

Two Heads Are Better Than One: Principles for Collaborative Design Practice

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Abstract Design is an inherently complicated activity, reliant on the input of many other disciplines, stakeholders, and users. Over recent years, product designers, clients, suppliers and customers have become even more close and connected, and working together has become paramount in the design process. This chapter looks at the notion of collaboration in design, and suggests that being connected to others can enhance the overall creative effort. As the prevalence of interdisciplinary teams and global work practices grows, this is relevant across all design disciplines. An interdisciplinary team approach provides benefits that can bring about innovation. However, teams are also idiosyncratic and serendipitous. Since design itself is equally unpredictable, there is a need to structure collaborative working. This chapter aims to provide creative practitioners and students with a set of methods by which a collaborative approach can be fostered and maintained in contemporary design practice.

Introduction: Organising for Uncertainty

Design and its concern with improving the future is marked by uncertainty. The outcome of a project rests squarely in the hands of the design team. At the outset of the process, the shape or form of a final outcome is unknown, and only results from progression through the design journey. Indeed, the design problem is in itself unpredictable or ‘wicked’ (Rittel and Webber 1973), meaning that there is no single, correct way of framing or solving a given problem. Therefore, the outcome depends on the experience, emotions, and subjectivity of those addressing the issue. These characteristics have made it problematic to model a framework that adequately describes and generalises the process: every design situation is unique.

The decision whether to cooperate or compete with others is a pivotal issue in management, and there are benefits to adopting either strategy (De Wit and Meyer 2005). In design, however, all projects – from products to software, from clothing to buildings to experiences – occur within commercial parameters, and require

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the input of a number of specialists. Design has always been inextricably linked to business: the ‘industrial’ design profession came about as businesses sought to mass-manufacture products for the open market (Woodham 1997). Moreover, the results of design are to be used by real people. However, when the factors which influence the process differ in every situation, and when the people involved affect the outcomes of the process, how can firms whose business depends on the outcome of the design process – the client, suppliers, manufacturers, creative consultancies – ensure that the final results will be adequate for all concerned?

In the modern day context, the design process has come to rest on communication: the only route forwards is working together to achieve optimal results. In this respect, design is a people-centric discipline, reliant on a dynamic social setting. These interrelationships have become even more important over the last two decades as the discipline has undergone great change. Major shifts in the technical, commercial, cultural and social landscapes have fundamentally altered how goods and services are developed, manufactured and sold, and have impacted the underlying methodologies of the profession. The need to work together – to cooperate, collaborate and communicate – with clients, users and a wide network is paramount when developing the technical, networked and sophisticated products required in today’s fast-moving, dynamic marketplace (Press and Cooper 2003).

It follows that there needs to be structure around the process to support the collaborative effort. It is necessary for stakeholders to come together – face-to-face or remotely – to share approaches and grow ideas, and to work together creatively to realise a goal, particularly since the number of players and information involved in the development process is currently growing in complexity. This chapter outlines tools and methodologies which can help in supporting a design team, in allowing stakeholders to communicate throughout the project, and in managing the creative process.

The chapter looks at the emerging shape, tools and structure of the contemporary design process. It examines how designers and design studios are embracing technical, commercial, cultural and social changes, and how they are adapting to cope with an increasing need to collaborate in the design process. First, the design process is examined in depth, and it is suggested that different types of collaborative practice occur throughout the process. Since every design situation is unique, the tools comprising any collaborative strategy will always be different. Second, the latest tools that are being adopted by design studios to catalyse successful creative collaboration are assessed. Many of these are information communication technologies (ICTs) which are freely available, and these bolster more conventional methodologies. A case example suggests when and how these tools may be used. Third, these ideas are drawn together in a set of principles which are intended as a guide to assist and encourage designers and students in the creative process. Being inclusive, embracing insight and having confidence to change direction, and incubating and developing ideas, are considered to enable practitioners to foster an ethos of innovation. The authors have engaged in qualitative research activity with design consultancies in Europe and the US, including interviewing and research of

an ethnographic nature, and these principles are based upon those insights, alongside their experience in teaching and working design and business students, and review of design success stories and of relevant literature.

