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From participatory design to co-creation: Using social media to engage youth

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Abstract

UNICEF Pacific faced the problem of how to engage and empower Pacific youth more through social media. The proposed solution was to invite Pacific youth to contribute to the design of a climate change game, the 'Pacific Climate Challenge'. Such an approach presents challenges including how to effectively engage co-creators, how co-creators will communicate and contribute, how contributions will be managed in a virtual environment and how decision making will be managed. This paper explores co-creation in a virtual environment using Participatory Design (PD) theory. Our findings highlight the importance of managing communication with a geographically dispersed team, managing development in an unstructured environment, the importance of leadership and access to both knowledge and skills. We identified that in co-creation environments as compared with typical PD environments, the development process can be less structured with no clear management hierarchy, roles evolve and change and standard success criteria may not apply.

Keywords

Co-creation, participatory design, Information systems development

INTRODUCTION

Increasingly people collaborate online through social media, to share knowledge, to contribute content, and to co-create online materials including software. For organisations such as UNICEF it is vital that their information reach as many people as possible. Social media can be a valuable communication channel for this. UNICEF (Pacific), a UNICEF chapter, recognised the value of social media particularly for distributing important information on matters such as health, emergencies, climate change and education (UNICEF 2011).

Engaging youth through social media is a key focus for UNICEF (Pacific). Participation is encouraged through blogs, a Facebook fan page, posting of online videos and a range of other resources posted on their web page. Social media effectiveness however is dependent on how it is used; if the users are not engaged, then messages will not be heard, and information is not communicated. Research has found that often a few contributors are responsible for the bulk of contributions to online communities (Rashid, et al. 2006). Despite the extensive use that people make of technology and social media in particular, it does not necessarily follow that they will engage with the content and contribute. When they do contribute they want to be heard, they need to believe their interactions are meaningful and they want information on how they can make a difference (UNICEF 2011, Gerodimos 2012).

UNICEF (Pacific) recognised the importance of learning to effectively manage their engagement with their online community (UNICEF 2011). They were challenged by Pacific youth to be "younger and less boring" in using social media. UNICEF staff found that Pacific youth, were not contributing significantly to, or engaging with, content shared on the UNICEF (Pacific) Facebook fan page There was a drive to explore social media's ability to empower selected youth to engage with UNICEF (Pacific), and exercise their right to receive and impart information using any media of their choice, and influence decision making affecting their own lives. Moreover, Pacific children, youth and their families are on the front line of key global issues in particular climate change, this beckoned UNICEF to gain more insight into the potential of social media and to explore and learn how to engage fans to mobilise and achieve results for children. The proposed solution was to invite Pacific youth to participate in the co-creation of a Facebook game, '*Pacific Climate Challenge*'.

Involving users in software design and development using participatory design (PD) is considered essential for developing successful systems (Avison and Fitzgerald 2003). However, PD theory, it is argued by Marcus and Mao (2004) needs to be reconceptualised for the key reason that the nature of IS development is changing. Today, many IS projects involve more stakeholders compared with when PD theory was first proposed, for example the implementation of ERP systems where there will be many users (Marcus and Mao 2004).

Social media can facilitate the participation of many people in the co-creation of software (Nakki and Koskela-Huotari 2012). There is however, limited published research on the software co-creation process. Our paper describes a single case study: the development of a unique co-created game for the purpose of engaging youth. The research questions we sought to answer were:

- Can a co-creation activity such as developing a game, be used to effectively engage youth?
- What are the factors for the successful co-creation of software in an unstructured, dynamic, virtual environment?
- Can PD theory as espoused by Marcus and Mao (2004) be extended to a virtual co-creation activity? What might be different?

