‘Pop-up’ Maker-spaces: Catalysts for Creative Participatory Culture

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***Abstract*—The changing technology landscape has reshaped the relationship between producers and consumers and has signaled a shift towards more collaborative and social cultural forms. These changing cultural practices are referred to as ‘Participatory Culture’. While the Internet offers an always on and readily accessible mode of engagement and involvement within participatory culture, these platforms need to be complemented with collaborative and creative participation in physical spaces for sustained engagement in real world cultural activities. Recent research on maker cultures and the growth of maker-spaces offers very relevant lessons in this regard. Using this research as a point of departure, we propose a decentralized and semi-organized form of maker-spaces called ‘pop-up’ maker-spaces that could act as triggers to create engagement within communities towards creative and collaborative production and informal knowledge sharing. Further, we describe three workshops that were setup as ‘pop-up’ maker-space environments as a part of a case study to discuss our findings and insights. While all the workshops had a pre-defined thematic area, the final outcomes were very different and represented differing conceptual and material explorations conducted by the participants.**

Keywords- Participatory Culture; Collaborative Spaces; Creative Engagement; Co-operation; Awareness; Motivation; Digital Engagement.

I. INTRODUCTION

The changing technology landscape has reshaped the relationship between producers and consumers and has signaled a shift towards more collaborative and social cultural forms. These cultures re-consider the passive role of consumers as mere users of content from controlled and established channels to a much more active social and collaborative role - one where they actively access content through ever increasing number of dispersed channels, discuss, re-appropriate and share it. Media scholars and the Human Computer Interaction (HCI) community refer to these changing cultural practices as “participatory culture” [1] - a culture of creation, re-appropriation, sharing and collaboration. Literature points to the importance of participatory culture in today’s society including collaborative learning, an informed attitude towards intellectual property, better civic engagement and a more empowered concept of citizenship [1]. While the most common and current examples of participatory culture do seem to come from Internet based services and platforms, the history of participatory cultures predates these technologies and has always existed as a form of de-centralized expression particularly amongst the youth [2].

While the Internet offers an always on and readily accessible mode of engagement and involvement within participatory culture [3], research suggests that such platforms are not always successful in sustained engagement in real world civic and cultural activities [4][5]. Papert [6] also stressed on the importance of face to face interaction, with a diverse mix of skill levels, from complete beginners to experts, for informal learning in a social setting. While participatory culture is discussed exclusively as a form of Internet based media production and sharing [7]–[9] there is growing interest in the HCI community on a different but, in our opinion, closely related phenomenon of ‘maker cultures’ [10]. Maker cultures refer to alternative practices of material and technology ownership and use with a focus on Do It Yourself (DIY) repairs, craft, hacking, digital fabrication and electronic tinkering [10][11]. Research has also highlighted [11]–[13] the role of collaborative co-creation spaces called ‘maker-spaces’ [14] and ‘fablabs’ [15] in catalyzing maker cultures. These spaces aim to create accessible co-production platforms for physical products and promote collaborative and social problem solving [14][16], which is in-line with Jenkins’ [1] description of participatory culture. Hence, we propose that platforms like maker-spaces should be seen as the physical counterparts of online content production and sharing platforms and have the potential to configure participatory cultures within communities by aiding creative production and discussion. However, while maker-spaces and maker culture in general have an openness, democratization and empowerment driven intent [10][12][14], critical research has also pointed out the gaps between the ideal nature of their intent and the realities of practice [17][18]. The highly technological nature of the material and culture in maker-spaces tends to also make them exclusive and limited to a ‘techno-savvy’ audience [13]. In light of such critiques, we suggest that maker-spaces need to take a more decentralized and semi-organized form with permanent spaces being complemented by ‘maker’ community run temporary or ‘pop-up’ maker-spaces that could serve to engage larger communities in the means of creative and collaborative production and informal knowledge sharing. We argue that the temporal nature of these pop-up maker-spaces could serve to create interest in otherwise disengaged communities and help translate the open and democratic intent of the maker culture without requiring the large scale investments needed for a traditional

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maker-space. Moreover, the advent of 'maker' oriented portable kit based technology platforms like littleBits [19], SAM [20] and Printrbot [21] allows these spaces to take a mobile and decentralized shape and does not limit them to fixed areas with expensive hardware on site. Hence, we suggest these 'pop-up' maker-spaces could act as bridges for grassroots participation by virtue of being accessible and offering a low barrier to entry.