Strategies for Collaboration During the Design Process

There are several reasons to explain the shifts that characterise modern day design practice. First, global connectivity and instant communications have enabled a diverse network inside and outside of the design process, comprising, for example, designers, clients, users, customers, engineers, researchers, manufacturers, suppliers, retailers and others. Hence, the design team can be distributed geographically across countries and even continents. Indeed, most manufacturing is now outsourced for economic reasons, and this gives rise to the need for international collaborative working (Kolarevic et al. 2000). Second, increasingly sophisticated technologies of production and manufacture have resulted in more technical and networked products. In turn, this creates a more complicated design process requiring the input of many experts (Press and Cooper 2003). Third, customers have become more informed, more powerful, and less loyal to one particular brand. To be competitive, there is a growing need to understand their needs and desires, and tailor products and services to match these precisely. Similarly, digital communications mean that trends change quickly, and so the cycle of new product development (NPD) is accelerating.

These trends drive more dynamic, fast-moving and connected modes of product development. Research by Dell’Era and Verganti (2010) shows that coordinating the input of a range of different sources in a well-balanced team tends to produce more innovative design results. A network provides benefits such as a greater breadth of specialist skills and knowledge, more expansive insight, and the opportunity to cross-pollinate and develop ideas.

A collaborative strategy can be deployed outside as well as inside the design team. User-centred design, which focuses on human-centred research, seeks to involve end users in the development process to understand specific needs and problems to be addressed. Each of these strategies results in different design outcomes, such as whether it is radically innovative, or a redesign of a previous product. Therefore, the collaborative strategy should be tailored to meet the project objectives.

Varying Forms of Collaboration

To understand the precise form and characteristics of collaboration in creative projects, it is useful to look at the phases and activities across the design process. It has been observed that each design project differs, however research by the

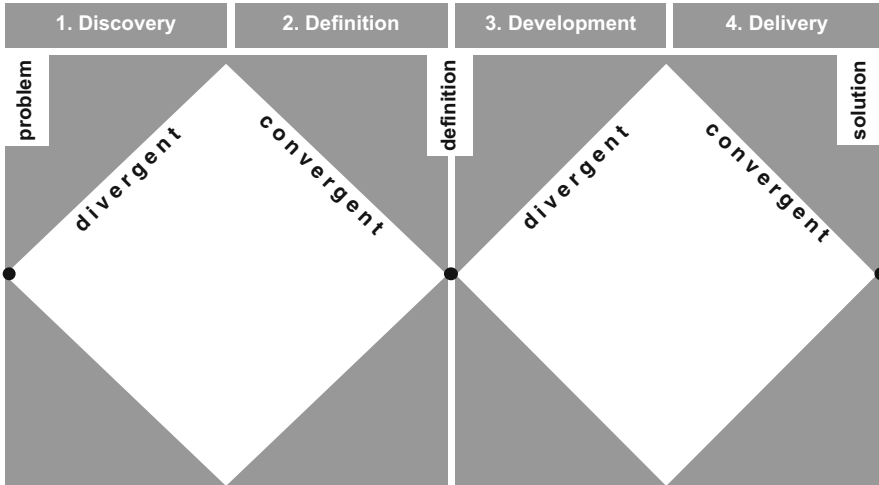


Fig. 1 The Design Council's 'double diamond' model of the design process

Design Council (2007) has uncovered four phases through which any design process passes. The 'Double Diamond' model, shown in Fig. 1, delineates four broad areas – 'discovery', 'definition', 'development', and 'delivery' – this allows design teams to explore ideas, test solutions and innovate. The model also indicates that iteration can occur during phases, and that previous phases may be revisited during the process. This proposition is useful since it acknowledges the different modes of thinking (for example, divergent thinking which is broad and externally-focused or convergent thinking which is more focused and internal-facing) throughout the process. It follows that modes of collaboration also vary depending on stage of the project.

Addressing the aims and objectives of the design process requires a different set of activities and approaches, as summarised in Table 1. For example, at the *discovery* phase, a large pool of ideas needs to be generated. A common approach may be to use brainstorming techniques internally to generate ideas. Involving stakeholders from different disciplines and areas of expertise is likely to enlarge the scope of the problem frame. Depending on the scope of the project, field research may be conducted with the target user group. This approach is an example of divergent thinking, and may yield a significant quantity of information.

Collaboration may occur at any stage of the design process, and Table 1 illustrates how different interfaces propel the different tasks required to progress through a project. In managing a successful design process, maintaining a relationship and open lines of communication with these parties is crucial (Maciver 2012). Indeed, working with stakeholders is a common approach in business, and research has suggested that strong design 'clusters' are more competitive (Verganti 2006) than those working in isolation. The banding together of people, teams, and organisations is recognised as a means to achieving greater goals than could be accomplished alone.