PARTICIPATORY DESIGN

PD is defined as "the direct involvement of people in the collaborative design of the things and technologies they use." (Shneiderman and Plaisant 2010 p. 132). PD involves users and analysts working in partnership on the same team as distinct from "expert and non-expert" (Avison and Fitzgerald 2003 p. 109). The reasons why PD is seen as an effective software development approach has been widely discussed. Reasons include increased user buy-in, leading to greater user satisfaction with the final system; better more innovative systems and systems of higher quality (Avison and Fitzgerald 2003 p. 109; Shneiderman and Plaisant 2010 p. 132).

There are also issues relating to users' involvement that are important to consider for a successful outcome. These include the need to select the right users with the appropriate skills and knowledge; ensuring users understand their roles, clear articulation of the role users will play in decision making and ensuring user input is taken seriously (Avison and Fitzgerald 2003; Lemmergaard, et al. 2005; Shneiderman and Plaisant 2010 p. 134).

Marcus and Mao (2004) argue that "Traditional IS participation theory hypothesizes a link between "participation" (or the related notion of "involvement") and "system success," defined in terms of system quality, user information satisfaction, user acceptance, and system use, and affected by various contingencies such as task and system complexity." In exploring IS participation theory, they argue that the three key reasons often proposed as to why PD leads to more successful systems need to be challenged. Briefly they reason that:

- 'User buy-in' presumes that because users participate they are more committed to the new system and encourage others to use it. The issue they identify however is that it is unrealistic to expect all users can or will participate. How can system success be explained when there are users who did not or could not participate in the development for example, in e-commerce systems development?
- 'System quality' it is suggested is improved through the participation of users. However, they argue that there is no guarantee that the recommendations made by users will be incorporated into the final system. Further they suggest that the role of developers in facilitating user participation will have an impact on system quality.
- 'Emergent interactions' describes the effect of closer interactions between users and developers resulting in a relationship where more information is shared and user requirements are more likely to be built into the final system. However, participation can be a negative, outcomes may not be as predicted and the impact of other factors such as developers' attitudes and organisational culture can change the relationship between users and developers (Marcus and Mao 2004).

Consistent with Marcus and Mao (2004), Kyng (2010) draws attention to the growing diversity of users which necessitates a reconsideration of how PD is employed.

CO-CREATION AND SOFTWARE DEVELOPMENT

Co-creation is considered an extension of PD (Banks and Potts 2010; Nakki and Koskela-Huotari 2012) usually in a virtual environment. We define co-creation as an approach where designers/developers, users and others work as a team through their direct involvement in the design of a software product. Participants may or may not be known in advance. Co-creators' contributions can include: contributing design ideas including system functionality and features; providing input on interface design; information and general feedback and testing.

The methods used for co-created software grew out of PD methods (Holmquist 2004). In PD organisational environments however, the users are generally known, are specifically selected with their roles and contributions closely managed and well defined (Shneiderman and Plaisant 2010 p. 133). Hagen and Robertson (2009) argue that with social technologies, participation changes the design process particularly in relation to roles and responsibilities of those contributing. Participation may include identified user groups but not necessarily identified individuals. They suggest that "at the beginning of the design process there will be no clearly identifiable existing community of users, rather they have to be brought 'into being' as part of the project" (Hagen and Robertson 2009).

The advent of Web 2.0 has enabled more users to become actively involved as co-creators in software development encouraging creativity (Kumar 2007; Nakki, et al. 2011). Online participation is often easiest for users as a co-creation mechanism (Nakki et al. 2011). Online technologies in particular social media platforms, enable information exchange and communication across geographical boundaries resulting in an increase use of software development by virtual teams (Reed and Knight 2010; Rutkowski, et al. 2002).

Co-creators are likely to come with a wide range of skills and expertise, but not necessarily development skills and they may come with different agendas. Engaging participants can be achieved through online tools which can encourage the development of ideas, seek feedback from users, involve users in testing, facilitate online meetings and crowdsourcing (Banks and Potts 2010; Chang and Kaasinen 2011; Nakki et al, 2011; Ropponen, et al. 2010).