In this paper, we use one such platform, littleBits [19], and examine the role it can play in conjunction with specific spatial arrangements and low-fidelity materials in configuring a 'pop-up' maker-space setup intended to provoke creative engagement within different communities. We describe three workshops that were setup as 'pop-up' maker-space environments as a part of a case study to discuss our findings and insights. While all the workshops had a pre-defined thematic area, the final outcomes were very different and represented differing conceptual and material explorations conducted by the participants.

The paper is structured as follows: The conceptual considerations and the technological platform that we build on to develop the construct of pop-up maker spaces is introduced in Section II. In Section III, we present our case study using three workshops that used the pop-up maker space construct in real world scenarios and highlight our approach with participants from different age groups and professional areas of practice. Finally, we discuss our findings in Section IV followed by a conclusion in Section V.

II. CONCEPTUAL AND TECHNOLOGICAL CONSIDERATIONS

In this section, we briefly outline the theoretical considerations that helped frame the approach and design of the elements of decentralized and mobile "pop-up maker-spaces".

A. Participatory Cultures

Jenkins et al. [1], in their seminal work, defined participatory culture as

"a culture with relatively low barriers to artistic expression and civic engagement, strong support for creating and sharing creations, and some type of informal mentorship whereby experienced participants pass along knowledge to novices."

They also argue that a participatory culture also allows its members to believe in their contributions and feel "some degree of social connection" [1] with others and their opinions about their creations. In general, participatory cultures reward participation but do not force it. This idea stems from the advancements in technology that has allowed people to shift from their roles of passive consumers to active creators of content and more recently products using self-fabrication techniques [22][23]. Further, Delwiche and Handerson [24] discuss three broad classifications within participatory culture, depending on the nature of participation. Their work suggests that the nature of participatory culture is largely defined by real world factors like space, participants and their level of engagement with the community and the media being generated.

1) Consensus cultures

This is an "agreement based" culture that is typically work or productivity oriented, usually with specific goals that need to be met or problems that need to be addressed. A special form of this kind of participatory culture can be seen in "expert cultures" where people with "specialized knowledge" come together like in think tanks.

2) Creative cultures

This is a culture which encourages its participants to create, re-purpose, remix, share and comment within a safe and supportive environment. Participants are often very passionate about their areas of interest and creativity and are willing to share and build on their knowledge and creations. This kind of participatory culture is known to foster sustained engagement. The maker, remix and art cultures are examples of this type of culture. Work within this thesis would primarily explore participatory culture in this context.

3) Discussion cultures

This is a culture that fosters participation around specific topics of personal and professional interest rather than specific objects and outcomes. Engagement in this kind of culture is varied with participant's interests changing over time. Since the objective of this kind of culture is discussion and debate, the nature of participant exchange may vary from support to heated disagreement, often in real time. News sites and fan forums are examples of this type of culture. The discussion outlined in this paper primarily concentrates on creative cultures, with its focus on collaborative exchange, sustained engagement and creative production.

B. Maker Culture

Maker culture refers to practices related to DIY, craft, electronic tinkering and technology repair leading to the development of alternate notions of material ownership and use within 'maker communities' [12]. Lately, maker cultures have been given a lot of interest within HCI with empirical studies on maker identities and values [12], analysis of the modes of material engagement [25][26] and larger investigations into the democratizing effects of maker culture on technology and technological practices. Maker culture is also turning into a popular phenomenon rather than a fringe activity for specialized communities largely propelled by the rise of maker-spaces, hacker-spaces or fab labs across the world [10]. While discussions on maker cultures tend to take a largely technology centric stand point as opposed to the media centric outlook of participatory cultures, we argue that there is a natural overlap between them with a focus on practices of community building, knowledge sharing and democratized expression and material access. Further, we suggest that maker spaces provide the spatial setting and cultural framework for sustained engagement with diverse means of creative production.