Table 1 Summarising the objectives of each phase of the design process

PHASE	OBJECTIVE OF PHASE	REQUIRED TASKS AND COLLABORATIONS
<i>1. Discovery</i>	Divergent thought and ideas - orientation characterise this phase where the design 'problem' is explored, investigated and questioned in full	<i>Internal project team:</i> Idea generation, brainstorm <i>Clients:</i> discussions around brief, aims and requirements <i>Users:</i> gaining broad understanding of current situation
	↓	
<i>2. Definition</i>	Convergent thought, where the insights are collated, result in the definition of a clear problem space to be addressed	<i>All stakeholders:</i> requirements agreement and analysis <i>Users:</i> research specific needs and challenges <i>Internal project team:</i> collect ideas, discuss and brainstorm around these, select winning concepts
	↓	
<i>3. Development</i>	Divergent thought patterns predominate this phase, where the fundamental aspects and details of the solution are investigated in detail	<i>Creative team:</i> design development <i>Stakeholders:</i> collaborative prototyping, including testing <i>Manufacturer:</i> production iterations <i>Users:</i> testing of prototypes with real people
	↓	
<i>4. Delivery</i>	Convergent thought brings the 'winning' concept to reality in this phase, when production, manufacture and launch take place. Feedback loops can enable iteration and improvement	<i>Client:</i> discussions around marketing strategy <i>All stakeholders:</i> achieve consensus of strategy to bring product to market <i>Users:</i> final testing, and research on launch strategy

Source: The authors

Despite these benefits, there are many challenges to establishing and maintaining creative partnerships. The next section looks at the problems faced by designers.

Challenges to Collaborative Creative Networks

The input of many people creates a very complex ecosystem, and there has been scepticism on the part of design practitioners as to how creativity can be enabled in a group context. It is suggested that designers have found the transition to overt collaboration challenging (Sonnenwald 1996). Whilst the cross-fertilisation of ideas is common in the industry, it is normal for professionals to be protective when

it comes to their intellectual property (Mun et al. 2009). Cooperation throughout the design process is typical, however may be unacknowledged, or treated with suspicion, by designers (Edmonds et al. 2005). This can, in part, be attributed to the tools that are common yet unobtrusive in design studios (for example email, teleconferencing, FTP (file transfer protocol), and instant messaging) and which provide a constant flow of communication across distributed teams, as well as more sophisticated tools (such as video conferencing, browser-supported file sharing and online whiteboard brainstorming sessions) which enable the sharing and real-time editing of project work. The use of such platforms is widespread and increasingly essential in the design industry. A survey conducted by Liapis et al. (2014) indicates a varied and comprehensive range of software used in design studios in Europe.

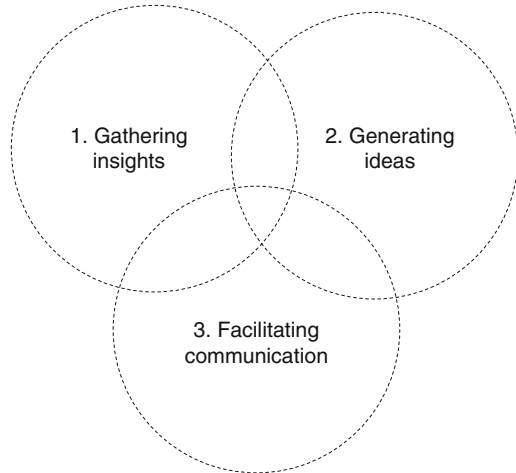
In terms of the collaborative process itself producing more creative and innovative products, there is also scepticism. Research by Norman and Verganti (2014) suggest that consulting users does not reap frame-breaking outcomes: for example, Apple does not conduct user research in the belief that users are unaware of the potential of technology. Conversely, it can also be argued that there is value in research for keeping the firm's offering current, innovative and relevant on the market, and for the user (Bailetti and Litva 1995; Veryzer and Borja de Mozota 2005). Such findings can enable a deep level of insight into customer aspirations, and alters how organisations innovate (Aula et al. 2005; Lojacano and Zaccai 2004). This approach tends to lead to incremental developments based on user needs rather than radical forms of innovation (Malins and Gulari 2013).

The logistics of enabling group creativity is also an issue to be considered: working with a team distributed across countries, with different languages and time zones, complicates communication, and finding consensus and agreement on all matters can be problematic. Nevertheless, it is now paramount to communicate and collaborate more intensively with international partners in order to bring new ideas to fruition. Designers are finding ways to creatively collaborate with stakeholders (Arias et al. 2000; Simoff and Maher 2000). Technology, particularly ICT, is becoming central to the business operations of design organisations. There has been a steep learning curve over the last decade, as design firms have had to find new means to communicate with a group. Moreover, where there is such a breadth of information and voices entering the design process, there is the need to manage projects adequately. The following section describes a variety of methodologies and tools that are adopted in design practice to support creative collaboration.