Organising and managing virtual teams is challenging in itself, there are also other issues where social media is used in a co-creation process (Hagen and Robertson 2009). For example the context of software use may not be clear; users are often diverse; decision making can be distributed and co-creators are likely to be geographically dispersed and in different time zones. Additional issues for virtual teams include managing communication, team cohesion, in particular dealing with conflict between team members, technical resources, cultural and language differences and the inexperience of team members (Olson and Olson 2000, Rutkowski, et al. 2002, Reed and Knight 2010).

RESEARCH APPROACH

Interpretive research approaches are particularly valid when looking at rich phenomena that cannot be easily described or explained by existing concepts or theories (Walsham 1995). Interpretive research involves analysing people's actions through a detailed study in their 'natural settings' which leads to a richer understanding (Neuman 2003 p. 76). A key objective of our research was to explore an actual co-creation process in a virtual environment. Marcus and Mao (2004), argue that more research in PD is needed in specific IS contexts "We recommend single-context studies here, because we would expect systematic variations across contexts in stakeholders, participants, and change agents." Ours is a single case in a specific IS context.

We explored co-creation from the perspective of PD theory as described by Marcus and Mao (2004) who argue that IS participation theory needs to be revisited as described earlier. They suggest that given the range and types of systems developed today, there is a need to examine IS participation theory in other contexts, particularly contexts where the user base may be unknown or very large, which was the case in our study.

The research was undertaken by an academic who undertook the data collection from the developers and data analysis. In addition she was a participant observer of the process of the game's development. The second author, a UNICEF (Pacific) communications specialist (referred to as the 'Sponsor'), participated throughout the project, shared correspondence and provided reflections on the process. Data from the co-creators was provided by him. He does not have a technical background but was directly responsible for the conceptual design of the game. He consulted with other specialists, sought input from and communicated with the co-creators and oversaw the development team's work.

For our research the data were drawn from a number of sources:

- Face to face semi structured interviews with the three developers (30-45 minutes in length) focusing on the key issues relating to the co-creation process. These included how they undertook the development process with a geographically dispersed team, how they engaged and managed the interactions with the other co-creators, the mechanisms for communication and how they incorporated new ideas and requests for changes. They were also asked how they generated and refined their ideas particularly in relation to the Sponsor's brief. There were also questions exploring their motivations for becoming involved.
- Reflections and feedback from the staff at UNICEF (Pacific) and the development team were collected throughout the development process. These included e-mail correspondence, testing results and voice communication through Skype.

- Email correspondence between the co-creators detailing the processes and interactions and other contributions they made through social media.
- Formal written reflections and correspondence from others involved in the co-creation process including input and feedback from the testers to the developers via email and social media.
- Usage data from the game, feedback and social media activity on the UNICEF (Pacific) fan page post the game's implementation.

In re-conceptualising participation theory Marcus and Mao (2004) propose a revised theoretical framework encapsulating the elements related to user participation in systems development. The co-creation model as a technology solution was explored through the lens of their framework. The data analysis involved an exploration of the data to identify the differences between co-creation in an unstructured, dynamic environment compared with PD in a more structured and managed organisational context using the Marcus and Mao (2004) 'IS Participation Theory Elements' (the actors and their roles and the participation activities), these are discussed in more detail later in the paper. The data were analysed from the perspective of these elements.

THE 'PACIFIC CLIMATE CHALLENGE' GAME CASE STUDY

The brief from UNICEF (Pacific) was to develop, pre-test and integrate a game application to be run on their web page and Facebook fan page. It was to be co-created and include contributions from Pacific Facebook fans. The game was to focus on the climate change challenge in Pacific remote communities, and to encourage the participation of youth in addressing the challenge. The structure was to be open ended to enable and facilitate learning on the challenges and opportunities climate change presents to those living in the Pacific. UNICEF (Pacific) sought and received financial support from the Commonwealth of Learning (COL) in Canada to take the game from an idea to an embedded feature on several UNICEF Facebook platforms.

