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THE USE OF THE "HACKATHON" IN DESIGN EDUCATION: AN OPPORTUNISTIC EXPLORATION.

Finlay PAGE[1], Sylvester SWEENEY[1], Fraser BRUCE[2] and Seaton BAXTER[3]
[1] MSc by Research, Product Design, University of Dundee
[2] Product Design, University of Dundee
[3] Ecological Design Thinking, Schumacher College

ABSTRACT
This paper reports on a "Hackathon" attended by 195 participants at an event in the University of Dundee in September 2015. In collaboration with a leading retailer of greeting cards and products in the UK, the goal of the hackathon was to reconceptualise new digital products from the firm's existing product range and markets. Over the course of five days, students from two undergraduate courses, product design and digital interaction design, participated in the event. The students were divided into large interdisciplinary/inter-year groups and provided with basic tools and electronic kits. "Fly on the wall" and "Immersive" techniques were used in the observation of the groups and in the development of their initial ideas and concepts during the hackathon. Samples of students were later interviewed and additional qualitative data gathered using a 'Graffiti wall' technique. The paper explores issues that were encountered during the event and also provides some useful insights on the role of icebreakers, leadership and team roles, distractions and workplace environments. The paper concludes with a series of recommendations for the future use of "Hackathons" in design education, paying particular attention to the role of team motivation at all stages during the event.

Keywords: Hackathon, Design, Product, Education, Icebreakers, Distractions, Motivations.

1 INTRODUCTION

To survive and grow in times of rapid change and uncertainty, companies need to accelerate the pace of technological innovation from idea to market [1]. In most cases, innovation involves a slow sequence of incremental steps to existing product lines. However, in order to gain competitive advantage, companies continue to search for new methods and techniques to generate new ideas that have the potential for further development [1, 2]. For many companies, the hackathon has evolved into a platform to facilitate fast paced innovation. Although there is no universally accepted definition for the term hackathon, it has clearly emerged from the combination of the words hack and marathon [2]. Also sometimes known as a "hack day" or "codefest" [3], it has become a popular event often lasting several days and engaging large numbers of participants in a variety of projects and themes. It appears to have evolved from a blending of techniques like brainstorming, prototyping and open-source design. The hackathon was originally conceived as an *"event where developers, programmers, designers and computer amateurs in general meet and work intensively to create software projects"* [4]. Yet it now seems to have evolved its own hybrid forms and embraces other event styles like "Sprints" or "Jams" [2]. Each hackathon is typically organized around a broad theme like health and wellbeing, or sustainability and community for example. Many also offer the prospect of a prize or even a work placement, thereby motivating or inspiring likeminded individuals to attend. The main drive for participation comes from the opportunity to interact and co-create with others, as well as the chance to experiment with design and open hardware and software platforms. Unlike the design jam however, a hackathon can often include pre-event and post-event planning (Figure 1) [2]. In doing so, pre-event planning allows the participants to begin team building and ideation before the main event itself, allowing them to focus their effort on the task at hand. This form of event results in the generation of a more resolved output and is therefore employed more actively by businesses within a corporate hackathon setting. However, the pre-event tasks undertaken in a corporate hackathon typically form the main component of a design jam. This is primarily due to a difference in the event outcome. In other words, personal development and networking during a design jam dominate the

proceedings more than the development of a product idea or concept. Briscoe et al. (2014) have usefully proposed a classification system to help describe the *purpose* of the hackathon, ranging from a tech-centric or focus-centric perspective [3]. Typically, tech-centric hackathons are organized around the development of a specific technology or application whereas focus-centric hackathons primarily revolve around tackling some sort of social or business issue [3].

