



DRS2020  
BRISBANE, 11–14 AUG  
SYNERGY



# The Practice of Design Innovation in the Academic Context: The Project Portfolio by Brunel Design

Giulia Cosco and Vanja Garaj\*

Brunel Design, Brunel University London

\*Corresponding author e-mail: [vanja.garaj@brunel.ac.uk](mailto:vanja.garaj@brunel.ac.uk)

doi: 10.21606/drs.2020.243

**Abstract:** Collaborations between academia and industry can be an effective way to build capabilities and generate value in design innovation. Department of Design (Brunel Design) at Brunel University London provides different design innovation support programmes to businesses by involving its students and academic and professional staff. This paper presents a literature review on design innovation and its benefits in collaborations between academia and industry. The final goal is to describe the practice of design innovation by Brunel Design through its programmes and the advantages obtained by the stakeholders involved. Each programme description is supported by a case study and the programme benefits are related to the relevant literature. Besides the direct benefits to the businesses involved, such as the development of commercial ideas and capabilities in design, the advantages for the academic community are explained, such as the expansion of the research capacity, education and career development.

**Keywords:** design practice; design innovation; knowledge exchange; academia-industry

## 1. Introduction

The impact of design on the UK economy is substantial. Design is the fourth driver of innovation in the UK (NESTA, 2009). In 2016, design generated 7% of the total GVA (Gross Value Added), which is equivalent to £85.2bn. This value was generated from both design and non-design sectors (Design Council, 2018). The recognition and use of design in innovation can accelerate economic growth (Innovate UK, 2015). According to the Design Council (2012), for every £1 invested, it is possible to achieve £20 in revenue. Nevertheless, the financial value is just a part of the overall benefit delivered by design. The intangible values – such as human capital and business strategy – are also highlighted by literature (Vijfeyken, Cools and Nauwelaerts, 2015; Design Council, 2008, 2012; Carlgren, Elmquist and Rauth, 2014). The use of design can overcome its role to create the competitive advantage



This work is licensed under a [Creative Commons Attribution-NonCommercial 4.0 International License](https://creativecommons.org/licenses/by-nc/4.0/).

and become embedded in the fabric of firms (von Stamm, 2004), a crucial competence that influences companies' culture and vision (Borja de Mozota, 2003).

Collaborations between university and businesses involving design are worthwhile opportunities to create new knowledge and generate value, bridging the gap between academic research and business practice and identifying the patterns that vehiculate innovation. The academic context offers several advantages to the creation of design value, capabilities and awareness, fulfilling its mission of creating and disseminating knowledge (Newberg and Dunn, 2003) and contributing to economic growth (Blumenthal, 2003).

The Department of Design (Brunel Design) at Brunel University London manages several programmes involving students, academics and businesses in design activities, which deliver different outputs related to capability building and value creation. This paper analyses the dynamics, stakeholders and motivations of these programmes. The different ways in which design activities are performed mirror the multifaceted expressions and contributions of design as an innovation driver. Identifying the effectiveness of these contributions and the benefits and barriers can help understand the university role in design innovation and how the contribution of the role clarifies the design and innovation relationship.

The purpose of this paper is to provide an overview related to the benefits of design innovation in academia-industry collaboration according to the literature and describe how these benefits are achieved by the design innovation support programmes by Brunel Design.

In the following sections, the literature about design innovation and its benefits in academia-industry collaborations is presented. The ways in which Brunel Design supports design innovation through its programmes are described, along with related project descriptions and case studies and an analysis of their benefits supported by the literature.

The case studies have been selected from a number of completed projects based on their overall impact. The three case study images presented below have been licensed for publication via the appropriate consent form signed by the students who authored the projects.

## **2. Design Innovation**

Despite the emerging evidence of design as an innovation driver (NESTA, 2009; Cooper et al., 2017), the role of design in innovation is a matter of study that still lacks a clear and precise definition (Hernández, Cooper, Tether and Murphy, 2018). Even though evidence of the value carried by design in innovation has been highlighted (Nomen and BDC, 2014; Galindo-Rueda and Millot, 2015), the picture is still not fully clear. According to Hernández et al. (2017), design has quickly grown as an independent discipline and in non-design contexts and measuring methods based on firms' success generated confusing interpretations of design role in innovation. Moreover, the design role in innovation suffered from "spurious assumptions like considering design's ability to contribute to innovation as a given" (p. 692). The effects of innovation are more evident than its causes (Fagerberg, 2005) and according

to Cruickshank (2010) innovation studies can lack in design domain because design engages with “aspects of innovation that are not easily quantifiable” (p. 23), despite being a valuable source of approaches and methods for economic and businesses growth.

Many scholars support the role of design in innovation process. According to Freeman (1982), design is crucial to innovation, because it is the domain of creativity. According to the OECD (1982), reported in Walsh et al. (1993, p. 80), design is the “very core of innovation” because it involves imagination. Design is a creative activity, the “central factor of innovative humanisation of technologies and the crucial factor of cultural and economic exchange” (Maldonado, 1969; Cited in ICSID, 2008) and the design “effort” that can deliver both radical and incremental innovations (Mutlu and Er, 2003).