Tools to Support Collaborative, Creative Environments

Emergent methods and tools are fortifying the conventional techniques used in traditional design practice. New technologies, the internet and the platforms powered by it, are being adopted for collaborative creative working. Many of the ideas described in this section are practical with a tangible purpose, while others are conceptual methodologies flexible with application to different design

Fig. 2 Challenges in collaborative creative processes



disciplines. It is significant to note the democratic availability of modern design and productivity tools. The software used by professionals is readily available in education. Therefore, student projects can assist in preparation for real-life work situations. Indeed, the tools already in place in university faculties, such as peer-to-peer communication platforms and interactive course material, are formative for professional practice. Students can use these in innovative ways, such as to collect and share resources, to better reflect professional practice in the studio environment.

This section delineates three interlocking challenges faced in collaborative creative processes, illustrated in Fig. 2: gathering insights, generating ideas, and facilitating communication. It analyses how modern methodologies may be responsive to addressing these questions in creative collaboration:

1. Gathering insights: What methods enable the gathering of a range of insights from many stakeholders?
2. Generating ideas: How can ideas be generated collectively when dealing with vast amounts of information and insights?
3. Facilitating communication: When working with a distributed team, how can the channels of communication be opened and maintained?

A Collaborative Approach for Gathering Insights

People are the core of any design project, and having a good range of insights is crucial for a successful project result. The ideas of the omnipotent, individual designer contrasts starkly with the need to collect insight from other people. Box 1 compares the approaches adopted by the lone mavericks such as Philippe Starck and Gordon Murray, versus the conditions created at firms like Pixar and IDEO for collective creativity.

BOX 1: The Creative ‘Maverick’ Versus the ‘Collective’ Approach

There has been research conducted to decipher whether the best creativity results from lone mavericks or group situations. Since real people have to use the products of design, the design historian Adrian Forty (1986: 245) concludes that “no design works unless it embodies ideas that are held in common by the people for whom the object is intended”. In this respect, successful designers temper personal style to balance conflicting forces. Lloyd and Snelders’s (2003) study into designer Philippe Starck’s creative process in arriving at the Juicy Salif lemon squeezer concludes that it does not fulfil many of the functional attributes of a squeezer: the legs bend when pressure is applied, there is no bowl to catch the juice, and the metal tarnishes on persistent contact with the acidic juice. However, it does possess a set of non-functional qualities: it is a dramatic kitchen item, it is decorative and it acts as a conversation starter. Likewise, Cross and Cross’s (1996) study of the creative process Gordon Murray undertook when developing the Brabham and McLaren Formula 1 cars of the 1970s and 80s also suggests a very personalised and therefore unpredictable approach to design decisions.

Starck and Murray can be considered quite exceptional and individual in their fields (in which they are world renowned), however, in organisations there is a need to temper individual style to incorporate an egalitarian philosophy. Co-founder and president of Pixar, Ed Catmull (2008: 66), upholds that: “*filmmaking and many other kinds of complex product development, creativity involves a large number of people from different disciplines working effectively together to solve a great many problems*”. To foster such ‘collective creativity’, Catmull has instilled a flat culture at Pixar where there is no hierarchy and everyone can talk to everyone, where creatives are empowered to take decisions, where all in the 250-strong production team can make suggestions, and where learning happens through ‘post mortems’. Likewise at IDEO, there is recognition that all members of an interdisciplinary group instil different qualities (Kelley and Littman 2006). IDEO partners suggest that acknowledging a range of different roles in the creative team is important in order to achieve an egalitarian approach which is considered to result in better designs.

Individual and highly personalised ideas and approaches are typical of a discipline as subjective as design, however the strategies deployed at IDEO and Pixar demonstrate how these may be tempered and integrated into a harmonious group approach.

Identifying Suitable Partners

Early in the process, online resources enable the creative group to be established, if it is not already complete. Online communities allow people to make connections with

others who have the skills and expertise, or financial backing, required to ignite a project. Platforms that connect potential partners and stakeholders across disciplines (for example, creative with technical talent) can enable global collaboration for specific projects. For example, Kickstarter connects would-be innovators with investors to help bring an idea to fruition, and has funded a range of creative projects including movies (e.g. Veronica Mars), games (Exploding Kittens received 110,000 backers), and many technological projects (e.g. the Pebble watch, the Ouya games console, and the Form 1 three-dimensional printer). Indeed, NESTA (National Endowment for Science, Technology and the Arts), an independent UK charity that supports innovation, reports how such resources drive entrepreneurship in the economy (see: Stokes et al. 2014).