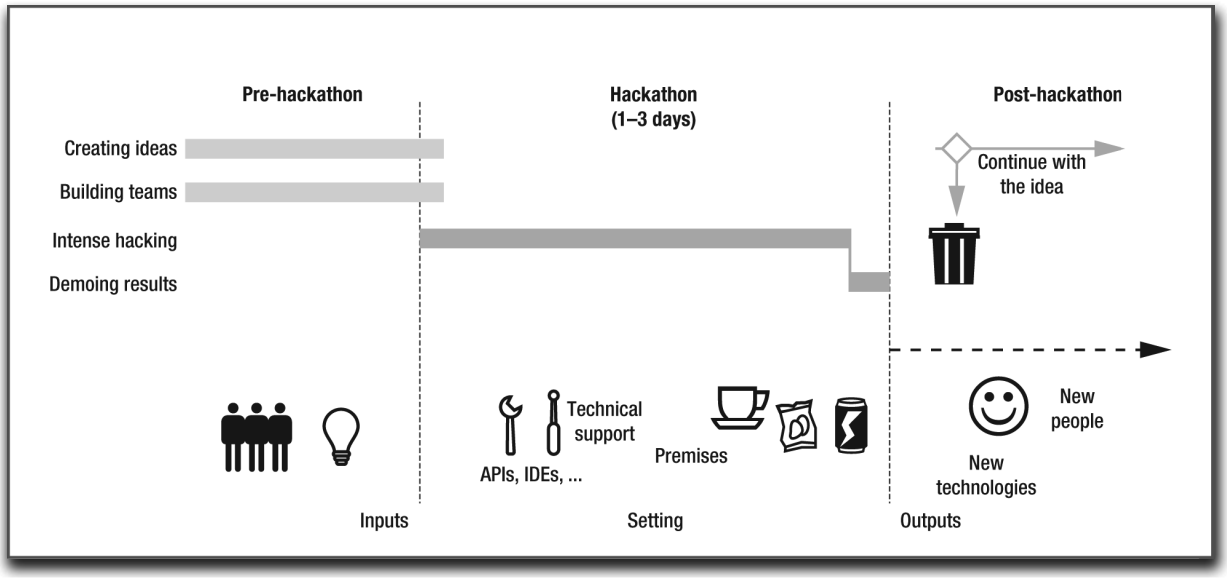

Figure 1. The typical hackathon process in terms of the activities, phases, and supporting elements

Other than popular articles or corporate social media, there appears to be limited published information on the operation and analysis of the hackathon as a tool or technique to be used in design education. However, some anecdotal evidence suggests the following attributes of the hackathon. It is enjoyable and exciting for participants, it enhances working inter-relationships and future associations, it encourages co-opetition (simultaneous collaboration and competition) [4], it widens the online information search areas and as a consequence of all of these, it can lead to creativity and risk taking and the emergence of unusual and unique ideas [5]. Interestingly, Komssi et al. (2015) suggest that *"an often understated by-product of hackathons is the participants personal development and sense of achievement from working with new technologies, meeting and collaborating with people they otherwise wouldn't"* [2]. So, it appears that hackathons might have something useful to offer those concerned with activity based teaching and learning strategies in an educational design setting. Indeed, allowing young designers to engage in a learning process *"whereby knowledge is created through the transformation of experience"* is paramount [6]. Writing from an action learning perspective, Weinstien (1995) also recognizes the importance of the transformative form of learning, suggesting that *"the best way to learn to do something differently is to focus on that 'doing' – in an area we have an interest in, an issue we need to tackle, an opportunity to grasp, or a problem we need to resolve – and learn from that experience, discovering as much from our successes as we do from our mistakes"* [7]. So, what now follows is an opportunistic exploration and analyses of the use of a hackathon in design education.

2 BACKGROUND

This hackathon was a four-day (74 hour) event held at the University of Dundee during the first week of the new academic session (September 2015) [8]. In collaboration with a leading retailer of greeting cards and stationary in the UK, the goal of the hackathon was to re-conceptualize new digital products from the company's existing product range and markets. Over the course of the four days of activities, 195 students from two undergraduate courses, product design and digital interaction design, participated in the event. The students were divided into fifteen interdisciplinary/inter-year groups of 13 participants with roughly an 8/5 male to female divide. The groups were installed in four rooms on two separate floors. The rooms were the same size but with slightly different layout and furniture. The participants were also provided with basic tools (e.g. paper, cardboard, tape, string etc.) and electronic

kits (e.g. Arduino, Raspberry Pi, LED's, actuators etc.), along with access to a fully equipped digital fabrication suite. Drawing upon the Design Council's "Double Diamond Design process model", each day of the hackathon had a particular focus [9]:

- ***Discover*** original insights through desk research and an analysis of the company's existing product ranges (Day 1).
- ***Define*** the nature and scope of the work and product specifications (Day 2).
- ***Develop*** ideas through sketching, mock-ups, models and technical prototypes (Day 3).
- ***Deliver*** a product demonstration to solicit feedback from a panel of industry experts (Day 4/5).

Although groups were not required to follow the model, it was hoped that it would increase some of the student's awareness of the different stages of a particular design process whilst also supporting their learning in a systematic way.