The connections between design and innovation are described by the Design Council (2011, 2018) and defined by Cox (2005), considering innovation as “the successful exploitation of new ideas” (p. 2) and design as “the link between creativity and innovation” (Ibid.). Design “turns an invention into a successful innovation”, to obtain outcomes that fit with our needs, which are usually different interpretations of an existing innovation (Oakley, 1990). Researches that draw attention to how design delivers innovation in the core design and non-design contexts, such as design-driven innovation (Verganti, 2009) and design thinking (Brown, 2008) help to understand the many ways in which design can contribute to innovation. Visual tools, methods and techniques are the common denominator (Hernandez et al., 2018) that encompass academic research (Verganti, 2006; Brown, 2008), business culture (Borja de Mozota, 2003; von Stamm, 2004), professional skills (Walsh et al. 1993, Hobday et al. 2012) and product’s innovative value (Verganti, 2009; Rampino, 2011). Therefore, the interpretation of design as the *language of innovation* (Hernandez et al., 2017) enriches the former definitions and highlights the ways in which design manifests itself.

The increased interest in embedding design as a driver of innovation has determined the development of many national support programmes (e.g. Designing Demand in the UK, Ulysses in Australia and Better by Design in New Zealand). Studies and design programmes highlighted how the development of design capabilities has several positive effects in firms’ culture, delivering both the long- and short-term impact, boosting business growth, generating new ideas and improving firms’ innovation capabilities in terms of resources, processes and mindset (Carlgren et al. 2014; Design Council, 2008). The development of design capabilities can be crucial for businesses that want to innovate and the demand of these skills is high (Design Council, 2018).

### **3. Academia-Industry Knowledge Exchange in Design Innovation**

Universities are a suitable context to support research and disseminate design skills and mindset, developing theories and training the future professionals. Collaborations involving universities, students and businesses are valuable opportunities to fill the gap between

research, education and practice, providing benefits that would be achievable only through their interaction.

Over the years, academia and industry have built different collaboration types, such as classroom and curriculum activities (e.g. courses and projects), workshops, competitions, employment opportunities, research projects, etc. (Roberts, 2007). Furthermore, the opportunities for academia and students to “bring the real world into the classroom or take the classroom into the real world” can increase connections, research approaches and methodologies (p. 11).

Getting access to real world problems in design context (Hakansson and Holmquist, 2010, Wodehouse and Mendibil, 2013, Evans and Waterworth, 2004) seems to provide benefits to all stakeholders. However, the benefits depend not only on the type of partnership, but also on the industry and university objectives. They are not natural partners (Lambert, 2003) and their different missions push them away from the significant gains that can be achieved by their collaboration.

The Design Innovation Catalyst proposed by Wrigley (2016), for example, is a framework adopted by Queensland University of Technology, with the purpose of letting the students apply design-led innovation principles in business realities, improving experience, corporate culture and design education and research. Similarly, curricular live design projects conducted in Salford University are described by Evans and Spruce (2005) as opportunities for students to improve their curriculum content, maturity and employment opportunities. Project-based learning, for instance, is a strategy enabling students to deal with real activities and tasks, improving team working skills, problem solving, initiative and project management (Wodehouse and Mendibil, 2013) and according to a survey conducted by Hakansson and Helmquist (2010) the students were more satisfied, appreciating working on real life projects. Other academic programmes, such as InnovationRCA (2019) and Startup@Berkeley (2019), offer support for students and alumni that have design-led ideas, providing entrepreneurial coaching and funds to commercialise and manage a business.

Scholars indicate some of the benefits for academia coming from these interactions, such as obtaining relevant information from commercial world, “alternative perspectives”, new research insights and career development, creating different job opportunities for staff and professors (Evans and Spruce, 2005, p. 598). The knowledge acquired can contribute to raise funds and to tailor educational contents to industrial practice (Tresseras, MacGregor and Espinach, 2005). Even the university prestige and use of resources can benefit from it, doubling “the student graduation productivity” (Kaufman, 2005, p. 284), increasing the number of enrolments and facilities exploitation. Therefore, a valuable outcome of the collaboration can be the establishment of live project frameworks, nurtured by professional insights, teaching and research material (Evans and Waterworth, 2004).

Beyond the evident advantages for academic community, there are significant motivations for industry to engage with academia. Industry can benefit from the identification of

students' skills, directly understanding their potential and needs (Roberts, 2007) and "reveal what they can offer" after graduation (Hakansson and Helmquist, 2010, p. 4). Meeting these human resources is also cost effective (Kaufman, 2005) and the industries involved in live projects can access to Universities' resources, facilitating knowledge transfer (Evans and Spruce, 2005) and technology transfer (Roberts, 2007). Industries then have the opportunity to meet the "refreshing and inspiring" (Watkins and Higginson, 2017, p. 84) approaches to problem-solving provided by students.

As Helyer (2011) states: "The HE experience should be a holistic one, embracing the widely varying contexts in which knowledge is produced, gained, built upon and used and this stretches beyond academia to encompass work, social and community uses, adding value to the many facets of its students' lives as they become talented and trained individuals." (Helyer, 2011, p. 103).

