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EVALUATING INTERDISCIPLINARY COLLABORATION — TOWARDS A METHODOLOGY

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ABSTRACT
'… the [collaboration] process itself can be unstable and troublesome' [1] How can design courses approach interdisciplinary collaboration effectively? This paper extracts a few key insights from Mark Dodgson's article on 'Collaboration and Innovation Management' [2] which focuses mainly on collaboration in a commercial setting. The paper proposed here identifies empirically the similarities and differences between academic and industrial collaboration through comparing results-driven and process-oriented approaches. This will be supported through a comparative study of two interdisciplinary student collaboration initiatives in the field of design management. The first example, the *Entrepreneurs Challenge*, which was staged for several consecutive years at the University of Hertfordshire in the UK, will be compared to the teaching of *Design Business and Innovation*, a curriculum component that has been introduced at LASALLE College of the Arts in Singapore in 2016. Through comparing these two undergraduate teaching and learning initiatives the paper will assess the effectiveness of interdisciplinary collaboration in relation to the teaching of design-business-related skills.
The discussion will concentrate on the following key questions:
1. How do design institutions approach interdisciplinary collaboration?
2. To what extent can quantitative assessment processes be deployed for the evaluation of the effectiveness of interdisciplinary initiatives in design education?
3. Can insights and concepts in the area of design thinking and open innovation help to foster a methodical approach to managing interdisciplinary collaboration in an academic context?

A list of insights will conclude the paper.

Keywords: Interdisciplinary collaboration, design management, innovation.

1 INTRODUCTION

This paper discusses what we can learn from innovation management and from open innovation principles in order to enhance the effectiveness of interdisciplinary collaboration in design education. The premise is that design teaching and learning constitutes a process, and that this process may be in need of innovating, if we seek to teach design students to think beyond individual design disciplines. Marc Dodgson argues that 'Collaboration is the *sine qua non* of [absolutely essential for] innovation management because innovation invariably involves many and diverse contributors' [3]. This paper examines this link between innovation and collaboration in pursuit of insights which may improve teaching and learning strategies in the area of interdisciplinary collaboration.
This paper refers to interdisciplinary as opposed to multidisciplinary practice. Julie Thompson Klein explains the differences between both forms of collaboration through characterising multidisciplinary practice as a form of juxtaposing, sequencing and coordinating knowledge, whilst interdisciplinarity is understood as a form of integrating, linking and blending knowledge [4]. If teaching contents are fundamentally new, existing paradigms of thinking cannot prevail amongst participants. In order to successfully tackle challenges, participants are required to build new knowledge through the integration of ideas, as opposed to simply contributing to design solutions from the perspective of specific disciplinary angles. This is why the two examples discussed later are best categorised as interdisciplinary practices. That said, it is likely that the principles that are examined in this paper apply to the management of different forms of collaboration, multidisciplinary and transdisciplinary collaboration included.

2 INTERDISCIPLINARY COLLABORATION AND OPEN INNOVATION

Henry Chesborough coined the term 'Open Innovation', and described it as 'a paradigm that assumes that firms can and should use external ideas as well as internal ideas […]' [5]. He describes open innovation as a 'business model [that] utilizes both external and internal ideas to create value […]' [6]. With reference to an older paper which he co-authored with Rosenbloom, Chesborough also states that 'In Open Innovation, the business model is the cognitive device that focuses the evaluation of R&D projects within the firm' [7]. In this study we need to relax the terminological accuracy in order to recontextualise insights gained in the area of innovation. Instead of business models, we refer to educational teaching models and frameworks. If we neglect the term business in this way, we may speculate that open innovation may provide us with suitable means to pursue interdisciplinary collaboration methodically.

The shift towards open innovation is one that involves certain risks. Chesborough warns that 'In the Open Innovation model […] it is less clear that there will be a return to the firm's investment' [8]. This means that the benefits of initiatives are not perfectly clear at the outset. As much as firms may worry about the possible lack of returns on investment, design courses may see their curricula compromised if interdisciplinary design teaching fails to produce the expected *dividends*. Some institutions will, of course, have encountered interdisciplinary practice in some shape or form. But the range of known and unknown factors that impact on the effectiveness on relevant processes is considerable. Opening courses up towards the interdisciplinary sharing of teaching and learning methods, much resembles the knowledge sharing in open innovation practice.

We need to ask ourselves which open innovation principles should be adopted for the enhancement of interdisciplinary design education, what can we draw from these principles, and how do we best apply them? Gasmann et al. suggest that '… the journey from closed to open innovation involves four main dimensions of the firm's organization, i.e. inter-organizational networks, organizational structures, evaluation processes and knowledge management systems, along which change can be managed and stimulated' [9] If design education were to adopt the open innovation model to innovate their processes, it is imperative that these four dimensions are taken into consideration.