Research and Road Testing

Throughout the process and particularly at the early stage of design, insight can be gathered from many types of experts. For example, a project to design a piece of smart, wearable technology for an elderly person may begin by speaking to people who have specialist information on the issues at hand: doctor, occupational therapist, physiotherapist, carer, nano technology specialist, as well as potential wearers of the device, to fully understand the issues. This method will ensure that the ensuing product design process will investigate the right issues, and that the result will have relevance and value to the end user. Research by Leonard and Rayport (1997) reports that an *empathic* approach allows firms to innovate using techniques such as: customer observation, data gathering through visual, auditory and sensory cues, analysis of data, brainstorming, and the development of prototypes of possible solutions. As the design process moves towards the ‘development’ phase, testing rough prototypes throughout keeps sight of the problem at hand, and keeps the core attributes of the product on track.

Design consultancy IDEO has pioneered this mode of human-centred design. Its *Open IDEO* arm aims to ‘*design a better world*’, and its projects involve addressing social problems on a global scale. Via its website, the organisation seeks to mobilise users from around the world. By providing guidelines in the form of design and HCI toolkits, members can provide local and personal information allowing the designers to home in on intricate issues on which information may not normally be forthcoming.

Generating Insights by Establishing Communities

Key insights can be generated using technology from a range of different people. Online platforms and communities can again be deployed for the organising of research and the collection of first-hand data leading to new insight. Joining or creating groups online can allow the right people to be reached, as well as allowing access to a large number of opinions. Asking the right questions on general or specialist forums, can be used to garner opinion from target user groups.

A Collaborative Approach for Generating Ideas

The early stages of the design process calls for the synthesis of the insights gathered from different sources. At this stage the problem to be addressed is still uncertain. Therefore, ideas generated through brainstorming hold the key to the solution and all have potential: the design team has to assess all insights. These are later analysed and filtered when data from the rest of the group is complete. Working in such a creative group environment requires a democratic approach, where each input is considered valid.

Gathering Inspiration and Idea Generation Tools

Gathering inspiration and stimulus material is a good starting point when beginning a project, as it can spark ideas and lead to new areas previously unconsidered. The fashion designer Paul Smith's first book is entitled '*You can find inspiration in everything – and if you can't, look again*', and in it Smith (2003) asserts that many of his designs were the result of things observed in everyday life. As advocated by Smith, being open to a wide range of interdisciplinary influences can allow the development of new ideas and thought patterns. Acting like a sponge to soak up influences outside of the immediate problem frame allows concepts to be considered in new and different ways.

Online platforms can support the quest to find and sort stimulus material. Virtual, cloud-based image repositories allow users to upload their own, or collect existing inspiration images in mood boards, with the benefit of being able to access their data on any system. Such platforms can also make recommendations of similar images, and connect users to other boards with similar themes. The ability to share such stimulus material with others in their design team supports group communication and collaboration. This is a valuable time saving platform for design teams, and can also assist the team when presenting a narrative at the end of the project.

News, media and culture provides design teams with up to date information regarding design trends. Specialist design agencies work specifically in predicting and disseminating upcoming trends. However, the power of personal, niche experience is not to be underestimated. Many products have resulted from a designer or entrepreneur's own dissatisfaction with the current situation sparking a desire for improvement. For example, the OXO Goodgrips products were born when the company's president observed his arthritic wife's difficulties using regular kitchen utensils, and led to a collaboration with Smart Design which spawned a full-range of kitchen products designed with this type of user in mind. Empathic modelling is a method by which designers can 'put oneself in another's shoes' and test out the user's current situation (McDonagh and Formosa 2011). Experiencing the user's challenges allows insights to be gained based on the user's perspective.

Developing a Creative Environment

Physical setting and environment is considered to be important in catalysing creativity. Whether ideas emerge from a meeting in the boardroom or around a conversation over coffee, it is impossible to predict exactly when new ideas will appear. However, it seems that the most relaxed moments and settings bring the most creative results: Roam (2009) notes the value of jotting down ideas on napkins or the back of envelopes when caught unprepared.