The collaboration between university and business is the concrete opportunity to increase the level of experience and education of students before graduation, meeting industry demand and creating synergies between research and practice.

#### **4. The Design Innovation Support Programmes at Brunel Design**

In the following section, Brunel Design support programmes are described with the purpose of highlighting the different ways in which design innovation activities take place in the collaborations between students, academics and industry. Each programme generates value and builds design capabilities in a specific way, which is outlined. The presented programme descriptions are supported by project case studies to facilitate the comprehension of the related design practice and activity.

As stated in the literature section, the collaborations between universities and businesses can have different dynamics and an important role is played by the type of activities and by the communication between students, academics and firms. Brunel Design manages different industry-facing collaboration programmes with the aim of fostering design innovation. The programmes involve different activities that fit with the needs of different stakeholders. Herewith, the programmes are described in their goals, activities and benefits.

##### ***4.1 Brunel Co-Innovate Journeys***

Brunel Co-Innovate Journeys is a design innovation support programme that Brunel Design runs since 2016, as a continuation of the previous similar programme called Co-Innovate (2012-2015). Both have been funded by European Regional Development Fund (ERDF), with the match funding provided by Brunel University London. Brunel Co-Innovate Journeys has recently received the funding extension to permit it to continue until March, 2023. As an outcome of Brexit, the funding responsibility may in the future be transferred from ERDF to the Greater London Authority (GLA).

The key aim of Brunel Co-Innovate Journeys is to provide design innovation support to Small and Medium Enterprises (SMEs) in the Greater London area. The programme links the businesses with Brunel Design students and academics, mediated by a team of 8 administration staff.

The SMEs participating in the programme are coordinated by the team's three Innovation Directors, who evaluate the collaboration opportunities, develop the collaboration briefs and then steer the collaborations towards the most appropriate interventions. The programme is aimed at generating value in terms of knowledge transfer and projects development. As such, there are three different kinds of collaboration activities available for the SMEs:

- Workshops, aimed at improving knowledge and skills about design and other relevant topics (e.g. intellectual property law) covering the areas of business and technology;
- Collaborative design projects with students under academic supervision, taking form of both the individual (major) projects and the group (coursework assignment) projects;
- R&D consultancy by academics, covering a range of design, business and technology aspects.

The programme supports SMEs in building their innovation capabilities, through workshops (Innovation Skills Workshops) and mentoring sessions (Knowledge Transfer Mentorships), facilitating access to academic and professional knowledge thanks to the involvement of both internal and external expertise.

From the experience of the Co-Innovate project, very specialised workshops and linked programmes are very successful in providing information and knowledge to the businesses. The programme also supports SMEs that want to develop a new product or improve an existing one. Brunel Co-Innovate Journeys Innovation Directors help them to develop a brief and propose it to academics and students, launching a collaborative project. SMEs' briefs introduced to academics and students can become a major project on a single innovation challenge for selected students, a dissertation topic, optional competition or a coursework assignment for several students.

Businesses collaborating with students benefit from academic thinking and new and fresh ideas from students. Students have the support of their supervisors and university's facilities while developing a product or a service related to real-world problems. There is also the opportunity to engage in collaborative projects with academics and researchers, which can be funded by Co-Innovate Vouchers, explained in more detail below.

Students benefit from delivering real-world related dissertation arguments, developing a project together with a firm, which contributes to their learning, and from university

facilities, workshops and academic tutors support. Companies can improve their product portfolio and receive valuable business insights and knowledge.

Co-Innovate projects create connections and collaborations between academic staff and SMEs, providing a formal intervention through Innovation Vouchers. Provided via Brunel's Research Support and Development Office (RSDO), the Innovation Vouchers permit the funding of up to £5,000 to the academic staff for the basic costs of a collaborative project.

#### *Case Study: Orange Amplification, A Group Project*

The collaborative project proposed by Orange Amplification, was administered as a design competition for MSc Integrated Product Design students. The company needed the development of design solutions for their on-ear/over-ear headphone products, famous for their distinct colouring and warm sound. The final product had to be in line with their heritage brand, with a target retail price of £100. Figure 1, presents the winning design.

Students were motivated by the competition as well as by the opportunity to design a product for an existing company, in line with the study developed by Hakansson and Helmquist (2010). Design processes and methodologies proposed by academics were applied, having the opportunity to test them in a real-world scenario, similar to Wrigley (2016), and the company gathered new fresh ideas in a reasonable amount of time, as in Watkins and Higginson (2017).



*Figure 1 Winning Project for Orange Amplification Competition by Alex Roquero Mendiola*

## **4.2 Bridging the Gap**

Bridging the Gap (BtG), as Co-Innovate Journeys, has been co-funded by ERDF/GLA and Brunel University London and managed by Innovation Directors. The project started in 2016 and it is available to registered London-based emerging start-ups, Brunel Design students in the final year of their BSc or at the MSc/MA level and SMEs and alumni with less than one year of activity. The participants have to demonstrate an innovative idea, be interested in developing it and, most of all, be motivated to enhance their capabilities in growing the business. The goal of this project is to support these businesses with an appropriate mixture of specialist mentoring, workshops and knowledge, with the aim of decreasing the gap

between good ideas and commercial businesses. The businesses involved in the programme are often recruited through networking events and the activities such as Made in Brunel (MiB), an annual design degree show exhibiting projects by undergraduate and postgraduate students.