This paper will present a comparative study of two interdisciplinary learning and teaching initiatives, one from the University of Hertfordshire in UK and one from LASALLE College of the Arts in Singapore. These two case studies will be examined in the light of Gasmann et al.'s four dimensions in order to establish how we can draw from insights in innovation studies in order to enhance the management of interdisciplinary teaching and learning, and to introduce novel curriculum contents.

3 INTERDISCIPLINARY IN DESIGN EDUCATION

3.1 Case study 1

The *Entrepreneurs Challenge* was an interdisciplinary collaborative initiative that was run at the University of Hertfordshire (UH). It began in 2010 as a one-week intensive engagement and it came to an end in 2013. Students worked in interdisciplinary groups of eight. During one year, these UH-based groups were asked to collaborate in groups of eight at a partner institution in South Africa. Then the team sizes doubled. During its final year, the initiative was run across a whole semester in parallel to subject-specific modules with only a small number of staff involved.

3.2 Case study 2

At LASALLE College of the Arts, the *Design Business and Innovation* initiative was one of several *clusters* which the students could choose from. Here students worked in interdisciplinary teams of four. The cluster initiative which was launched in 2016, is part of a greater agenda to introduce interdisciplinarity and to reframe design teaching and learning in a cross-disciplinary way.

3.3 Similarities and Differences between both Case Studies

What the two initiatives had in common was the range of courses involved. Students at both institutions were studying one of the following: fashion design, graphic design, interior design or product design. At UH there was an additional course entitled as Applied Arts. What was also very similar was the degree to which different teaching and learning cultures had been established within those different courses. Both institutions deployed teams of lecturers from the disciplines mentioned,

and depending on the discipline, the lecturers were accustomed to different approaches to design teaching and learning.
The difference in the working morale amongst students was greater at UH by comparison to LASALLE. But students of both institutions had prior experience in team working, though perhaps not in the context of multi- or interdisciplinary team work. The educational level of students was similar: The students at UH were in their second semester of their second year, whereas the students at LASALLE were in the first semester of their third year. The cultural backgrounds of students varied on both sides. Whilst the students at LASALLE stemmed predominantly from various countries in South East Asia, the students at UH were mostly of European or Middle-Eastern background. Mentality differences did not seem to affect the effectiveness of the initiatives. Most noticeable were the differences in teaching the working cultures of both staff and students from different courses at either of the two institutions. It appears that the alignment of methodologies is most significant in relation to the effectiveness of inter- and multidisciplinary team work.
With respect to methodologies the following could be noted: At UH, students were provided with prescriptive workbooks that contained tasks for them to complete. Lecturers provided only advisory support. At LASALLE, where a range of *clusters* were offered for the students to choose from, teams of lecturers structured lesson plans in accordance to the different cluster groups, and they did so almost 'on the fly'. Whilst all UH students UH students had to commit to the *Entrepreneur Challenge*, students at LASALLE could sign up for their preferred clusters, with *Design Business and Innovation* being one of seven options. Even the lecturers could choose which cluster to teach. The student collaboration groups at UH were significantly larger than at LASALLE where only 4 students formed a group, as opposed to UH where 8 students collaborated (16 in the final year). At UH students were assigned to groups. At LASALLE students could form their groups following an ice breaker session.
The learning programme at UH was pre-structured and results-oriented, in part due to the fact that activities were all organized around the handbook contents. With LASALLE's *Design Business and Innovation* initiative, the work flow was unstructured and open. Students were provided the submissions requirements mid-way through the initiative. The LASALLE teaching teams, who diligently monitored student attendance as opposed to UH where no attendance measure was in place, used action learning in order to constantly adjust their teaching methodology. The approach deployed at UH was more of a laissez-faire nature. Students could obtain feedback if they wanted, but did not have to.

3.4 What worked and what did not

Which of the two initiatives was more successful? As obvious as this question may seem, it is flawed. It cannot be answered without identifying specific criteria for what constitutes success, and this was clarified at neither institution. What can be said is that UH deployed what we may refer to as a closed model that allowed limited adjustments during the course of the teaching and learning activity, whilst LASALLE applied an open approach. The latter made the learning process difficult to predict, but easy to adjust. LASALLE's approach was more process-oriented, UH's results-driven. LASALLE's approach nourished an open mind amongst staff who saw the open approach as an opportunity to pro-actively shape the learning experience through engaging in the management of teaching and learning activities and through the continued production of learning materials. Action learning could be deployed here to enhance the learning experience for the benefit of the students.
If we define one approach as open and the other one as closed, then we can deduct the following characteristics from the above comparison:

