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"I've become a cross-disciplinary interpreter";

Experiences of open learning within a multidisciplinary collaborative design context.

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ABSTRACT

Open working practices are increasingly encouraged across the domains of design, business and academia, with concerted efforts made to enable contextual learning and facilitate knowledge exchange between multi-disciplinary partners. Despite the understanding and acceptance of this way working, challenges to collaborative practice exist widely.

This paper aims to explore experiences of learning within a multi-disciplinary collaborative design context. In the same way that Chesbrough (2006) considers open innovation as 'the use of purposive inflows and outflows of knowledge to accelerate internal innovation', this paper asks how 'open learning' within a multidisciplinary collaborative design context can make use of those same flows of knowledge in order to realise value for those participants engaged.

Contextualised within a series of multidisciplinary design-led events in Scotland, emerging themes of learning are identified from across business, academia and design participants. Deconstructing the pedagogical themes, this paper questions how design can enable wider participatory education practices, with the aim of informing the knowledge and understanding of learning within a multidisciplinary design space.

Keywords:

Learning, Multidisciplinary, Design

INTRODUCTION

Open ways of working, including knowledge exchange and collaborative endeavors are increasingly encouraged across the across disciplinary practices towards increased innovation and sustainable development. Despite the understanding and wide acceptance of this way working, challenges to the practice of such collaboration exist widely. The translation of ideological paradigms and the sharing of practices inherent within each discipline can be challenging, hindering the creation of new knowledge (Hepburn, 2016).

As discipline practitioners, and as people, we are increasingly called upon to collaborate with others. This might be people familiar to us, those with whom we have a working relationship developed over time. However this is not always the case. We might also need to work with people whose working practices are in conflict with our own, whose lived experiences are far removed from our own and whose values are at odds with our own. Such collaboration outside our usual boundaries can be understood as 'open', enabling wider participation and juxtaposed to the traditional 'closed' practices of internal working.

Chesbrough (2006) considers open innovation as 'the use of purposive inflows and outflows of knowledge to accelerate internal innovation'. In this way, organization's that engage in an open way gain value in the contributions from external resources, including knowledge, processes and experiences; the 'inflows'. The ability to collate and leverage these connections can enable an enhanced distribution of knowledge towards developing improved working practices and creating new business opportunities; the 'outflows'.

The concept of collaboration can be linked to contextual learning and within organizational learning the benefits of knowledge transfer and knowledge exchange have been identified. Piller and Walcher (2006) recognize knowledge as a source of competitive advantage while Brown and Morrad (2013) support the view that SME networking activities are critical to the acquiring of this new knowledge. Collaboration is inherent within the design discipline where it is recognized that the design process is a creative social process involving teamwork, in which each individual contributes shared experience to the common goal of designing a product (Bucciarelli, 1994; Sanders and Stappers, 2008; Koskinen *et al*., 2011) while Cross (2007) states that design knowledge resides in people, processes and products.

Building on the role of the social, interaction between participants is recognized as a critical element, whereby those engaged shape and transform both themselves and the environments within which they work (Lee-Kelley *et al.,* 2004). Similarly Du Plessis (2008) and Nonaka *et al*., (2000) refer to the capture of knowledge on collaborative platforms, arguing that the success of knowledge capture in this context can be attributed to the fact that knowledge transfer is a social activity.

Frequently, collaboration is based around a specific challenge and aims to work towards a common goal or shared solution. The value of that collaboration is most commonly realized in that final outcome or emergent solution. While this is often used as a measurement for the success of a collaborative activity, little reference is made to the learning that takes place during the collaboration.

With this in mind, this paper explores experience of learning within a multi-disciplinary collaborative design context. Exploring Chesbrough's notion, this paper asks how 'open learning' within a multidisciplinary collaborative design context can make use of those same flows of knowledge in order to realize value for those participants engaged. Contextualised within a series of multidisciplinary design-led events in Scotland, four emerging themes of learning are identified. Deconstructing the emerging pedagogical themes, this paper asks how design can enable wider participatory education practices, with the aim of informing the knowledge and understanding of learning space within a multidisciplinary design context.

Open innovation and knowledge flows

With its origins in business development and sustainability, open innovation describes the purposeful capture of knowledge from outside an organization (Chesbrough, 2003). Traditionally, organizational research and development was confined, or 'closed', within the departmental structures of a business and limited to the extent of knowledge and experience of that internal team. However as organizations adapt to new economic and social challenges, the need to harness and capitalize on new opportunities encourages movement beyond the existing structures.