C. LittleBits

LittleBits [19] is a technological platform for aiding rapid prototyping and electronic tinkering aimed at people with little to no prior experience with electronics. The platform is

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designed to be modular and plug and play in nature with little to no configuration needed. It consists of an assorted set of color coded magnetic 'bits' that encapsulate a specific function like temperature sensing, light sensing, USB power, Direct Current (DC) powered motors, servo motors, Light Emitting Diode (LED) lights and so on. Based on the nature of the bits, they are divided into four categories – power (blue), input (pink), output (green) and wire (orange). These functions can be arranged in linear sequences that can then be triggered using programmatic, cloud connected or sensor driven bits. The color coding of the functions allows for ease in identification and configuration aided by their magnetic nature that only allows the bits to be connected in their correct orientation (since the bits repel each other in an incorrect orientation). The bits by themselves are intended to act as alternatives to bare bones electronics components and allow ease of use while prototyping the interactive functions of a concept. Therefore, they are intended to be used along with other lo and hi-fidelity materials that would create the external form and tangible interfaces for the concept being prototyped. LittleBits [19] were chosen as the technological material for the purposes of our workshops because of their ease of use and configurability due to the limited time available to the participants in a pop-up maker-space scenario.

III. CASE STUDIES

As stated in the introduction, our goal was to explore the portable kit-based platform littleBits [19] as a material in a workshop setting to explore the construct of a 'pop-up' maker-space for configuring creative participatory cultures. These workshops were conducted as a part of larger project, which aims to investigate technology centric design interventions as a means of configuring public engagement and participatory culture. In this paper we describe and discuss the outcomes from three workshops conducted with different user groups: (i) Children from the age group of 7 to 12 years, (ii) Design researchers, (iii) Professional graphic designers. These groups highlight a broad spectrum of creatively inclined individuals with differences in age, nature of practice and access to technology. While all three groups identified engaged with creative production, with children regularly engaging in creative activities at school and in their home environment, design researchers using various prototyping methods in their design projects and graphic designers primarily engaging with creative production in a professional setting, all groups had limited to no experience with the use of tangible technological materials in practice.

We organized pop-up maker spaces in a workshop setting with each group of participants separately. Due to the differences in the nature of each group, the approach used to engage with them in the workshop was different. However, the physical space in each case was temporarily converted into a maker space like setting, with free and easy access to prototyping materials like colored paper, card sheets, foam boards, paints, scissors, brushes, ice-cream sticks, rubber bands, cups, assorted lego bricks and play-doh (Figure 1). Multiple littleBits [19] workshop kits were used as the primary technological material for provoking electronic tinkering. The quantity of each material differed based on the themes of each workshop. This also helped us evaluate the role and impact of supportive materials on the nature and form of engagement when used in conjunction with littleBits [19].

Figure 1. The spatial setup (top) and the materials used (bottom) in the pop-up maker-space.

As the workshops were conducted in the form of open pop-up maker spaces, the format of participation was either open (walk-in) or sign-up (pre-registation) based. While the sign-up based workshops began with an informal introduction to the littleBits [19] platform and a loosely defined theme for the day and ended with a presentation and feedback, in the open workshop setting, the introduction was interspersed between the activities. Previous experience with littleBits [19] or any other technological tools was not required for any of the workshops.

The sub-sections below describe each workshop in greater detail. Photo-documentation was the main analytical tool used for the purposes of this research. Therefore, a large number of photographs were collected during the workshops, both of the final outcome as well as the interim explorations by the participants. These photographs were then analyzed to identify differences in the mode of engagement and processes undertaken by each group of participants to arrive at their respective outcomes.

A. *The First Workshop with Children*

The first workshop was conducted as an open (walk-in) exploratory pop-up maker space with children. It was conducted as a four hours long workshop, with 23 participating children. There were three moderators in the workshop. All moderators were well versed with littleBits [19] and were practicing designer researchers and 'makers'. The theme of this workshop was "Sound and Motion". This workshop was setup as a part of a larger maker event, open

for children from the age group of 7-12 years. An enclosed hall was taken up for the workshop adjacent to a library's open lounge area. The materials for the workshop included the littleBits [19] kits and craft materials described earlier. As there was no planned introductory session, artifacts such as a bend sensor controlled wind mill and a simple draw-bot were made and displayed on the tables in the workshop area along with the littleBits [19] and the craft materials to give a visual explanation of the bits' potential and to provoke interest. Multiple copies of the littleBits [19] 'getting started' guide containing simple projects were also placed on the tables. The tables were arranged linearly with chairs for working. The bits themselves were grouped by color and kept on a central table along with other materials.