The Sponsor conceptualised the co-creation process and invited four adolescents from Fiji to be 'social media facilitators'. The development team were three Australian research students who were paid for their work. All had strong technical backgrounds and had developed games for Facebook or other internet based games. All were from non-English-speaking backgrounds (China and Bangladesh). Two of the developers were female. One was working in Hong Kong and had not met the others. Although two developers were located in Australia they were not co-located. Other co-creators included self-selected Pacific youth, climate change experts, UNICEF contributors, UNICEF (Pacific) staff based in Fiji, testers based in China and the funding organisation COL.

Figure 1 describes the locations of the co-creators. The one way arrows indicate that input was provided by participants but with no further interaction. The two way arrows indicate there was ongoing dialogue between the participants at different points during development, as can be seen most interactions were two way.

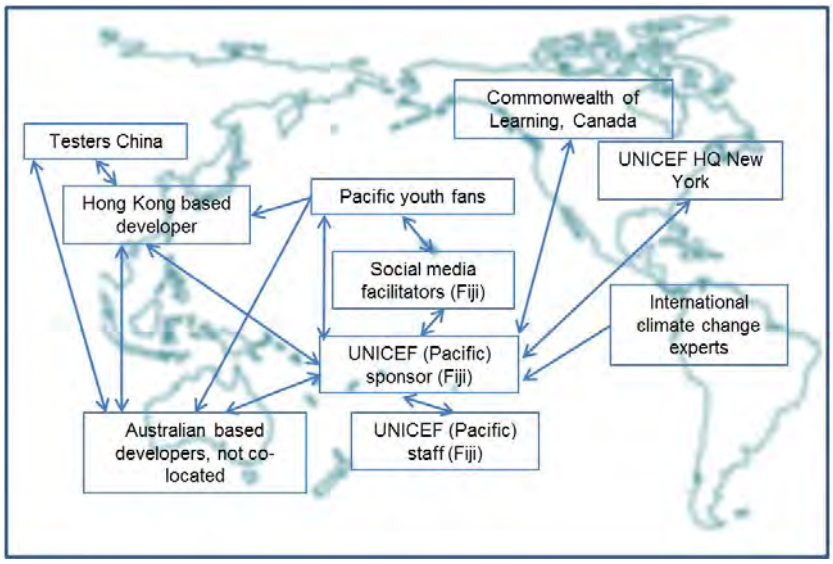

Figure 1 Location of co-creators

The Development Process and engaging co-creators

The social media facilitators posted a photo together with a message inviting input on the game and launched this as a Facebook album with text announcing and encouraging UNICEF (Pacific) Facebook fans to participate and to contribute to the game's design. Giving young people the opportunity to contribute to share ideas and be heard

is recognised as important for encouraging engagement (Gerodimos 2012). Input and comments came from many fans, as well as numerous fans hitting the 'like' button. The responses suggested that the game needed to be very interactive, interesting and colourful. It should not be a boring knowledge based game. Other more detailed comments from fans included "Something that is proactive and outlines things we can do now, rather than pointing fingers and what should have been done." and a request for "role playing, simulation". Postings from the fans can be found at https://www.facebook.com/media/set/?set=a.10150136957170039.325427.168599115038&type=1.

The brief made it clear that the game was not about climate change but about encouraging players to think about climate change coping strategies. An overriding objective one developer explained was "we have to look into many issues. It should not be very complex. It must be very simple. For Facebook users it must be really easy. They are passing the time so they don't play it very seriously." The developers found the fan page postings very helpful and acted on the key message that the game should not be too complex and must be attractive.

Those aspects of climate change relevant to the audience had to be identified. This was one of the more difficult tasks given input was coming from several sources. The developers needed to meet the requirements and ideas of all of those involved. One developer's frustration in finding the right direction is expressed in this quote.

"Developing the ideas was a very challenging part, if we go to the published literature we come up with hundreds of ideas. It was very challenging to know what the audience would like. We are all Facebook users so we know that in Facebook we don't want to be serious and [it] must be very easy so we want to pick the right one that people will like. That was very challenging. At one point we were very frustrated as to what would be the most suitable one. So many ideas and we had time limitations to develop the game so we must choose the right one."