Within Chesbrough's open innovation paradigm (2006), he refers to 'inflows' and 'outflows' of knowledge and this has been extensively considered across the literature from a business context (Lichtenthaler, 2011). In this context, inflows refer to the flow of knowledge from sources such as suppliers, end-users and competitors and have a direct impact on organizational capacity, enhancing understanding and creating the conditions for development. Outflows refer to the output generated as a result of the inflow of knowledge, for example a new product or service informed by external knowledge and developed in response.

In response to the growing literature beyond a business perspective, Lichenthaler (2011) suggests a wider definition of open innovation that incorporates knowledge management, 'open innovation is defined as systematically performing knowledge exploration, retention and exploitation inside and outside an organization's boundaries throughout the innovation process' while West and Bogers (2014) redefine open innovation as "a

distributed innovation process based on purposively managed knowledge flows across organizational boundaries". Each of these definitions aligns with an understanding that open innovation has the potential to move beyond the business domain.

Collaborative Learning

Based on the understanding that knowledge is socially constructed and enacted through the interaction and exchange of experiences, information and ideas, collaborative learning has potential to respond to multi-faceted challenges in a cross disciplinary way. By engaging multiple perspectives, experiences and ideas can be socially enacted, suggesting a participatory element. This is aligned with the belief that participation is critical to learning activities (Leidner and Jarvenpaa, 1995). From this perspective, the participatory nature influences a stronger contribution, enabling a better the learning experience. The shift towards an increasingly 'participatory culture' (Jenkins, 2006) and the resulting evolution of perspectives of value within learning contexts has significantly altered the practices of engagement. No longer is the teacher the master of knowledge and the learner an empty vessel waiting to be filled, but a more equal and reciprocal sharing and collaborative creation of knowledge is favoured, inextricably linked to social interaction and the democratization of knowledge production.

Collaborative learning combines diverse perspectives with the aim of illuminating and unpicking the complexities of interactions involved. On practical level, learning in this way can only be situated contextually. Taking form from the mix of participants engaged, the collaboration evolves constantly based upon the level and quality of interaction that takes place. It is though this interaction that the sharing of knowledge, skills and tools takes place, shifting learning from an 'individual solidary act' towards something more engaged and collaborative (Jonassen *et al*., 2006). This is supported by Carcasson *et al.,* (2010) who state that each participant within a collaborative partnership has the ability to influence the social dynamics and the potential outcome of collaboration, shaping the process as well as the output.

Warburton (2003) recognizes the opportunities offered by collaborative approaches to learning beyond the subject matter in question. By being immersed within a collaboration, the practices and working processes of each individual member, and the discipline from which they emerge, are made explicit, creating opportunities to understand and bridge 'disparate discourses, traditions and methodologies'. In this way, the final output becomes less important; of interest is the experience and learning that occurs as part of the process of collaboration.

Learning Theories

Across the literature, learning theory within collaborative contexts is still under-researched, with no common approach adopted (Leach *et al.,* 2013). In considering the learning theories that exist, Leidner and Jarvenpaa (1995) state that no theoretical positioning is dominant, rather the learning context, the subject matter and the participants involved will work to shape the learning style required.

Constructivist approaches consider a more adaptive and active model of learning and has a focus on reality as being socially constructed. Learning in this way is person-centered, with each learner working at their own pace to interpret the information offered in a way that is based upon their own understanding of reality and experiences. Here learning focuses on the exploration of multiple perspectives or contextualized learning (Jonassen, 1993).

Collaborative approaches that consider learning as a social process, one in which the interpersonal interactions of learners enables a more effective learning experience, build upon the theoretical foundations of Vygotsky (1978). By encouraging participatory practices, this model assumes that knowledge is created as it is shared. A critical element of this model is the value of participants' contribution, their experiences and knowledge and the impact this has on the wider learning experience of the group (Alavi, 1994). In collaborative learning situations, through conversations, discussion and debate, participants offer explanations, interpretations and resolutions of problems which lead to social construction of knowledge, as well as development and internalization of meaning and understanding (Alavi, Wheeler & Valacich, 1995).