BtG and Co-Innovate Journeys share the same method of engagement to increase the level of involvement of students and academics. However, unlike Brunel Co-Innovate Journeys, BtG is more focused on building capabilities by offering several activities to help early stage businesses. Online learning platform, skills training, mentoring, pitching and communication opportunities related to their needs are organised and performed. BtG workshops and lectures are delivered by members of Brunel academic and professional staff. They are called Innovation Trainings and focus on Capabilities, Concepts, Context, Commercialisation and Confidence. BtG outputs are tracked considering the development of a new product or service, job positions created, businesses supported and hours dedicated to each client.

Students have the opportunity to build hard and soft skills to improve their innovation capabilities and the training performed by academics has a direct impact on the early stage businesses participating in the programme. As in InnovationRCA (2019) and Startup@Berkeley (2019), Brunel alumni are supported through individual coaching to bring their design-led ideas to the market.

#### *Case Study: Cosicare*

Cosicare, a collaborative project developed by Lauren Bell via BtG is a toy turtle that combines engaging plays with itch management for children suffering Eczema. The toy offers a number of cooling and frictional elements that a child can use to cool the surface of their skin as an alternative to scratching. The wooden shell is covered in metal rotational balls that can be used to rub and massage the skin. There are foam arms to sit on when playing, with the additional two detachable starfish, also covered in cooling balls (Figure 2).



Figure 2 *Cosicare* by Lauren Bell



In Cosicare, design is a driver of innovation developing a product that meets user needs, solving Rittel's wicked problems (1973). The collaboration with Bridging the Gap trains designers to deal with business challenges and equips them with valuable skill to make their product successful in the market, promoting the business culture mentioned by Borja de Mozota (2003) and von Stamm (2004).

### *4.3 Design Plus*

Design Plus is a design innovation support programme that started in 2004, fully funded by Brunel University London. Unlike Co-Innovate and Bridging the Gap, which work with SMEs, Design Plus links Brunel students and staff with corporations (UK-wide and international), such as British Telecom and Phillips Electronics.

Partnering a final year student with a company for their major project significantly improves the overall outcomes of their work and therefore career prospects. Students work on a variety of real-life design challenges, supported and guided by their supervising tutor. This is an opportunity, not only to access a useful design resource, but also to add considerable value to the educational experience and career prospects and to support the next generation of innovators.

One of the main activities of Design Plus in the group assignment setting is the crowdsourcing of ideas. Students are involved in brainstorming sessions to generate new ideas and provide different insights and solutions to solve a problem in an original way. They also have the opportunity to deal with real-world problems, as described in the literature in Section 3, train their creativity skills and convert the theoretical knowledge into practice. Students are strongly motivated by the collaboration with companies and by the opportunity to add this kind of experience to their curriculum. Businesses get access to new ideas (Watkins and Higginson, 2017) and to human resources (Hakansson and Helmquist, 2010).

### *4.4 Impacting Business by Design - IBbD*

Impacting Business by Design (IBbD) has been funded by Research England, Connecting Capabilities Fund and involves Brunel University London, De Montfort University (Project Lead) and Nottingham Trent University. Having started in 2018, the project offers companies with innovative ideas across England to collaborate and receive support from the team of professional designers hired by the university partners and/or external design studios and freelancers. Usually, the candidates for the collaboration are experts in their field (e.g. physicians, educators) that have identified a business opportunity and need support developing it.

The proposed project ideas are evaluated by the university partners, considering the innovativeness, feasibility and the commercial challenge. The selected ideas are developed at the industrial level, to the point of being ready to be launched to the market. The support to the businesses is covered by a grant, the amount of which depends on the length of work required to develop the project. The projects are managed by the IBbD team, which – together with the client – decides on the activities, times, objectives and funds involved at

each project phase. A requirement for the businesses involved in the project is to demonstrate that they don't have internal design knowledge or capacity. This awareness and the recognition of design value is something that should be transferred through the direct involvement in product development.

### *Case Study: Airhead*

Airhead is a London-based start-up, which had the aim to create a superior pollution protection mask for commuters, cyclists and those breathing polluted air in urban environments. Brunel's IBbD design team helped Airhead to achieve their innovation goals by implementing a design innovation project structured by the four stages of the Double Diamond framework (Design Council, 2005).

A four-person design team using the framework worked with Airhead to systematically research customer and user needs, human factors, enabling technology alternatives and the target market environment into which to launch the new product. The project was underpinned by a clear spirit of collaboration. The Airhead team was involved in the project through all stages, providing critical commercial and strategic context. Brunel's IBbD team provided a pragmatic strategic product focus, creative design direction, prototyping (Figure 3) and technical resources based on the structured design approach of the Double Diamond framework. In doing so, a ready to manufacture product was created, but importantly, Airhead gained significant new insights into how a strategic design innovation process can help accelerate successful product design outcomes. In the Airhead project, design capabilities (Hobday et al. 2012) and professional skills (Walsh et al. 1993) delivered an innovative result and a successful Kickstarter campaign raising over £300,000.