Three themes emerged after consultation with UNICEF (Pacific) staff who sought input from other climate change experts. The three themes were: the CO2 Reducer challenge which requires players to identify potential CO2 emitters; the Flood Tales challenge highlights the causes of floods and the need for flood mitigation; the Evacuate Life challenge requires players to understand the climate change threats and initiate action, for example to evacuate or rebuild before there are serious consequences. Links to other websites with information on the three topics was researched by the development team and included in the game facilitating further learning. The game can be found at http://apps.facebook.com/unicefpacific/.

The team, through an iterative process, conceptualised their design with the Sponsor providing regular feedback on the concepts, sources and references used to validate the game ideas. The input drew on information from climate change experts in and outside of UNICEF and from other co-creators including the funders (COL). The facilitators continued to engage and respond to input from other Pacific youth throughout the process.

Each member of the development team developed one theme. They tested for errors and the game was tested with UNICEF (Pacific) staff who provided technical feedback, the facilitators provided feedback and to test with a real audience one developer asked young friends in China to play the game.

CO-CREATION AND PD THEORY

Reflecting on the co-creation development process, the *Pacific Climate Challenge* game demonstrated that it is possible to co-create and collaborate across distances and time successfully; it is possible to motivate and engage a wide range of people. Marcus and Mao (2004) describe their purpose in theory building as posing the question "How can change agents employ participation practices to increase the chances of success in varied IS development contexts?" They argue this means we must be clear about "1) the success outcome, 2) actors, including change agents (e.g., developers) and others (e.g., users), 3) activities devised by change agents for others' participation, and 4) hypothesized links between activities and outcomes". Using the Marcus and Mao (2004) framework we evaluated the co-creation process, what helped facilitate success and what the co-creation challenges were. It should be noted that Marcus and Mao in describing the elements of their PD theory suggest the context for PD is usually large organisational systems, something quite different to our case study.

1) The success outcome, did the co-creation of a game lead to greater youth engagement?

The key success outcome measure was the extent to which the game achieved UNICEF Pacific's goals of engaging Pacific youth. The game works and from our feedback is being played and enjoyed. Since its launch there has been a steady increase in activity on the UNICEF (Pacific) Facebook fan page. Facebook is one of several social media applications employed by UNICEF (Pacific) and the game is now an imbedded activity on the fan page. Early in 2012 there were fewer than 10 monthly hits on the site compared with nearly 400 by mid-March 2012 following a promotion of the game on Facebook. Facebook fan page usage data indicates that more than 88% of visits to the fan page are users accessing the game. Although not all the activity can be ascribed to the game, the increase in engagement did come about following the use of Facebook as a platform for co-creation of which the game was one initiative. Feedback from the fans has been good with many 'likes' recorded.

At the time youth were invited to contribute this was the most significant engagement recorded by UNICEF (Pacific) Facebook fans. A UNICEF press release highlighted the impact of engaging their Facebook fans in the co-creation of the game and confirms that the objective regarding engagement with youth was achieved.

"UNICEF (Pacific) recently tested the use of social media site Facebook.com as a participatory platform for engaging potential champions for children in communication on the topic of climate change in the Pacific. The test showed that when the UNICEF (Pacific) Facebook fan page was used merely to share information, fans did not display any significant engagement in posted content. However, when invited to co-create content for the Facebook page, interaction in terms of fans sharing comments, ideas and expressions of interest grew by more than 1600%. Similarly – the number of new subscribing fans to the UNICEF (Pacific) Facebook more than tripled. Using the social media site for two-way communication with individuals and groups in other words proved more effective to engage with them." (UNICEF, 2011)

Shortly after the game was released a request came from Voices of Youth (a UNICEF website supporting young people) to embed the game on their website which the developers subsequently did. Our evaluation suggests our objectives and those of UNICEF (Pacific) have been achieved. The game was considered by UNICEF (Pacific) to be a significant achievement as well as demonstrating the potential of interactive digital media to facilitate participatory social dialogue and channel this into a tangible product and action. A major objective was to increase Pacific youths' engagement in their Facebook fan page and to empower the UNICEF (Pacific) community to contribute. The game is being used in the context for which it was designed and the benefits are being realised by UNICEF (Pacific).