More recently, a socio-material or social-cultural perspective has dominated describing learning theories that 'move beyond individual acquisition, representation and transfer, emphasizing instead how learning is embodied in dynamic relationship among people and their physical contexts' (McMurtry *et al.,* 2016). In this way, learning is understood as a more relational process, engrained in the collective and emerging though the social relationships developed. Furthermore, these perspectives consider that the tools for learning have an explicit role to play in the learning activity that takes place (Leach *et al.,* 2013). This theory is particularly interesting within the context of participatory design whereby the tools and methodology adopted are integral to the process of collaboration.

Research Setting

Four design-led events (chiasma) provided the context for this study. Chiasma are two and a half day, residential knowledge exchange workshops organized as part of large research project, Design in Action with the aim of exploring the potential of design as a strategy for growth in Scotland and each chiasma had a particular societal or economic challenge to address. Participants were recruited from across design, business and academia with a view to collaboratively developing new business ideas towards potential seed funding of £20,000.

Methodology

The study undertook a qualitative approach in order to capture and explore the experiences of learning within the chiasma context and included interviews with thirty-five participants (thirteen business participants; thirteen design participants and nine academic participants) with the aim of exploring and capturing their experiences of learning. The interviews were semi-structured as focused around key themes: the chiasma experience, networks and collaboration and innovation and reflection.

Data Analysis

All transcripts were thematically analyzed enabling the clustering of data, from which the experiences of learning began to emerge for each participant type (business, academic, designer). From there, it was possible to identify and themes across each discipline and the emergent inflow and outflow of learning.

Findings

Four key learning themes emerged across the three participant perspectives; interaction, experience, practice and reflection and these will now be discussed in relation to inflow and outflows of learning.

Interaction

Interaction emerged as a theme of learning for all participants. In the first instance, business and academic participants discussed the participatory nature of interaction and the resulting impact on how they engaged. The chiasma comprised of a series of intensive design activities including persona development, fast ideation and prototyping and lightning talks from experts. Each activity was designed to engage participants in a hands-on way and enable them to make meaningful contributions. For many participants, this level of participation was described a new way of collaborating, "There was no time for sitting back, we had to be involved from the start you know, get our hands dirty. It was miles away from what I'm usually like in a business meeting" (Business Participant).

This participatory interaction can be highlighted as a learning inflow. Identified as a way of engaging beyond the usual business and academic models of interaction, both participant groups remarked on the intensive nature of the participation and the ease with which they felt they could contribute to the activities due to the level of engagement required, "It was amazing how much we all shared during the first activities. It was so easy to be open and I learned so much about some of the people at my table. In my normal job, it might take us months or even years to get to that point of familiarity" (Academic Participant).

The learning of design participants was less clear in this theme. Many design participants were familiar with the methodologies used and felt comfortable in that space of interaction. However, some designers had never worked out with the traditional designer/client brief context and found the emerging dynamic enlightening, "It was

challenging for me to not take the lead, as a professional designer I'm used to telling people how it should be, what they best idea was but I had to take a step back and share that responsibility" (Design Participant).

In terms of outflows and how the emergent learning might extend beyond the chiasma setting, this was most apparent in the sharing of individual knowledge and the shift towards a collective understanding. The high level of interaction enabled participants to share, understand and most importantly value the skills and knowledge of each participant as well as the potential contribution they could make to the collaboration, "We got to know each other really quickly, the tasks were fun and we relaxed. It meant that when we came to choose team members, you could quickly identify those people who thought the same as you, who appreciated or valued the same things" (Design Participant). The increased level of interaction created a rich dialogue, open to all contributions and each participant group identified this as a key contributor to the degree of openness, "…very quickly we moved beyond our job titles or what we did or believed it. We were people. I wasn't a business owner but a person, just like them" (Business Participant).

Experience

Experience in the chiasma setting was linked predominantly to the creation of an authentic learning context. There was agreement among participants that the exposure to multidisciplinary perspectives, combined with tasks undertaken as part of the collaboration (the design-led activities), created an environment conducive to learning and furthermore had impact on learning both at the time and following the chiasma. Again, the learning through experience, or learning by doing, was highlighted more strongly by the business and academic participants, who referred to engaging with the design methods and how this facilitated group formation; "the way of working, the design part I guess, really helped us to work though who we were as a team and what our USP was" (Business Participant). Design participants referred less to the experiential learning gained through engagement with tools and more towards the capture of experience and the broader understanding this provided.