*Figure 3 Airhead Pollution Mask Prototype*

## 5. Discussion

From the literature related to the role of design in innovation in Section 2, one can argue that design is able both to generate value and build capabilities. The value generated by design can be considered as financial and non-financial (Vijfeyken, Cools, Nauwelaerts, 2015), involving the generation of new ideas and the development of new products launched on the market. Capability building by design can be regarded as the acquisition of the abilities mentioned by Hobday et al. (2012), related to the acquisition of skills to deal with problems, find solutions and develop a mindset that stimulates creativity and empathy (Hernandez et al. 2018) by the use of processes and visualisation tools.

From the literature related to academia-industry collaboration in design innovation presented in Section 3, it is possible to systematise and highlight the benefits for the stakeholders involved in the Brunel Design support programmes. In the following table, the benefits for students, academia and industry are presented and clustered in the key categories according to the literature – for each of the programmes.

Table 1 Stakeholder Benefits from Brunel Design Support Programmes

Stakeholder	Benefits and References	Brunel Design Programmes			
		Co-Inno.	BtG	Design Plus	IBbD
Students	<b>Real-World Problems</b> Obtain access to real-world problems in design context (Hakansson & Holmquist, 2010; Wodehouse & Mendibil, 2013; Evans & Waterwoth, 2004).	Yes	Yes	Yes	N/A
	<b>Skills Development</b> Enhance students' learning and overall experience; Earn money; Test yourself; Understand own strengths and weaknesses; Improve critical thinking, team working, problem solving, project management, communication skills and initiative; Embody the role of both designer and client (Kaufman, 2005; Wodehouse & Mendibil, 2013; Bohemia et al., 2009).	Yes	Yes	Yes	N/A
	<b>Employability</b> Improve employability and job prospects; Link with business realities; Improve CV contents; Work placements; Practice and experience development (Watkins & Higginson, 2017; Evans and Spruce, 2005; Kaufman, 2005; Wodehouse & Mendibil, 2013; Belfield, 2012).	Yes	Yes	Yes	N/A
	<b>Apply University Studies in Real World</b> Merge theoretical knowledge with real-	Yes	Yes	Yes	N/A

	world practice; Apply design principles in business realities; Improve experience, corporate culture, design education and research (Wrigley, 2016; Renganathan et al., 2012).				
	<b>Motivation</b> Improve motivation and satisfaction; Appreciate working on real life projects (Hakansson & Helmquist, 2010).	Yes	Yes	Yes	N/A
Academia	<b>Bridging Research-Practice Gap</b> Retrieve relevant information from commercial world; Gain alternative perspectives and new research insights; Get access to real world problems in design context (Evans & Spruce, 2005; Hakansson & Holmquist, 2010; Wodehouse & Mendibil, 2013; Evans & Waterwoth, 2004).	Yes	No	Yes	Yes
	<b>Career Development</b> Career development; Create different job opportunities for staff (Evans & Spruce, 2005).	Yes	No	No	Yes
	<b>Honing Design Theories</b> Application of design principles in business realities; Improve experience, corporate culture and design education and research (Wrigley, 2016).	Yes	Yes	No	Yes
	<b>Education Enhancement</b> Tailor educational contents to industry practice; Live project frameworks establishment, nurtured by professional insights, teaching and research material (Tresseras, MacGregor & Espinach, 2005; Evans & Waterworth, 2004).	Yes	Yes	Yes	Yes
	<b>University Prestige</b> Enhance university prestige; Double students' graduation productivity; Increase the number of enrolments and facilities exploitation (Kaufman, 2005).	Yes	Yes	Yes	Yes
Business	<b>Human Resources</b> Identify students' skills, directly understanding potential and needs; Foresee the potential of students after graduation; Develop cost-effective Human Resources connections (Roberts, 2007; Hakansson & Helmquist, 2010; Kaufman, 2005).	Yes	No	Yes	No
	<b>Access to University Resources and Facilities</b>	Yes	No	No	Yes

---

Have access to university resources; Facilitate Knowledge Transfer and Technology Transfer (Evans & Spruce, 2005; Roberts, 2007).				
<b>Ideas Generation</b>	Yes	No	Yes	Yes
Industries have the opportunity to meet the “refreshing and inspiring” approaches to problem-solving provided by students and staff (Watkins & Higginson, 2017).				

---

### *5.1 Benefits to Students*

Student benefits are directly related to the development of design capabilities that can make a positive difference in their future job. Collaborative projects are opportunities to improve the quality of the student portfolios with design solutions that are based on real-world problems and developed in partnership with a company.

During the interaction with companies, students also develop problem-solving skills and merge theory acquired in class with design practice. Workplace skills are improved in these collaborations, enabling students to better manage work tasks, deadlines and communication.

Teaching and learning curriculum largely benefits from the collaborations as the students develop their understanding of the business of design, while the connections created with the company, in many cases, improve the employability prospects.