The success of the co-creation approach used in the case study has been shared with other UNICEF staff and documented in a report on Social Media (Obregon 2012). The approach is now promoted as good practice for social media engagement and provided as an exemplar for digital engagement. It is also promoted as a mechanism for using technology for climate change action. Various Government officials in Fiji and the Secretariat of the Pacific Community are also interested in the approach. Learning more about this has enabled UNICEF (Pacific) to further refine its strategy for co-creation of content and online promotion.

2) The Actors

Marcus and Mao (2004) identify a number of actors in a PD process. *Stakeholders*: "those who are likely to be affected by a solution" they are the most obvious participants in the development process, their use and acceptance of the system is most important. *Participants*: are a sub-set of the stakeholders participating in development activities and possibly implementation. *Change agents* undertake roles which differ from the Information Systems (IS) specialist as they help in the design and conduct of stakeholder participation, this can include identifying who will participate and how participation might be managed. *IS specialists* are defined as a sub-set of the change agent group.

Using the Marcus and Mao (2004) definitions, Table 1 describes the actor roles played by our co-creators.

Table 1 Co-creators and their roles

Co-creators	**Actor role**
UNICEF (Pacific) Sponsor	Stakeholder, Participant, Change agent
Pacific youth social media facilitators	Stakeholders, Participants, Change agents
Developers	Stakeholders, Participants, IS specialists, Change agents
Pacific youth fans	Stakeholders Participants
UNICEF (Pacific) staff	Stakeholders, Participants
UNICEF staff	Stakeholders, Participants
Testers	Participants
Climate change experts	Participants
Project funder (COL)	Participant
Researcher	Change agent

Table 1 highlights the variety of actor roles our co-creators performed. However, the Marcus and Mao (2004) definitions were insufficient to describe the extent of the actors' roles. The funders wanted to encourage learning but were not direct stakeholders as defined by Marcus and Mao (2004). They would not be interacting with the game and were not the target audience but they provided the impetus for its development. The development team

were stakeholders given their motivations for participating but would not be playing the game, they were also change agents because they initiated testing and co-ordinated some of the input from other co-creators. The social media facilitators were clearly co-creators and the target audience but they were also change agents having helped identify how others could contribute and managed some of the input. UNICEF (Pacific) staff are unlikely to play the game but they are stakeholders because the success of the project, in terms of using social media, is important for them from a learning perspective. The testers from China were not stakeholders as they are not the target audience. Thus some participants were not part of the wider stakeholder group, some change agents were also stakeholders and the IS specialists were both change agents and stakeholders.

3) Activities of change agents for others' participation

In updating participation activities Marcus and Mao (2004) argue that participation impacts on the success of the 'solution' developed and on its implementation. Success measures can include developers' satisfaction and the user participants' satisfaction with the process. Implementation success relates to change management and preparing the users for the change and whether the users "adopt the system, use it as expected, and/or use it with the desired effect" (Marcus and Mao 2004). However, they caution, well designed participation can lead to success of both the solution and implementation but it is not enough to ensure success. Further they argue "that the relationships between participation activities and outcomes are neither necessary nor sufficient, merely influential."

We would argue however, that how participation is encouraged, supported and managed in a co-creation environment is critical and is certainly more than influential. In community sponsored projects such as this one involving co-creation, the relationship between the activities of the co-creators and their contributions and the outcomes is clear as we have demonstrated. Identifying and encouraging the people with the right expertise or background to participate is an imperative otherwise the solution will not be used. For example the Sponsor's idea to appoint Fijian youth as social media facilitators was a key to ensuring participation of youth as they were able to engage and communicate effectively with the target audience. The requirements of Pacific youth had to be met for the solution to be successful. Knowledge and expertise from, for example, climate change experts was an imperative but the experts had to be willing to contribute.