The workshop started with children observing the demonstrative interactive artifacts. The moderators gave a quick demo of the different ways of connecting the bits to the children in small groups by connecting and making a small circuit with sound and light. The participants explored the bits on their own for half an hour in the workshop. The interaction between the participants and moderators was more intense during this exploratory phase when the children were trying to identify different possibilities of using the bits. However, after the first half an hour, children started working on their own projects. Some of them who knew each other beforehand worked in groups of two while rest engaged with them individually. While most of the projects started with creating a sound or light driven artifact, slowly they progressed towards creating a button driven car, a drawing car and interactive music boxes that worked through different sensors (Figure 2).

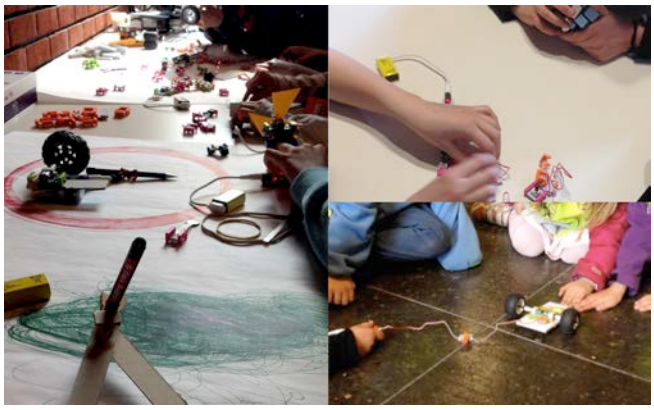

Figure 2. Some outcomes from the first workshop.

Looking at the artifacts made by the participants, littleBits [19] in conjunction with the available craft materials and the open spatial configuration where all the participants engaged in similar activities played a pivotal role in triggering creative engagement. Further, the ease of connecting littleBits [19] lowered the barrier to entry tremendously and a quick demo was effective and sufficient for the children to get started with making things. Finally, successfully being able to build feedback in the system developed confidence in them leading to greater engagement and attempts at creating more complex artifacts.

B. The Second Workshop With Design Researchers

This workshop was conducted in a design lab with similar materials as the first case at a university with eight participating design researchers. Amongst them, four were PhD fellows and the remaining participants were professors in design research. Participation in this workshop was based on pre-registration and it was conducted over a duration of three hours. The theme of the workshop was light and motion. The participants in this workshop had no previous experience with using littleBits [19].

This workshop started with a formal presentation on littleBits [19], which introduced the participants to the platform and its basic functions and interactions. Possibilities of using the platform as a prototyping tool in design projects were also explained briefly to closely relate the materials with the participant's practice. After the introduction, the participants used the littleBits [19] manual do some initial exploration followed by a round of brief ideation. They moved organically from very roughly thought out ideas to trying to make interactive prototypes of their concepts, highlighting the really low barrier to entry to the prototyping process. One wireless remote based car was made by one group of three participants while other participants made by a 'head banging' light device that blinks with neck motion, a drawing machine and Arduino [27] connected lights (Figure 3).

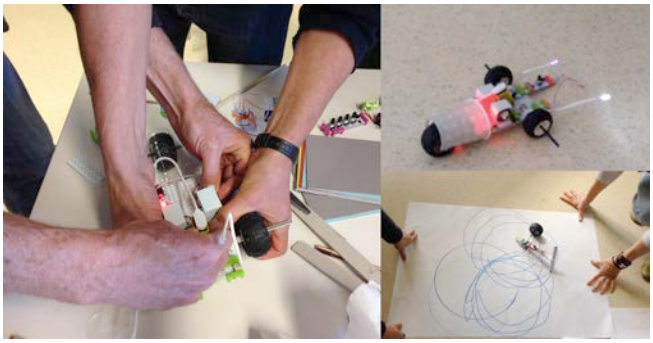

Figure 3. Light following bot and drawing bot created by participants in workshop 2.