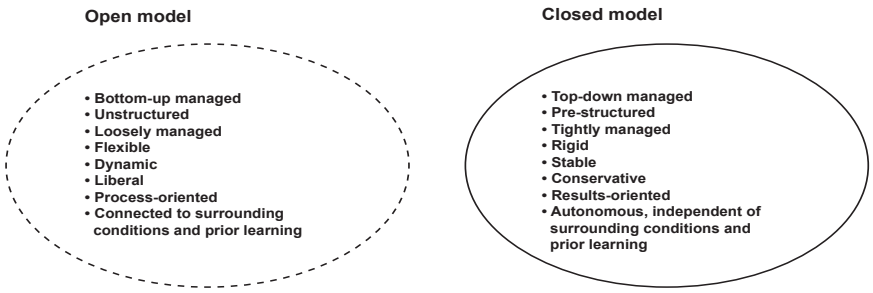

Figure 1.

Figure 1 outlines the characteristics of the open and closed management models for the teaching of interdisciplinary design initiatives. One could argue that the closed model is more resource-efficient, whereas the closed model is more effective with respect to the teaching and learning of methods and processes.

4 WHAT INTERDISCIPLINARY DESIGN TEACHING CAN LEARN FROM INSIGHTS IN THE FIELD OF OPEN INNOVATION

As mentioned earlier, the two interdisciplinary initiatives will be reviewed against the four dimensions of open innovation as proposed by Gasmann et al., i.e. inter-organizational networks, organizational structures, evaluation processes and knowledge management systems [10]. In both institutions, we already have organizational structures, which are usually mapped through projects, modules, courses, schools and/or faculties. We also have inter-organisational networks, although these tend to be mostly informal. In the case of LASALLE the staff-allocation to individual design clusters could be perceived as such an inter-organizational network. Even UH's top-down-managed staff teams can be seen as inter-organisational networks

What is lacking are adequate evaluation processes and knowledge management systems. Results-driven evaluation processes that focus on the project outcomes are insufficient to measure the effectiveness of the teaching process. Rather than assessing the student work, one would want to directly assess the effectiveness of the teaching and learning processes involved, and ideally one would want to do so through progress monitoring and, importantly, whilst the teaching and learning processes are ongoing. What is often neglected with respect to the teaching and learning processes, is the way in which staff from different disciplines connect with each other. Both LASALLE and UH have deployed some means to assess how students perceived the interdisciplinary learning. However, with the exception of some informal conversations, neither institution paid much attention to the effectiveness of the collaboration within the interdisciplinary staff teams involved.

This leads to the second dimension that is commonly lacking: Knowledge management systems are usually limited to internal file-sharing platforms and ad-hoc meetings. Such systems, which are shaped through traditional design teaching and learning, may be inadequate for the management of interdisciplinary design education. It can also be argued that said systems functioned more accurately as information management (IM) Systems, rather than knowledge management (KM) Systems. Terra and Angeloni state that '[…] IM has not taken into account how people learn, create, validate, codify, share knowledge and make decisions. Its focus has been on the manipulation of data and information [whereas] KM projects has less to do with technical achievements and more to do with changes in behavior or actions derived from connections or learning opportunities that the projects facilitated' [11]. Knowledge that arises in relation to novel forms of practice, is dynamic and in need of regular, if not to say constant monitoring. Monitoring activities should not be limited to the students working efforts, but also cover the actions of teaching teams. Where sets of lesson plans are altered for instance, one would not want to examine only the final version. Most telling with respect to KM are the changes that have to be made over time, since these adjustments may highlight trends and allow for the prediction of future needs in the management of what one would consider an evolving curriculum. So there needs to be some form of capturing of the strategic adjustments in the management of teaching and learning activities, and there should be systematic processes of analysis of these adjustments.

5 MANAGING INTERDISCIPLINARY DESIGN EDUCATION AS A STRATEGIC EXPERIMENT

Govindarajan and Trimble present the '[…] strategic experiment [as] a risky new venture within an established corporation' [12]. If we consider an academic institution to be the *established corporation* here, then we can identify the introduction of novel interdisciplinary design teaching and learning as *a risky new venture*. Some might argue that this is not at all the case, and that interdisciplinary design teaching and learning is easy to come by. As long as the process is not examined rigorously and thoroughly, one can always claim for an interdisciplinary initiative to be successful. But if one does, successes and pitfalls may become evident.