This learning, related to the gathering of insights through the sharing of personal experience and storytelling was another significant inflow. In this way, participants were able to learn from multiple perspectives, increasing their awareness and appreciation of the wider disciplines within their team. This was apparent in the generation of a shared understanding of competencies as well as through a realization of the discipline specific skills each team member brought to the collaboration, "I learned a lot about the experiences of running a business. I hadn't encountered that level of sharing before, they were real-life experiences and quite unlike what I'd expect to read on the subject" (Academic Participant). This also extended to the role of the designer within the collaboration, "I realized that the designer was there for much more than decorating the packaging" (Business Participant).

Through making explicit the professional and personal competencies of individual participants, it became clear that this worked to manage expectations within the collaboration. Participants were both aware of people's expertise as well as where their own strengths lie in relation to others, "I felt that it was an engaging and challenging couple of days, exposing me to many different personalities and backgrounds in a short time period" (Academic Participant).

The collective learning that emerged was visible as an outflow in the final business ideas. This highlighted the learning journey for each group, illustrating how far the idea had progressed and how it had been informed by the experiences and interactions within the group. Furthermore, in the period after the chiasma participants had the opportunity to rework their pitch into a final proposal for seed funding. The applications submitted demonstrated the outflow learning that took place, making reference to the feedback given during the chiasma and in the subsequent iteration of the idea.

Practice

The inflow of learning through practice was visible as individual participants and as the collective. Individually participants developed a more cohesive understanding of their own working. Additionally, participants identified occasions when their contribution evolved beyond the current understanding of their role towards a new positioning within the collaboration. This was observed when individuals assumed roles within the groups and most notably when a design participant discussed how they had been called upon to act as a mediator between two other participants using their skills in a non-traditional way, stating, "I've become a cross-disciplinary interpreter" (Design Participant).

Learning around practice related to design, the application of design as part of collaborative activity and the role of design in a wider strategic sense. For the designer, this was linked to learning around articulation of the role of the designer and also how to consider design skills beyond the traditional design discipline, "I was really forced to consider myself as a designer in the broadest sense, I wasn't a textile designer anymore, I was simply a designer" (Design Participant). The realization that design skills moved beyond the particular skillset of a discipline was a recurring theme and raises questions about the way in which designer self-identify and articulate their role. However the learning went beyond design practices. Some participants also referred to the business practice knowledge generated, "…provided new tools and approaches for business that I hadn't heard of before" (Design Participant).

As the collective progressed through the design activities, forming meaningful relationships, the group became a cohesive entity; "We started out as a group of individuals but became a unit" (Business Participant). This was supported by an academic participant who shared that, "It took our team a while to get to a point where we had a shared vision, but our idea was stronger when we got there in the end."

Examples of outflow of learning include the transformation of tacit knowledge to explicit, enabled by design practice. Participants articulated their individual discipline specific skills and knowledge in a way that could be easily understood by all members of the collaboration through engagement in design methods "…I simplified what I do in the beginning, to make it easier to understand but once people started working together, they got it and I could be more complicated in my description" (Design Participant). Furthermore, the adoption of good working practices from each discipline and an openness to future collaboration were also identified as learning points within the chiasma highlighting the potential impact beyond the chiasma context, "I've used some of the techniques since, in my own work" (Business Participant).

Reflection

Reflection was most strongly linked to learning in a balance between inflow and outflow. Participants absorbed the inflow of knowledge during the experience then through synthesis, reflected on that experience and identified their key learning points. These were then applied at a later stage of the chiasma process with impact beyond the event itself; "I took lots in, it was non-stop immersion in a really intense conversation and it wasn't until later, when I'd had a chance to process it that I realized what were important things to remember" (Business Participant). This was most visible as the teams begun to develop their business idea in response to both societal challenges and the experiences of fellow participants, "There was a lot to take in at the start, lots of people sharing their experience and it wasn't until we had really begun to develop our business idea that we could really go back and unpick those experiences" (Academic Participant).

Aside from the acquisition of new knowledge identified in the previous themes, there was a recurring discussion of self-development and personal learning that emerged around the idea of reflection. Participants noted that the direct experience of interacting in a collaborative setting supported the development or enhancement of personal skills, competencies and values. For designers, this was linked to the democratization of design as a practice: "I'm usually quite self-absorbed at work. When I'm designing, I'm the only one who makes decisions so it was challenging to have to share that design responsibility" (Design Participant). For business and academic participants, this was linked to a better understanding of multidisciplinary collaboration; "I'm much more aware of the range of possibilities. My discipline is so rigid; it's difficult to try new ways of working. But I feel inspired to try, to push the boundaries" (Academic Participant).