The project demonstrates that co-creation requires creative thinking on how input can be gathered and incorporated into design. Managing participation in a co-creation environment must ensure that co-creators' motivations are maintained, sustaining enthusiasm and engagement however, can be difficult (Iivari 2010; Nakki et al. 2011). Pacific youth were motivated to contribute because the initiative was prompted by them and was for them. Using the Facebook fan page was used also to motivate. UNICEF (Pacific) staff were motivated to explore new ways to engage youth. Although the development team were paid they were motivated because they were concerned about climate change and wanted to make a difference. The developer from Bangladesh was strongly motivated because she said "it is a very vital issue particularly for the countries in the Pacific and in particular my country cyclones and floods everything. There is great suffering and I know from my point of view I know what happens when natural disaster happens it destroys everything inside, it is a big issue."

DISCUSSION

The Marcus and Mao (2004) framework has presented a valuable lens for examining this case study from a PD theory perspective. Clearly the roles of the actors in a co-creation context will be different and overlapping. Success, in our case study, cannot be described just in terms of the design of the game, the 'solution' or its implementation. Co-creation as a mechanism for engaging youth was an important success measure and extends the concept of success. In community based projects success is likely to be more than a well-designed solution, successfully implemented. Models of PD therefore need to accommodate this.

Factors for the successful co-creation of software in an unstructured, dynamic, virtual environment

There are however, other elements important for success that relate specifically to co-creation in an unstructured dynamic, environment, that fall outside the Marcus and Mao (2004) framework. These are discussed next.

- Managing communication

Communication is a critical issue with distributed teams and was certainly a constraining condition in our project. It is well documented that co-located teams communicate more effectively than distributed ones (Aragon, et al. 2009). The inability to communicate face to face can be a major problem particularly in cross-cultural development projects (Rutkowski et al. 2002). It is also more difficult to establish common ground when teams are distributed, are culturally different and have not met (Rutkowski et al. 2002).

As the development team and the co-creators could not meet face-to-face it was critical that the right technologies be found to facilitate effective communication. The Sponsor and the development team identified

which technologies were the most appropriate for which circumstance. This was important for generating ideas and ensuring rapid feedback.

The developers were young, regular Facebook users and very familiar with the communication technology they were using. The Sponsor used Facebook to communicate with the co-creators in the Pacific and email for communication with other experts.

The three developers agreed that although communication was frustrating at times, this was not a major impediment. The team identified the technologies they would use, and how to ensure no one in the team was out of the communication loop. They agreed early in the process to email each other every couple of days and they used Skype and instant messaging as well.

Facilitating and coordinating the co-creation process entirely online with participants divided by geography and time was challenging and was not left just to the change agents. Managing the process, one developer commented: "was very challenging because we would not face each other and sit together this was challenging part. I have learnt most about collaboration from this part." The development team took an active role in ensuring input was managed effectively and encouraged participation through communication with other co-creators. There was no opportunity to discuss, elaborate and clarify ideas and concerns face to face; every piece of information and communication had to be very concise and consolidated.

- Leadership

There was no management hierarchy apart from the Sponsor's role as leader, unlike development activities based in organisations. Therefore, because of the dynamic nature of the co-creation activity and dispersed participants, a strong committed leader was critical to the success of the project. The Sponsor was the leader he managed all the negotiation and collaboration. It was understood that the Sponsor was the final arbiter and he emphasised that input from the other co-creators must be taken seriously.

- Managing development

The developers identified strategies early for managing the development process at a distance. Roles were defined but not in a hierarchical way. Establishing the decision-making process including negotiation and collaboration was agreed on early because the team was not co-located. They understood the roles of the other co-creators and built that into their decision making process. The team members were highly organised, they kept minutes and agreed as a team on who would be responsible for which tasks, when they would meet and how they would communicate.