Govindarajan and Trimble argue that 'Planning systems for strategic experiments […] should be designed to *explore future strategies* by supporting *learning*, given the unpleasant reality of *reliable*

unpredictability.' [13]. Of course the authors are discussing entrepreneurial activities in a commercial corporate context, and the application of the argument to design teaching and learning can be questioned. However, teaching and learning of interdisciplinary design does constitute a paradigm shift for most design institutions. It does so in particular if it is connected to the introduction of new curriculum contents such as design innovation. This was the case for both UH and LASALLE where interdisciplinary collaboration amongst both students and staff was combined with new learning contents, which is that of design business and innovation. Due to the number of variables involved, the level of unpredictability is high. UH chose to use a closed teaching and learning strategy, LASALLE an open approach. LASALLE's approach embraces unpredictability. But how is the latter best managed?

Whilst LASALLE apply an open approach, their practice does not fall in line with a strategic experiment, since 'Despite reliable unpredictability, predictions must be made.' [14]. Govindarajan and Trimble recommend to focus on 'a small number of critical unknowns', and 'Instead of making specific numerical predictions' they suggest to predict trends [15]. Moreover, these predictions will need to be acknowledged, shared and agreed across the teaching team as stated by Bodislav that '[…] leaders of strategic experiments must do more than just predict, they must share with their colleagues and hold them connected until the forecasted results are shaped' [16].

In conjunction with strategic experiments Govindarajan and Trimble refer to theory-focused planning. They argue that 'Theory-focused planning is appropriate when more is unknown than is known — when an industry is just emerging, no business model is established, and the uncertainties are so large that not even the basic nature of the relationships between activities and outcomes is clear.' [17]. This means that the experiment is strategic when 'Learning follows from the diligent analysis of disparities between predictions and outcomes, with specific attention to the *stories, models* or *theories* upon which the predictions are based […] lead[ing] to improved theories and improved predictions — proof that learning is happening' [18]. Whether or not the principles which Govindarajan and Trimble discuss in relation to entrepreneurship, can be applied to academic curriculum management remains questionable. Introducing fundamentally new subjects, and teaching those in fundamentally new ways, e.g. in an interdisciplinary fashion, produces a large number of unknowns. In design education these unknowns are commonly not recognized or managed strategically. No clear hypotheses are agreed and mapped against the teaching and learning experience as the latter unfolds. This was the case with LASALLE where clarity was pursued through a long process of trial and error which was judged intuitively and inter-subjectively by those involved. If satisfaction is not achieved over prolonged periods of time, initiatives are simply discontinued as in the example of UH. What institutions should do instead, is to identify critical unknowns in relation to novel teaching and learning strategies, and find reliable measures to assess what works and what does not.

6 CONCLUSION

Dodgson states that '… the [collaboration] process itself can be unstable and troublesome' [19]. The unsystematic way in which academic institutions often approach interdisciplinary collaboration seems surprising given the high risk of failure involved. This paper has deducted insights from open innovation studies, and hypothetically applied those on to an academic context. Mapping two different interdisciplinary learning and teaching initiatives against Gasmann et al.'s four dimensions of open innovation led to the following insights:

- The verification of the effectiveness of interdisciplinary learning and teaching initiatives focuses usually on the student experience only, and not on the performance of lecturers involved.
- The evaluation of initiatives is commonly based on generic questions. The lack of strategic quantitative data makes it difficult to draw reliable conclusions which would help improve the organisation of subsequent interdisciplinary learning and teaching initiatives.
- The introduction and iteration of interdisciplinary teaching and learning initiatives may be best approached as a strategic experiment. A small number of critical unknowns should be identified and agreed within the teaching team.
- The analysis of interdisciplinary teaching and learning initiatives should revisit the outcomes against predictions made, to identify key strategic areas of improvements. Knowledge management methodologies using monitoring protocols can guide such discussions and in turn, help mitigate the risk of experiments to fail.

Despite its relatively unusual characteristics, interdisciplinary design teaching is mostly managed in conventional ways. For more effective implementation of interdisciplinary initiatives, it seems recommendable to adopt methodologies that have been tried and tested in the industry. Their implementation requires initially extra effort on behalf of the curriculum managers and the teaching staff. But it is likely to help to avoid, or at least mitigate, teething problems in pursuit of interdisciplinary teaching and learning initiatives. Seidel and Fixson warns that, 'it would be unfortunate if a design thinking [or interdisciplinary] approach was discarded prematurely by individual teams or entire organizations due to its frustration in implementation' [20]. This was the case at UH, where the initiatives were discontinued due to unsatisfactory results.

Design institutions would be best advised to learn from the modus operandi of industries, since learning through trial and error is not only time-consuming, it can also be costly. One could argue that the adoption of external industry practices by design education is precisely how Chesborough defines Open Innovation: a 'model [that] utilizes both external and internal ideas to create value' [21]. A more proficient, i.e. methodical approach to interdisciplinary collaboration will not only enhance internal processes and reduce the risk of new initiatives to fail, it will also make it easier to pursue interdisciplinary initiatives in collaboration with industries and across multiple academic institutions.

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