers of managers have an academic background, and the ability to distinguish between the significance caused by the actual work itself, and the significance caused by external circumstances (like the influence of previous art on it for example). Poggenpohl (2015) argues that nowadays with focus on innovation, and the amount of information available and the attention to research, designers who are focussed on creating something new and on what comes next, designers ignore the fact that the past is the base of development.

## Conclusion

Every year, a number of socially and economically impactful artefacts and products, carrying a load of research value, are produced and go unshared and unnoticed. The fixation on high research assessment exercises and their scrutiny when it comes to non-traditional research outputs holds researchers and practitioners from sharing that knowledge. In this paper we tried to generate a collective list of barriers and limitations based on the perceptions of a group of experts, to see where the problem really lies. Three areas of barriers were identified; Commercial/academic relationships, commercial/academic projects and research quality assessments. The scale of the projects (time and money), the communication between commerce and academia, the unclear definition of the different elements that characterise quality research, and most importantly, the fixation on producing research submit-able to research assessment exercises, backed by a list of other limitations, create this bridge academia has long been trying to cross.

This list of limitations will then be used to try and find ways to overcome those barriers. The solutions, when available, will later help in creating a framework or set of criteria that can support commercial and academic institutions bring out the research value lying in the background of impactful commercial and non-traditional outputs.

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## Authors Biographies

### Dana Al Batlouni

PhD student at PDR, Cardiff Metropolitan University. Her background in marketing and international business management combined with her interest in design, led to her involvement in this research study. Dana is interested in the role commercial design can play in supporting academia, for more sustainable academic research.

### Dr Katie Beverley

Senior Research Officer in Ecodesign at PDR, Cardiff Metropolitan University. Since joining PDR in 2014, Katie has been involved in university-industry collaborative projects with companies from a variety of sectors including furniture, fashion and automotive. Katie has a strong interest in the role that universities play in supporting innovation.

### Prof. Andy Walters

Director of Studies at PDR, Cardiff Metropolitan Umiversity, Andrew has developed research interests that centre on applied research related to design practice. That is, Andrew is interested in how companies use design, and how that use of design can be improved through intervention at the organisational and government policy level. Thus, Andrew's work is closely linked to Enterprise and Knowledge Exchange (KE) activity where meeting the needs of participating industrial organisations creates both research material and informs subsequent interaction.