Discussion

In considering open learning as part of a multidisciplinary collaborative design context highlighted, a number of points were highlighted enabling, informing and supporting the creation of a space for future participatory education practices.

The Ethics of Open

It was clear that creating a shared grounding, or underpinning, for the collaboration in the early stages of the collaboration was essential. This underpinning ensured participants were clear in terms of the aim of the

collaboration, the anticipated form and the expected contribution from each participant. This underpinning was developed on a set of core ethical considerations and included the individual elements of mutual respect, a valuing of individual skills and knowledge, a sense of equality and reciprocity. Only once participants felt that had reached a consensus around theses common values could real and balanced contributions be made. Participants noted that learning took place most naturally once this shared understanding had been reached. These ethical interactions reflect the qualities inherent in design practice and can work to support open learning within a participatory context.

There was also a significant role for design in creating an space that was open and equal, enabled through the design tools and activities and through design-based facilitation that reinforced the ethical qualities of design (empathy, creativity, humility, ability to fail) and that then supported the potential ability of participants to learn.

Space for Social Interaction

It was also apparent that the social element of collaboration was critical to the learning process within the chiasma. The social interaction enabled the conditions for relationship building, then contributing to the extent to which participants shared. Once participants had reached a safe space where they could confidently contribute, learning was actively enabled. Social interaction in this context, and in particular the conversations and dialogue that took place around engagement with design tools was fundamental to learning from a socio-material perspective. The connection with design artifacts, the development of a shared understanding, allocation of meaning and translation of multiple perspectives deepened the connection and worked towards enabling a space for learning. This space for social interaction is aligned with similar considerations of the role of conversation in learning and teaching pedagogies (Laurillard, 2007).

The creation of an authentic learning setting also significantly contributed to the level of which participants felt they had a learning experience. The engagement of multiple disciplines ensured that the different perspectives offered were realistic and the experiences shared were relevant to the societal and economic challenges being addressed within the chiasma. Aside from enabling wider learning around multiple perspectives and experiences, participants were able to work in a contextualized and situated way, learning how practices differ across disciplines and considering real world applications of thinking from outside their traditional learning boundaries.

To this end, learning in the chiasma context is a situated and contextual social activity and as such requires a space that enables open social interaction. Reed *et al*., (2010) state that social learning is the "change in understanding that goes beyond the individual to become situated within wider social units or communities of practice through social interactions between actors within social networks' and this was true of the chiasma. Further to this, the role of design within the social space enabled facilitated and mediated learning through the use of tools and methods used.

Learning as Added Value

While the chiasma was designed as a knowledge exchange activity, the key focus and anticipated outcome described by participants was the generation of a viable business idea and the subsequent seed funding. Neither individual nor collective learning was considered as an explicit outcome of the chiasma experience. Despite this, all participants reported learning as added value.

The participatory nature of the chiasma required a high level of engagement and this worked to support the participants as active learners. This is a view shared by Mochizuki and Fadeeva (2012) who consider the empowerment of learners through participatory activity. A critical element then is the shift from individual thinking to a shared collective way of engaging and interacting.

Similarly, participants were not always aware that they were learning in situe, with many stating that the full understanding of the learning they experienced was not fully understood until they had the opportunity to reflect post-chiasma. The tangible and immediate outcomes of learning, in this context the knowledge, understanding and skills developed as a collective can be used as examples of effective learning and furthermore they may work to support learning practices and attitudinal change in the longer term.

CONCLUSION

In considering these findings, the role of design can be seen to enable the conditions for open learning within a participatory experience. By first creating value for individuals before working towards the generation of collective value, the learning that emerges at each stage of the process works to encourage greater connectivity and cohesion and can enable a space for more effective collaborative activity. This creates interesting opportunities for considering design within pedagogical approaches and the role design might play in facilitating, negotiating and supporting complex contexts.

Beyond this, it is clear that learning in this context can be understood in two ways. The *perceived learning*, that is the knowledge participants expect to learn within a particular context, and the *actual learning*, the development of tacit knowledge that isn't often fully realized until beyond the particular event. Whether learning is planned or not, the participatory nature of collaborative design activity encourages it to become an inherent element, enabling opportunities for wider participatory education practices.

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