We observed all the participants completely engaged in looking for extra materials on their own in their environment to complete their prototypes. Although all the participants felt that they lacked a very clear intent of a project to make something more complex and just littleBits [19] were not enough invoke more advanced projects ideas. However, most of them indicated that they wanted to come back to this space to prototype their own design ideas.

C. The Third Workshop with Graphic Designers

The third workshop was carried out in the context of a design school. There were twelve participating graphic design professionals and students in this workshop. An open foyer in the design school was identified as the space for setting up the pop-up maker-space. A similar set of materials was arranged for the participants in this workshop as well with a higher quantity of sketching and painting tools like

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brushes, different kinds of paints, crayons and markers due to the workshop theme - 'printing/drawing machines'. It was a full day workshop conducted over a duration of five hours. Like the previous workshop, the first activity in this workshop was a formal presentation on littleBits [19]. It was introduced as platform for quick prototyping and sketching in hardware and a tool that can be easily incorporated by graphic designers with no experience with technological prototyping as a means for creative expression. When the making session started, it was conducted as a round table activity. The participants formally introduced themselves and their backgrounds to each other. The initial plan was to do a similar exploration exercise with the bits followed by jumping into projects afterwards in groups. However, being practicing designers, the participants started to work with the platform while ideating concepts simultaneously. While two participants who were classmates made a group, others embarked on individual conceptualization and rapidly making ideas.

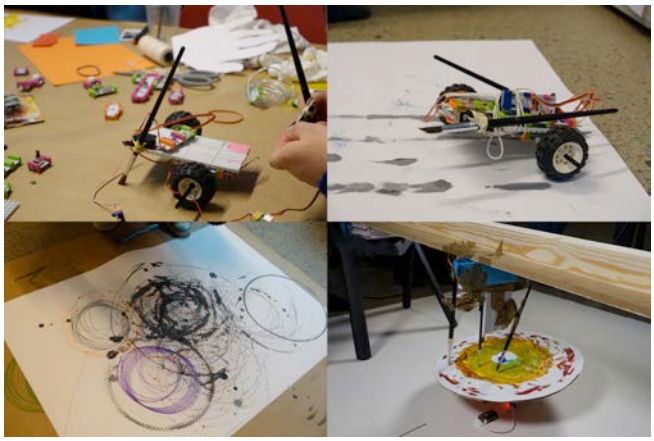

Figure 4. Drawing machines and artwork created in workshop 3.

This time we observed the participants did not spend time exploring littleBits [19] in isolation. Each one of them took time to plan their project outcomes and prepared materials for it. Their final projects were more finished in comparison to the previous workshops as well in addition to having very different interactions despite all of them being drawing machines (Figure 4).

IV. DISCUSSION

We analyzed our first hand observations and documentation for insights with a keen focus on uncovering the role of modularized and easy to use technological platforms like littleBits [19] in shaping the physical spaces into cultures that foster creative engagement and lead to an organic sharing of knowledge and ideas.

Firstly, a clearly designated physical space with an open and exploration friendly configuration helped create a context for the exploration and use of the technological material (littleBits [19]) specifically and engaging with electronic tinkering in general. For example, in the first workshop with children, even before children could get a hands on 'maker' experience, the set up of the space with demonstrative artifacts, freely kept materials and bits, and various manuals combined with free seating arrangements conveyed the nature of the space. The crafts materials on display also contributed to the maker space environment. While the library's open lounge required greater efforts to convert it into a space for creative activity, the design studio for the second workshop and graphic design school foyer in the third workshop lent itself naturally to the nature of the activity.