In BtG, the students in their final year or Brunel alumni can benefit from improving their knowledge in business management, commercialisation, growing business and pitching through a focused mentoring support and a facilitated access to start-up accelerator linked to Brunel.

### *5.2 Benefits to Academics*

The collaborations provide Brunel academics with valuable insights into the real world developments, thus filling gaps between research and practice and improving the understanding of business perspectives and personal motivations and goals.

Researchers benefit from external insights – coming from the business world, which improves the motivation to do research and adds to the relevance and novelty of the research focus. The insights include valuable information about users, trends, technologies and processes used by companies and how they deal with design and innovation.

When academics are involved in collaborative projects with companies, they have the opportunity to hone design methods and processes, increase their applicative skills and CV and exploit what they learnt from the experience in their research. They are financially covered in these collaborations and also motivated by the opportunity to differentiate their career and activities.

By supervising the evolution of the project and the implementation of theory into practice by students, they gain a better understanding of the skills demanded by the businesses. In this way, academics can improve the quality of their teaching content and overall student experience by aligning the focus on the job market requirements.

### *5.3 Benefits to Businesses*

The most tangible value generated for businesses is the development of new innovative products and ideas through the collaboration with students and academics. The programmes involving collaborative projects give businesses the opportunity to discover alternative ways to deal with problems, receive different design solutions and increase their portfolio of products. They have access to students motivated by the collaboration with a business and to different design methods and processes applied in academic context. The projects can be delivered at different levels, in the form of challenging crowdsourced fresh ideas and concepts or to a more advanced stage of development. Where the support needed is more technical, they have the opportunity to engage with academic staff, having access to their knowledge and expertise.

Workshops, mentoring and knowledge transfer activities managed by the programmes provide businesses with a clear opportunity to improve their capabilities in different fields. Moreover, businesses have a priority access to the student talent and thus a temporal advantage in terms of recruitment. During the project work, students acquire the knowledge and experience from the collaboration and become aware of the company's culture, business focus and background, which reduces the need for training in case of hiring.

### *5.4 Brunel Support Programmes Ecosystem*

Generating value and building capabilities in design innovation are the main objectives of design innovation support programmes by Brunel Design. The availability of the programmes that share the same academic context, but support different goals for different stakeholders provides an opportunity to address the most suitable support to the specific needs of a business through a valuable mediation of Brunel Design staff. The programmes are interrelated and activities are fully integrated into Brunel fabric, without redundant overlaps.

In this collaborative context, academia has the role to intercede between parties, acting as a mediator (e.g. Innovation Directors for student-academic-business projects, mentoring and workshops or academic staff for student supervision) to help students in major projects and coursework assignments. The process of knowledge transfer happens reciprocally: students give fresh ideas and design solutions, while businesses and academics provide their knowledge, insights and experience. These goals are reached through strong connections between stakeholders, encouraged by a positive attitude towards innovation through design. A crucial role is played by the programmes staff, which carry collaborations by guiding businesses and students through the support process and managing communication

between stakeholders in all stages. The results of these interactions are the increased awareness by the stakeholders of the importance of design innovation and how their knowledge and experience can be enhanced by collaboration.

## **6. Conclusions and Future Research**

This paper presents Brunel Design support programmes that involve students, academics and industry under the domain of design innovation. The literature is still not fully clear in defining the role of design in innovation and this discourse needs further considerations. The literature related to academia-industry collaboration in design is also not completely systemised, but it is possible to identify relevant scholars' experiences, insights and dynamics for collaboration activities.

Brunel Design support programmes attempt to foster the activities that can instigate the generation of value and capability building, supported by synergic connections that are advantageous for all stakeholders involved, thus directly fulfilling the role of design as a driver of innovation within the UK economy. To integrate the benefits just highlighted, future studies should be carried out to identify the barriers to collaboration and how to tackle them and devise evidence-based practice related to collaborations among such variety of stakeholders.

Qualitative and quantitative studies related to the impact of such collaborations under the design innovation domain in the short- and long-term should be conducted to help improve the quality of future support programmes. The correlations between the activity participation and stakeholders' performance should also be identified, since they can be monitored within the same academic context. Beyond the short-term impact generated by the collaborations – NPD, acquisition of knowledge, projects and dissertations – the additional impacts should be analysed in the long run in term of business growth, post-graduate employability and research relevance.

## **7. References**

- Belfield, H. (2012). *Making Industry–University Partnerships Work: Lessons from Successful Collaborations*. Brussels, Belgium: Science/Business Innovation Board AISBL.  
<https://tinyurl.com/qr98lut>
- Blumenthal, D. (2003). Academic–industrial relationships in the life sciences. *New England Journal of Medicine*, 349, 2452-2459. doi:10.1056/NEJMhpr035460
- Bohemia, E., Smith, N., Harman, K., Duncan, T., Turnock, C. & Hwang, S.G. (2009). Distributed collaboration between industry and university partners in HE. *Proceedings of Rigour and Relevance in Design: The International Association of Societies of Design Research 2009 Conference*, 18-22 October 2009, Seoul, Korea, 235-244.
- Borja de Mozota, B. (2002). Design and competitive edge: A model for design management excellence in European SMEs. *Academic Review. Design Management Journal*, 2(1), 88-103. doi:10.1111/j.1948-7177.2002.tb00014.x