"After each meeting we maintained minutes of meetings and what was the decision at this meeting and what is our next discussion topic and who is responsible for which part and in the next meeting we just reviewed that tasks from the last meeting and who has done what." *(Developer)*

The team agreed on guidelines and protocols. One of the developers said for her working at a distance was the most challenging part but also where she learnt the most. They were successful she believed because "from the first day we were very organised, we followed the rules. What happened was that adaptively we had to understand that we had to do it this way."

- Knowledge and skills of the co-creators

The skills, knowledge and background of a development team were important for success. The development team had to understand who the audience was, the purpose of the product and the importance of supporting and encouraging the young co-creators. They needed to be adaptive, they had to accept and be able to interpret the input they received and translate it into a working game including the Sponsor's changes. The developers also had to be willing to work in a virtual environment and manage input from a wide range of sources.

Understanding that the development team did not have all the requisite knowledge on climate change highlighted how important input from other experts and stakeholders was to the success of the project. The skills of the Sponsor in bringing the co-creators together and managing them cannot be underestimated. It could also be argued that because the team were young, they related to the problem and they had an understanding of what others their age might want in a game. They understood the technology and were not daunted by the challenges the co-creation environment posed for them.

- Co-creators evolving and changing roles

The roles of the co-creators' were not easy to define. Although the developers developed the game they were also participants and change agents (Table 1). This was not anticipated at the start of the project, it was expected that the development team would develop a game based on the input from others. However as the development progressed they themselves took the initiative to manage some aspects of the development such as the testing and identification of a free platform. Pacific youth and the Sponsor played key design roles. The UNICEF (Pacific)

staff became more engaged as the project progressed, they were proactive in communicating with experts and filtering information content as well as performing technical testing (normally the role of developers) again this was not anticipated. As other UNICEF staff based outside the Pacific heard of the project they became involved contributing information, promoting the game on other UNICEF websites and discussing with the Sponsor the use of social media for engagement.

CONCLUSION

Our research was initiated by a very real problem UNICEF (Pacific) faced. This is significant because most other published research relating to co-creation reported in the literature, has been initiated by researchers. However, this is also a limitation as it reflects just one example of co-creation. Further research, is needed as espoused by Marcus and Mao (2004) who ask IS researchers to study PD in different contexts "to evaluate the effectiveness of various participation strategies" and to extend their framework.

The online partnership between UNICEF (Pacific), the University and COL was unique, the expectations were from the outset centred on engaging first and foremost in the co-creation of the game as a mechanism for empowering youth. We learned that such collaborations can work but this requires significant planning and commitment from all involved. UNICEF (Pacific) staff learned that it is possible to connect the dots and create new concepts online, and that partnerships can form out of nowhere. At the same time collaborating online can be very complex and tedious.

Further, with social media increasingly used to engage users in co-creation, it is important to understand how successful outcomes can be achieved. As more organisations like UNICEF see the potential of taking a co-creation approach using social media to more meaningfully engage with their constituent communities, there is a need to better understand how this can be done successfully. Our research and contribution to practice we would argue, is in identifying some of the critical factors for success for such organisations.

Participatory design is acknowledged as making an important contribution to more effective systems in an organisational or commercial context because of its focus on user input during design. Our research investigated co-creation using Marcus and Mao's (2004) PD theory noting that their original theory was designed to challenge current PD thinking in an organisational context. Co-creation in a virtual environment is far less structured than developing systems in organisations and requires a different approach. The contribution to the cumulative knowledge base therefore is in building a better understanding of PD in a genuine co-creation development environment and demonstrating that the PD theory can be extended to a virtual co-creation activity.

From the perspective of UNICEF (Pacific) the project has been successful. There is a far greater level of engagement with Pacific youth through their social media, a key project objective. From a research perspective we have a far better understanding of how to design, manage and succeed using co-creation in an unstructured, dynamic, virtual environment.

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