Secondly, the technological material combined with quick access to seasoned makers in itself played a pivotal role in driving the creative focus and confidence in exploring ideas which previously seemed out of reach by the participants. For instance, during the first workshop children were fascinated by the interactive windmill on display but displayed hesitance in lifting and examining the artifact itself. However, when moderators helped them in making similar interactions on their own, it led to a realization of the ease of getting started with electronic tinkering and the fact that they could also create something similar to the artifact on display on their own. This led to the children being less in awe with what they were seeing but more engaged with what they could accomplish on their own by using the bits. Although one of the downsides of such a setup was that many children started making projects very similar to what was already on display. A similar but slightly different response was observed in the other two workshops, an introduction to the platform and a small session with the bits sufficed in breaking the fear of working with technological materials and participants then started focusing on their ideas and concepts rather than trying to learn the technology itself. We could see modularized easy to use platforms like littleBits [19] as an encouraging platform that seemed to get out of the way and instead let the participants have conversations and engage with making things without having to go through a prolonged learning processes. We argue that such quick access platforms are pivotal in creating initial interest in creative maker cultures at 'pop-up' or temporary spaces where there is limited time to engage with the materials at hand.

Thirdly, we observed that while the bits themselves largely formed the internal components of most ideas, they were the primary drivers of conversations and the exchange of knowledge. As discussed in Section II, this technological platform in itself consists of a large number of bits that encapsulate a single function that compound exponentially into a huge number of potentially complex interactions when configured into different kinds of arrangements. Therefore, it can be difficult and quite monotonous for one individual to sit and learn all of these functional characteristics and configurations. However, engaging in the act of making and in an organic and exploratory manner coupled with exchanges with other participants, the participants inadvertently get exposed to most of the different components through the process of helping and watching other people engage with them. This was observed more prominently in both the second and third workshop, where individuals working on their idea kept to themselves during the making process but constantly engaged in listening and

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contributing to the discussions around the function and use of a new bit along with inquiring about bits that they stumbled into or saw lying around.

Finally, craft materials were used to construct the physical form of the ideas conceptualized by the participants and remained pivotal in all the three workshops. The bits made complex concepts feasible and quicker to configure than with traditional electronic toolkits like the Arduino [27] but the craft materials allowed for the interactive functions to have an engaging and usable form. For instance, in one of the projects in the third workshop made by a two graphic design students, the function of a large scale drawing machine was prototyped using the bits but the concept could not have been complete without the rotating plates and the scaffolding for the paint bucket. Finally, the use of external camera lights added an element of drama to the art installation and made it even more engaging. Therefore, we argue that a technological platform like littleBits [19] needs to be situated within a larger ecosystem for exploratory and creative engagement. Specifically, in the case of a 'pop-up maker space' having a diverse set of electronic and non electronic reconfigurable tangible materials is critical to engage and fully involve participants and help them in physically realizing their ideas to their fullest potential. The temporal nature these pop-up arenas leave little space for isolated struggles with the tools themselves which can hamper the drive to work with the ideas in the limited timeframe.

V. CONCLUSION

The paper illustrates the use of 'pop-up' maker-spaces as a construct to configure creative culture based engagement and participation, using modular and easy to use technological platform in conjunction with craft based materials and an open spatial setup for fostering creativity in participating communities. Three workshops were organized, in the form of pop-up maker events. The first featured children from the age group of seven to twelve years, while the remaining two were focused on design researchers and graphic designers. The main tool for engaging the workshop participants in process of tangible construction and representation of their ideas was littleBits [19]. The process was photo documented and analysed.

First, we remark that using the modular technological platform, littleBits [19] for DIY prototyping proved effective for the workshop participants. While the intent of participating in the pop-up maker-spaces differed for all three categories of participants in the three workshops, the ease of access and understanding of littleBits [19] played a pivotal role in engaging the users. We witnessed that the participants engaged extensively with the bits and the other craft material provided to make their ideas in all the workshops.

Our key finding was that a hands on popup maker-space environment engaged participants in collaborative exchanges around an easy to use technological platform led to creative outcomes even though all the participants were completely new to electronic tinkering. The spatial configuration and access to technical and craft based materials helped catalyze the engagement and explorations. Moreover, they also served as triggers for exchange of knowledge and informal conversations among the participants who suggested alternative bits and techniques to each other based on their limited experience to aid the construction of each other's artifacts.

The insights and early results from these pop-up maker-spaces can serve as a foundation for further research on the role of technological toolkits and materials on sustained engagement and creative expression. Our future work would involve identifying design patterns for configuring pop-up maker-spaces along with exploring other technological toolkits, materials and diverse spatial configurations for exploratory and creative DIY engagements amongst participants.

VI. ACKNOWLEDGEMENTS

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