- Brown, T. (2008). Design thinking. *Harvard Business Review*, 86(6), 84-92.
- Carlgren, L., Elmquist, M. & Rauth, I. (2014). Design thinking: Exploring values and effects from an innovation capability perspective. *The Design Journal*, 17(3), 403-423.  
doi:10.2752/175630614X13982745783000
- Cooper, R., Hernandez, R., Murphy, E. & Tether, B. (2017). *Design Value: The Role of Design in Innovation*, Final report. Lancaster University: Lancaster, UK. doi: 10.13140/RG.2.2.28595.43046
- Cruickshank, L. (2010). The innovation dimension: Designing in a broader context. *Design Issues*, 26(2), 17-26. doi: 10.1162/DESI\_a\_00002
- Design Council (2005). *Eleven Lessons: Managing Design in Eleven Global Brands: A Study of the Design Process*. <https://tinyurl.com/rj59wo2>
- Design Council (2008). *The Designing Demand Review*. <https://tinyurl.com/us3roqc>.
- Design Council (2011). *Design for Innovation*. <https://tinyurl.com/t4yh8xr>
- Design Council (2012). *Design Delivers for Business*. <https://tinyurl.com/sayn7nq>
- Design Council (2018). *The Design Economy 2018*. <https://tinyurl.com/ybnep4f5>
- Evans, M. & Spruce, J. (2005). Knowledge networks: Collaboration between industry and academic in design. *Proceedings of the 3<sup>rd</sup> Engineering & Product Design Education International Conference, Crossing Design Boundaries*, 15-16 September 2005, Napier University, Edinburgh, Scotland.  
<https://tinyurl.com/ub4zfpf>
- Evans, M. & Waterworth, S. (2004). Industrial collaboration and its importance to ensuring currency in design education. *Proceedings of E&PDE 2004 (DS 33): The 7<sup>th</sup> International Conference on Engineering and Product Design Education, The Changing Face of Design Education*, 02-03 September 2004, Delft University of Technology, Delft, The Netherlands.  
<https://tinyurl.com/y7cyp3nk>
- Fagerberg, J. (2004). Innovation: A guide to the literature. In J. Fagerberg and D. C. Mowery (eds.), *The Oxford Handbook of Innovation*. Oxford, UK: Oxford University Press, 1-26.
- Freeman, C. (1982). *The Economics of Industrial Innovation* (2<sup>nd</sup> ed.). London, UK: Frances Pinter.
- Galindo-Rueda, F. & Millot, V. (2015). *Measuring Design and Its Role in Innovation*. OECD Science, Technology and Industry Working Papers, No. 2015/01. Paris, France: OECD Publishing.  
doi:10.1787/5js7p6lj6zq6-en
- Håkansson, A. & Holmqvist, B. (2010). University–industry cooperation and student driven projects: A model for educating design engineers. *Proceedings of E&PDE 2010 (DS 62): The 12<sup>th</sup> International Conference on Engineering and Product Design Education, When Design Education and Design Research Meet...*, 02-03 September 2009, Trondheim, Norway. <https://tinyurl.com/wq5qphj>
- Hernandez, R.J., Cooper, R., Tether, B. & Murphy, E. (2017). The value of design in innovation: Results from a survey within the UK industry. *The Design Journal*, 20(sup1), S691-S704. doi: 10.1080/14606925.2017.1353015.
- Hernández, R.J., Cooper, R., Tether, B. & Murphy, E. (2018). Design, the language of innovation: A review of the design studies literature. *She Ji: The Journal of Design, Economics and Innovation*, 4(3), 249-274. doi: 10.1016/j.sheji.2018.06.001.
- Helyer, R. (2011). Aligning higher education with the world of work. *Higher Education, Skills and Work-based Learning*, 1(2), 95-105. doi:10.1108/20423891111128872
- Hobday M., Boddington, A. & Grantham A. (2012). An innovation perspective on design: Part 2. *Design Issues*, 28(1), 18-29. doi:10.1162/DESI\_a\_00137
- International Council of Societies of Industrial Design (ICSID) (2008). *Official Definition of Design*. <https://tinyurl.com/yx4y875s>