The social setting is certainly important to how nascent ideas can be nurtured and developed. Some firms, like Pixar and Google, encourage staff to mingle, and recreation areas are centralised to achieve this. The rationale is that by mixing different functions in a social setting, there is a greater likelihood that ideas will be cross-pollinated. Google has been innovative in its office interior architecture, and has included features such as break out areas away from the desk, recreational activity spaces and ‘chill out’ zones complete with beanbags, with the expectancy that relaxation of the body will also relax the mind. Lego practices a policy of ‘serious play’ where groups solve problems together using Lego to construct and tell stories.¹ While it is impossible to generalise how a creative environment should be designed, it is clear that communication is crucial when developing ideas. Moreover, sharing and discussing at the early creative stages has a greater likelihood of developing the idea in new directions, and flagging different insights.

Facilitating Collaboration and Communication

The final dimension of the collaborative design project is facilitating communication, maintaining the group, harmonising contributions, and keeping sight of purpose and process. Allowing creativity to flourish when the design team is distributed is particularly challenging. Online platforms have been developed to enable sophisticated modes of creative communication. For example, online group sketching sessions are possible using dedicated online platforms. These allow users to log in and simultaneously sketch digitally on a blank page which has been designed to replicate a virtual whiteboard. Voice and video web conferencing are freely available, and surmount language barriers through use of shared screen environments and visual communication. Instant messaging services allow informal communications across the team during the working day. Since project material can take many forms – such as images, diagrams, objects, three dimensional prototypes, rough sketches, experience and journey maps, wireframes, websites and videos, amongst others – being able to share these is paramount when it comes to presenting

¹For further information on Lego’s methodologies for creativity, see: <http://www.lego.com/en-gb/seriousplay/>.

the story of the design process. Presentations and project files can be shared and organised, and updated collectively in real-time using online platforms.

It seems that the key to smooth and creative partnerships occur when teams are open and transparent. An egalitarian team approach, where information and sharing is full and complete, and where stakeholders have appropriate access to information, helps to bring about positive relationships and a smooth interchange of ideas. A project management channel for communication can help to maintain democratic access to information. These steps assist in cross-pollinating ideas, skills and insights, and foster the optimal conditions for innovative results.

A Framework for Creative Collaboration

The previous sections have examined some of the challenges of creative collaboration, and have analysed how the available tools may be able to address these issues. While it has been noted that the methods and collaborative strategy followed in a creative process cannot be generalised, it is possible to present a framework for enabling the right type of collaboration for any project. Table 2 presents a case study, suggesting and summarising the techniques and collaborative requirements that may be used in a hypothetical design project. It also indicates where potential tools may assist different activities of the design process. This lays the foundations for highlighting patterns and principles in the creative process.

Principles for Fostering Collaborative Creativity

The chemist Louis Pasteur is quoted as saying of his seemingly serendipitous discoveries that “*Chance favours the prepared mind*”. Similarly, Thomas Edison proclaimed: “*Genius is one per cent inspiration, and ninety nine per cent perspiration*”. These advocacies for preparation, consistency and reliability in the creative *engine room*, rather than reliance upon sudden flashes of brilliance, are equally true today. The lead author witnessed examples of protracted design processes being punctuated by creative breakthroughs during research conducted at Design Partners, a leading Irish design consultancy. The consultancy can be considered commercially successful and indicative of best practice, as it expanded during the recession of 2008–2013 to open new studios in continental Europe and North America. On one project, led by a consultant named Rob, the brief was to design an implement that both measured and scooped baby milk formula, in different quantities depending on the age of the child, for a baby-care company. Through interviews with parents recruited on a local parenting website, and with several members of the team having young children themselves, the designers understood the effort to remember to count the number of scoops when making formula for a crying baby. Since the product was to be used at any time of the day or night, it had to be as simple to operate

Table 2 Framework for collaboration across the design process

Phase/associated issues	Methodologies/actions	Collaborative requirements	Potential collaborative tools
1. Discovery			
<i>What are the parameters of the problem?</i>	Meeting with client to understand and fine-tune parameters	Meetings with stakeholders, formal and informal	A virtual meeting space; instant messaging to communicate informally
<i>Who are the stakeholders?</i>	Meet with project team	Find experts in lighting design	Expert forum/community membership
<i>Whose input is required?</i>	Investigate brainstorm session with creative team to understand who the user is	Recruit potential users to participate in research (e.g. students, homeworkers)	Virtual brainstorm environment which records train of thought
<i>How can you communicate with these people?</i>	Ad hoc acting out of use scenario within creative team	Brainstorm session	Image database/repository
<i>How will you organise the process?</i>	Initial online research, gathering of stimulus material	Gather stimulus material and create mood board	Project management platform
	Conduct preliminary user research	Assign team roles	
	Evaluate ideas within team		
2. Definition			
<i>Who do you need to talk to?</i>	Ranking of priorities in the design, and agreement on parameters with client team	Discussions with wider NPD team	Virtual meeting space
<i>Where can you find the necessary expertise to understand the problem?</i>	Conduct more in-depth user research in real-life setting (homes were light may be used). Ethnographic research plus users recording experiences digitally	Show initial sketches and share visuals	Tool to share visuals and sketches (digital or otherwise) online
<i>How can you find the right information?</i>	Research on: lighting, materials, light sources, engineering, production	Story board the use case scenario	AI tool which can suggest material to be added to story board
<i>What methods will you use to brainstorm as a group?</i>	Sort, filter and storyboard insights from research	Sort ideas from stakeholder workshop	Analysis of keywords and semantics arising from group discussions