3 DATA GATHERING

Duncan of Jordanstone College of Art at Design (DJCAD) at the University of Dundee was approached by an external company to engage with them in a 5-day hackathon. In order to minimize the disruption to the planned curriculum, it was agreed to accommodate this request immediately prior to the start of the new academic session. This was a great opportunity at short notice to explore the potential benefits of a hackathon within an educational setting (DJCAD) along with an external partner. While it might have been helpful to plan the event better, the time frame available to us provided an opportunity to take advantage of unexpected insights and success factors. Two new MSc by Research students (F.P & S.S) were available and keen to get involved in this small exploratory study. However, due to a short preparation time, it was quickly decided that the students would work together and adopt the following research techniques to gather behavioural and attitudinal data on the event.

3.1 Behavioural Research

Behaviours were observed and recorded using both "Fly-on-the Wall" and "Casual Observation" techniques. With the availability of two researchers, it was decided early that one would act as a participant observer (F.P) and the other would remain anonymous (S.S). The two research observers never participated in the same group at the same time in order to avoid accidental cross communication. "Fly-on-the-wall" is a technique used to unobtrusively gather information on a particular situation [10]. On Day 1 of the event, the participant observer (F.P) informed the students of his presence. However, to avoid the chance of participants altering their behaviour when alerted to the presence of an observer, the other researcher (S.S) acted as a "Secret Outsider" [11]. A sample of the data gathered using this technique is presented in Table 1 of the results. According to Martin and Hanington (2012) "casual observation" is the systematic recording of data about the interactions between people in their environments [10]. On Day 2 and 3, the participant observer (F.P) fully immersed himself in the activities of the group. The anonymous observer (S.S) refrained from direct immersion but still engaged in conversation with the participants [10]. This form of observation allowed the researchers to identify behavioural changes over a short period of time. A sample of the data gathered using this technique is shown in Table 1 of the results. It should be noted that the data recorded in Table 1 are interpretations of the behaviours of groups during the hackathon as determined by the observers.

3.2 Attitudinal Research

Through two forms of post-event attitudinal research, "Interviews" and the application of the "Graffiti Wall" technique [10], quick and valid feedback was gathered from participants. Standard interview techniques on a random sample of participants were used to gather data on first-hand experiences, opinions and attitudes. A sample of the data gathered form the interviews are presented in Table 2. A "graffiti wall" is a blank canvas on which participants can leave their feedback both anonymously and freely in diagrammatic, visual or text formats [10]. By the time the graffiti wall technique was used, the participants had already returned to their respective year group and original studio spaces, outside which, a graffiti wall was placed. The walls were then photographed each day for a week, thereby gathering the feedback after the event had finished. A sample of the data gathered using this technique is shown in Table 3. It should be noted that the data recorded in Table 2 and Table 3 are direct

quotations from participants and recorded either orally in the interviews or graphically from the graffiti wall technique.

4 RESULTS

Samples of the data gathered by all four techniques are now shown in the following tables.

Table 1. Fly-on-the- Wall & Casual Observations

Fly-on-the-Wall	Casual Observations
On a group-by-group basis at any one time of observation, approximately 1/3 of the participants were operating laptop computers, another 1/3 engaged in active discussion, and the remainder appeared to be waiting on instructions.	The layout of the rooms appeared to influence the degree of progress made by some of the group members (especially in terms of table layout and available wall space).
Team leadership was slow to emerge in all of the groups.	By Day 3 fewer participants arrived at the event on time.
In the early stages, groups that did not have computers in operation appeared to develop a stronger group dynamic.	By the later stages of the event, it appeared that motivation in groups was declining or had declined.
At the beginning of the exercise it was observed that only 2 groups had introduced "ice-breaking techniques" (see section 5.1) to help getting to know each other.	Within any studio environment, it appeared that the teams operating within that space quickly synchronized their activities to keep pace with other teams.
Teams that did not publicly and openly record their ideas appeared to be more disoriented because there was no means by which individual members of the group could stay connected to the discussion.	Teams that are highly productive appeared to display more active/physical behaviours.
20% of the participants (3 of the groups) appeared to be working on idea generation without any overall organized plan or method.	By Day 3, some groups were tired, de-motivated and seemed unsure about what they should be doing.
Teams that have broken off into sub-groups, in order to tackle separate tasks, appeared to be suffering from a lack of communication.	As a deadline became nearer team momentum and activity increased.