- Innovate UK (2015). *Design in Innovation Strategy 2015-2019*. <https://tinyurl.com/yxy7oeta>
- InnovationRCA (2020). *Our Programmes*. <https://tinyurl.com/y8orq9v3>
- Kaufman, J. (2005). Professional internships and cooperative product design education. *Proceedings of the 3<sup>rd</sup> Engineering & Product Design Education International Conference, Crossing Design Boundaries*, 15-16 September 2005, Napier University, Edinburgh, Scotland.
- Lambert, R. (2003). *Lambert Review of Business–University Collaboration*, Final Report. <https://tinyurl.com/vd79hkl>
- Maldonado, T. (1969). *Industrial Design Definition History*. ICSID/WDO. <https://tinyurl.com/szdmfz4>
- Mutlu, B. & Er, A. (2003). Design innovation: Historical and theoretical perspectives on product innovation by design. *Proceedings of the 5<sup>th</sup> European Academy of Design Conference*, 28-30 April 2003, Barcelona, Spain. <https://tinyurl.com/vnanza3>
- National Endowment for Science, Technology and the Arts (NESTA) (2009). *The Innovation Index: Measuring the UK's Investment in Innovation and Its Effects*. London, UK: NESTA. <https://tinyurl.com/wetsmdc>
- Newberg, J.A. & Dunn, R.L. (2001). Keeping secrets in the campus lab: Law, values and rules of engagement for industry–university R&D partnerships. *American Business Law Journal*, 39(1), 187. doi:10.1111/j.1744-1714.2002.tb00298.x
- Nomen, E. & Barcelona Design Centre (2014). *€Design: Measuring Design Value*. <https://tinyurl.com/ruxs2o7>
- Norman, E.W.L. (2012). *Curriculum Convergence and Divergence in "Industrial Design" and "Technology" Programmes in Higher Education*. Orange Series: Design Curriculum Matters 3. Loughborough: Loughborough University. <https://tinyurl.com/sd3bwzd>
- Oakley, M. (1990). *Design Management: A Handbook of Issues and Methods*. Oxford, UK: Blackwell.
- Rampino, L. (2011). The innovation pyramid: A categorization of the innovation phenomenon in the Product–Design Field. *International Journal of Design*, 5(1), 3-16. <https://tinyurl.com/stegy5p>
- Renganathan, S., Karim, Z.A.B.A. & Li, C.S. (2012). Students' perception of industrial internship programme. *Education+Training*, 54(2-3), 180-191. doi:10.1108/00400911211210288
- Rittel, H.W. & Webber, M.M. (1973). Dilemmas in general theory of planning. *Policy Sciences*, 4(2), 155-169. doi: /10.1007/BF01405730.
- Roberts, J. (2007). The future of academic–industry collaboration. *Proceedings of IASDR07: International Association of Societies of Design Research*, 12-15 November 2007, Hong Kong Polytechnic University, Hong Kong, China. <https://tinyurl.com/tpmbjtf>
- Skelly, M. & Bruce, F. (2017). Designing collaborations at the intersection of academia and industry. *Proceedings of E&PDE 2017 (DS 88): The 19<sup>th</sup> International Conference on Engineering and Product Design Education, Building Community: Design Education for a Sustainable Future*, 07-08 September 2017, Oslo, Norway. <https://tinyurl.com/rlounk5>
- Startup@Berkeley (2019). *Learn. Build. Fund. We Connect Student Entrepreneurs with UC Berkeley's Startup Ecosystem*. <https://startup.berkeley.edu/>
- Tresserras, J., MacGregor, S. & Espinach, X. (2005). SME collaboration as a driver of design research and education development. *Proceedings of the 3<sup>rd</sup> Engineering & Product Design Education International Conference, Crossing Design Boundaries*, 15-16 September 2005, Napier University, Edinburgh, Scotland.
- Verganti, R. (2009). *Design Driven Innovation: Changing the Rules of Competition by Radically Innovating What Things Mean*. Brighton, MA, USA: Harvard Business Review Press.

- Verganti, R. (2006). Innovating through design. *Harvard Business Review*, 84, 114-122.  
<https://tinyurl.com/vhg6ub7>
- Vijfeyken, E., Cools, M. & Nauwelaerts, Y. (2015). Measuring the value created by design: A qualitative study generating a comprehensive overview. *Journal of Creativity and Business Innovation*, 1, 129-159. <https://tinyurl.com/su8m8nv>
- von Stamm, B. (2004). Innovation—What's design got to do with It?. *Design Management Review*, 15(1), 10-19. doi:10.1111/j.1948-7169.2004.tb00145.x
- Walsh, V., Roy, R., Bruce, M. & Potter, S. (1993). Perspectives on design and innovation. *Creativity and Innovation Management*, 2(2), 78-86. doi:10.1111/j.1467-8691.1993.tb00076.x
- Wilson, T., (2012). Business-university collaboration: The Wilson review. Independent Review. <https://tinyurl.com/vo32y3m>
- Wodehouse, A.J. & Mendibil, K. (2013). Collaboration mechanisms for university–industry projects. *Proceedings of E&PDE 2013 (DS 76): The 15<sup>th</sup> International Conference on Engineering and Product Design Education, Design Education – Growing Our Future*, 05-06 September 2013, Dublin, Ireland. <https://tinyurl.com/rjy6ule>
- Wrigley, C. (2016). Design innovation catalysts: Education and impact. *She Ji: The Journal of Design, Economics and Innovation*, 2(2), 148-165. doi:10.1016/j.sheji.2016.10.001

#### About the Authors:

**Giulia Cosco** is Research Fellow on the Impacting Business by Design project, funded by Research England. Her current research interests include Design Innovation and Design Methodologies. Previously, she worked as a researcher in the area of Biomechanical Design and Additive Manufacturing.

**Vanja Garaj** is Head of Brunel Design and Principal Investigator for Impacting Business by Design at Brunel. His research is aimed at design, development and evaluation of innovative systems, products and services—with the focus on digital and digital↔physical domains and the application of the latest technology.