(continued)

Table 2 (continued)

Design brief: To design and develop a budget-end desk lamp with an adjustable, moving arm, which uses a sustainable and eco-friendly light source		
Phase/associated issues	Methodologies/actions	Collaborative requirements
	Sketching of ideas in design team, reaching consensus as to features of design	Prototype, build and model solutions in a craft workshop
	Encourage all stakeholders to prototype ideas in a workshop	Collaboratively build presentation for client
	Discussion with NPD team to agree on features of the concept	
	Pitch idea to client team	
3. Development		
<i>What ideas are going to be carried forth?</i>	Detailed development prototyping in workshop alongside lighting and engineering experts	Focus group with group of end users to discuss the solutions
<i>Is it important that everybody in agreement?</i>	Testing prototypes with end users	Construct a CAD file and send to production plant
<i>How can the prototypes be shared with the group?</i>	Commission a production model	Liaise with producers sharing visuals to surmount language barrier
<i>How will the prototypes be tested?</i>		
4. Delivery		
<i>How can we present the information?</i>	Meeting with client to present the story of the finished desk light	Update storyboard
<i>How can we get feedback on our ideas?</i>	Analyse feedback and iterate idea	Gather original stimulus material
	Market research re-starts iteration loop...	Integrate client requests into CAD file
		Sort and timeline progress of the project
		Presentation synthesis in the cloud

as possible. In getting to grips with the details required to design this product, Rob consulted with experts in measurement at the School of Food and Nutritional Sciences at University College Cork, while the design team created profiles of intended users, made storyboards and constructed a mood board. Gathering together this research, the design team developed six concepts in the weeks leading up to the client presentation which were modelled by design engineers and built by in-house model makers. Many centred on the idea of a set of different sized spoons, however none emerged as a clear winner. The evening before the pitch, Rob was reading an online forum and out of the corner of his eye saw an advertisement for a washing detergent. He wasn't quite sure why the detergent measuring cup sparked a sudden inspiration to solve the niggling design dilemma. He envisaged and roughly sketched a moving mechanism inside the scoop which could be adjusted to precisely measure different quantities of formula. Texting his colleagues about the breakthrough, Rob and the team convened early the next morning in the studio. Everyone was enthusiastic about this new idea – there was a gut feeling that it would work, and that it could be produced within the parameters of the brief. The team sketched, storyboarded and presented the idea to the client at 11 am. It turned out to be the winning concept.

Rob's story illustrates two key ideas: first, the innate *designerly* passion for arriving at the best ideas which transcends barriers and boundaries, and second, that the winning concept resulted in the hours of due diligence that Rob, the team and their collaborators spent talking, sharing knowledge, and devising seemingly random ideas. Rob and the team conducted a range of experts, and used personal experience to gain an innate understanding of the problem. They researched, brainstormed and prototyped several ideas. They pondered and reflected on how their solutions addressed the issue. They observed and absorbed different sources of inspiration. They laid the groundwork over weeks of effort, however they were open to new ideas and had the courage to change their path and go with a new idea at the last minute.

Creativity in action has been the subject of in-depth investigation. Research by Dunbar (1997) attempted to examine the “messiness” of innovation and invention. During a year long, ethnographic study of scientists in their labs, Dunbar discovered that the majority of breakthroughs were not expected nor predicted. In fact, Dunbar discovered that the process of trying – and failing – led to the most significant discoveries in the lab. Mistakes, failures and anomalies in experiments, alongside a patchwork of lab meetings, team discussions on experiment failures and anomalies, random corridor conversations (‘watercooler moments’) provoked learning and thinking about discoveries in new ways. Furthermore, Dunbar concluded that the subjectivity of the scientists themselves – their choices of what's interesting and worthy of further investigation – are major precursors to new findings and innovations. Johnson (2010) likewise suggests that the sudden ‘flash’, ‘lightbulb’ or ‘Eureka!’ moment that individuals often report having which lead to an idea are

actually the product of years worth of overlapping and often quite serendipitous experiences, conversations and failures. It seems that Pasteur and Edison's assertions hold true today.