Table 2. Sample Data from Interviews

Interviews
"…computers don't belong in the early stage of the design process…"
"…there was no point at which everyone was in, but that made it all more manageable…"
"…digital fabrication tools are a distraction…"
"…we could have benefited from a social session at the start…"

Table 3. Sample Data from Graffiti Wall

Graffiti Wall
"…the space you're in, really effects how you work as a group…"
"…without strong leadership the teamwork was weak and undirected…"
"…we weren't sure what stage we should have reached by the end of each day…"

5 DISCUSSION

On reflection the following issues appeared to be influential in the operation of this hackathon:

5.1 Icebreakers/Energizers

A common starting point for most teamwork involves techniques which familiarize individuals and bring them closer together. These techniques are often referred to as icebreaker or energizers [9]. In this hackathon icebreakers were not suggested as guidelines in the early formation of the teams and, except in those teams which introduced their own icebreakers, the remainder took longer to settle and establish themselves as a team. For instance, the simple task of wearing a nametag seemed to quickly overcome individual differences.

5.2 Leadership/Roles

Within this event participants had not previously worked with the same group of people. In the early stages of team formation there are always disparate views, lack of understanding of purpose and inevitably a lack of coordination. This is usually overcome by some form of leadership and the establishment of team roles, neither of which were prescribed in the guidelines. This appeared to lead to frustration and lack of coherence. However, it was also observed that the teams that took it upon themselves to appoint roles, appointed them for the week rather than daily, which left certain members of each team at a loss if their role was not active at that moment of time. Clear leadership would have helped to guide the teams through these occasional turbulent periods and minimized the problems of "social loafing" or "free riders". In addition, many participants expressed the opinion that they personally and the event in general would have benefited from a preset timetable with clearer objectives and from more facilitation and regular feedback from tutors.

5.3 Distractions

Most hackathons adopt a procedural sequence of daily activities that tend to begin with techniques like brainstorming leading towards a coordinated team push to a final solution or output. Where this procedure, which is followed by most of the team members, is disrupted by individual deviations, then this tends to destroy the overall team effect and ultimately slows down team progress. For example, when individuals depart from the group process in order to make individual use of computers for internet searching and digital making tools, then the cohesion of the group is weakened and progress in activities like brainstorming are disrupted. Disruptions of this nature should be minimized during the early stages of team formation and yet maybe highly appropriate at the latter stages when individuals are playing relevant roles agreed by the team.

5.4 Environment

The fifteen teams were distributed in four different studio spaces each containing more than one team. These differences had the potential to influence the operation of the teams. It was observed that the teams that were able to find wall space on which all the team members could see and actively participate in the development of their ideas maintained team cohesions, involvement and shared purpose. In addition, it was observed that comfortable relaxing furniture such as sofas and chairs appeared to diminish this heightened activity.

Our firm impressions are that all of these previous comments are interrelated and connected and also impact on the motivation of the teams at different stages throughout the event. For example, the use of icebreakers and strong leadership and the elimination of distractions in the early stages (Day 1) provide strong motivation in team building. Moreover, poor environmental conditions may well weaken team motivation during the middle stages of the event (Days 2 & 3) and consequently result in poor time keeping, lack of coherence and loss of purpose. In the final days of the event (Day 4 & 5) high motivation is paramount to ending with a flourish, on time.

6 THOUGHTS FOR THE CURRICULUM

In conclusion we have the following suggestions for those who intend to host a hackathon event within the teaching and learning environment of product design and engineering courses. We believe

that the essential nature of a hackathon rests in achieving the highest motivation for team-working throughout the event but with special regard to the guidelines and stimulation in the first day.
The following detailed recommendations are aimed at encouraging, maintaining and finally celebrating this high level of motivation:

1. Ensure that all team members are familiarized through the use of icebreakers and energizers at the beginning of the event.
2. Provide each team within their workspace with large amounts of wall space for display purposes and a central resource for collective discussion and working.
3. Provide guidelines on the formation and management of the operation of effective teams.
4. Discourage the use of individual facilities like computers and maker spaces during the initial stages of the event when team formation and building is paramount.
5. Provide guidelines for teams to assess progress and performance at the end of each day.
6. If teams occupy different work spaces try to ensure studios are as similar as possible with regard to wall space, table space, lighting and furniture.
7. Ensure at the end of the hackathon that key representatives (e.g. tutors, external partners etc.) provide a stimulating, relevant and future-orientated conclusion.

Finally, the external partner was suitably impressed with the overall level of student engagement and the quality of ideas/concepts generated over the course of the week. Early discussions are now underway regarding concepts with potential for further development.

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