These stories highlight the underlying premise of this chapter that creativity is rarely a solo activity, but rather burns slowly and unfolds organically in ways that can't quite be predicted. Despite this non-conformity, we can generalise some patterns and therefore learn how to promote creativity and encourage new ideas. Three broad principles are outlined below which can be deployed in every day collaborative creative practice, and which can help groups establish and maintain creative rhythm.

Principle I: Taking an Interdisciplinary Approach

Taking an interdisciplinary approach means being inclusive about who can play on your team. Creating a network to establish collaboration, embracing the differences of members rather than seeking homogeneity, and operating a philosophy where all ideas are acceptable supports the development of new ideas. Mobilising users and potentially insightful experts is vital in gaining the right information. Rob showed that openness to embrace knowledge from other disciplines, talking to different groups, and seriously processing their input enabled learning which resulted in a better result. This principle also applies inside firms where the flat structure at Pixar, and its democratic approach allows learning. Allowing others to ask questions prevents domination of one idea, and prepares a good starting discussion for innovation. On the micro level, being interdisciplinary means not restricting your own self to one particular domain, but having an open attitude. Design is a team sport and, while there may be a leader, everyone's input is valuable.

Principle II: Changing Direction and Embracing New Insight

We know that, given the uncertainty and unpredictability that characterises the design process, novel thinking is required to arrive at a great solution. Flexibility in approach to the process is a great asset. Embracing new insight involves being a 'sponge', absorbing influences and experiences from a range of contexts – professional and personal, first-hand or observed. Rob and the team were genuinely interested in parents' problems, and desired to create the best possible result. Moving the goalposts and switching course on the last day shows commitment to their client, as well as the trail of related stakeholders. By constantly being aware, observant and mindful, Rob remained attuned and was able to spark ideas until the last possible moment.

Principle III: Incubating Ideas – Persevering, Iterating, Testing, Improving

Its ambiguous foundations in discovery-driven observations, rich, context sensitive data and serendipitous circumstances mean that design work is slow burning. The ability to persevere, improve and incubate ideas determines how the team can grow and change its focus over time: Dunbar's scientists failed on many occasions before stepping towards a new discovery. As the environment at Google shows, a relaxed mind appears to reap greater creative results. Many design teams advocate stepping away from the project. For example, interdisciplinary New York design studio Sagmeister Walsh closes for one full year in every seven. Partner Stefan Sagmeister² notes that the majority of projects and work arising in the following seven years comes from work and ideas derived from this sabbatical. Likewise, it was in Rob's free time when the winning idea appeared. By taking time to regain perspective, new ideas have space to come to the surface. Trying different approaches, prototyping, trying again and not settling for the first answer requires tenacity and an overall creative confidence.

Conclusion

In an era of interdependency, this chapter has examined the realms of cooperation in contemporary, creative practice. Uncertainty, heterogeneity, individualism are key themes, all of which are inconsistent with the uniformity expected in commercial networks. However, it has been suggested that such a serendipitous approach – tailored to the group, the project, the unique situation – is how innovation typically unfolds. Indeed, the connected group effort is posited to enhance creative results. This is an especially important concept in the design process, where a 'design thinking' approach implies solving problems by reconciling people, technology and commerce. This raises a number of questions for the reader: does the creative process need a leader? Are all voices equal? Who takes the final decisions?

While the course of innovation may not be predictable, creating the best conditions and adopting the right mind-set can encourage a creative ethos. By examining when and how collaboration happens in the design process, it has been possible to suggest a range of methods that are equally applicable for use in many types of design situations. Again, tailoring the strategy is key.

As collaboration becomes paramount for the development of new products, services and experiences, technology is becoming a strong enabler by putting structures and frameworks around the creative process. It facilitates new types

²See 'The Power of Time' by Stefan Sagmeister available at: http://www.ted.com/talks/stefan_sagmeister_the_power_of_time_off#t-945073.

of collaboration, and bolsters existing methodologies. ICT is making it easier to assemble groups, gather, sort and present insight and communicate with a diverse network, and it is predicted that digitisation will continue becoming an intrinsic component of the design process in coming years. Providing the best interfaces to support creative approaches continues to be a priority for software developers.

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