

# Communications of the Association for Information Systems

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Volume 47

Article 37

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10-13-2020

## Information Systems Development as Value Co-Creation

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### Recommended Citation

Kautz, K., & Bjercknes, G. (2020). Information Systems Development as Value Co-Creation. *Communications of the Association for Information Systems*, 47, pp-pp. <https://doi.org/10.17705/1CAIS.04701>

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## Information Systems Development as Value Co-Creation

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### Abstract:

In this research, we investigate information systems development (ISD) as value co-creation and how different actors perform co-creation as an ISD approach. For this purpose, we present a case study of an ISD project that developed a digital game on the topic of climate change in a not-for-profit, intergovernmental context. The project had limited resources. It involved a number of youth and used a social media platform. We apply a taxonomic framework for value co-creation that we derived from a taxonomy of Web-based co-creation. The taxonomy had originally been developed for a commercial context and researchers have not empirically validated it before. Our study shows that the taxonomic framework explains the project as value co-creation especially with regard to co-creators' motivation and the types of value they created. We further discuss our findings in reference to information systems (IS) literature on service innovation. This literature contributes to additionally explaining what value co-creation is and how one can perform it as an instance of ISD practice. Against this background, we offer some propositions for how future ISD research could benefit from adopting a value co-creation perspective. Although we derived our findings from a specific project in a particular setting, we argue that they can be used to 1) prepare any co-creation project, 2) cope with co-creation during the development process by explaining co-creation as an approach to ISD, and 3) reflect and derive lessons learnt. While researchers need to further empirically validate these claims, we develop insight into value co-creation in ISD with respect to participatory approaches to ISD beyond conventional environments, roles, and participant and contributor types.

**Keywords:** Information Systems Development, Value Co-creation, Service Innovation.

This manuscript underwent editorial review. It was received 08/18/2019 and was in production for seven months for two revisions. Tilo Böhmann served as Associate Editor.

## 1 Introduction

Recently, the concept and role of co-creation and, in particular, value co-creation (Payne, Storbacka, & Frow, 2008; Vargo, Maglio, & Akaka, 2008; Kazman & Chen, 2009; Zwass, 2010; Grönroos, 2012; Lusch & Nambisan, 2015; Alves, Fernandes, & Raposo, 2016; Vargo, Akaka, & Vaughan, 2017) have also gained more prominence in information systems development (ISD), especially in open source software and community-based service systems development (Kazman & Chen, 2009). In this context, we contribute to better explaining ISD in practice with our research. While researchers traditionally viewed ISD as a technical process that normative techno-centric and engineering approaches dominate (Kautz, 2009), they have since recognized that ISD represents not only a rational, methodical, and controlled process but also an adaptive, agile, and emergent process (Highsmith, 2000; Madsen, Kautz & Vidgen, 2006).

The emergence of Web technologies has enabled businesses, governments, and people to collaborate (Baltzan, Lynch & Fisher, 2015). Indeed, many non-located people and organizations now collaborate online to share knowledge and information, to contribute content, and to co-create materials and goods, such as information and software systems, by using social media as a development and usage platform. Much literature on co-creation reports on research conducted in commercial and predominantly e-commerce environments where co-creation has been used in a variety of ways to develop new products and services, to evaluate ideas, and to propose solutions (Payne et al., 2008; Füller, Mühlbacher, Matzler, & Jawecki, 2009; Zwass, 2010; Alves et al., 2016).

In contrast to for-profit organizations, we lack research on how not-for-profit, non-government, and international intergovernmental organizations use information technology (IT). Not-for-profit organizations generally use IT at a less advanced level compared to for-profit organizations (Chang & Chang, 2011). Further, many not-for-profit organizations do not realize the benefits from using social media since they often use such media to “push” communication out and few enter into a dialogue with their stakeholders (Cockerill, 2013).

The United Nations Children’s Fund (UNICEF) represents one such organization whose information needs to reach as many people as possible. UNICEF Pacific Island countries (UNICEF-P), a UNICEF chapter, has recognized social media’s value particularly for distributing important information on matters such as health, emergencies, education, and climate change. UNICEF-P focuses on engaging youth. At one time, Pacific Islander youth challenged UNICEF-P to use social media in a younger and less boring way, and Pacific Islander youth did not contribute significantly to or engage with content that UNICEF-P shared on its Facebook fan page. Thus, to explore IT’s ability to empower youth to engage with something more and to help youth to make decisions that affect their life, UNICEF-P invited Pacific Islander youth to participate in different roles in co-creating an information system, a Facebook-based game, called the “Pacific Climate Change Challenge Game” (PC3G).

In this paper, we present this project as a case study. In particular, we focus on co-creation and, in particular, value co-creation as an approach to ISD (in this case, in a not-for-profit environment). We address the following research question (RQ):

**RQ:** How do different actors perform value co-creation as an ISD approach?

For this purpose, we use an analytical framework that we derived from a taxonomy of Web-based co-creation that Zwass (2010) developed after extensively reviewing the co-creation literature. Zwass originally created the taxonomy to serve as an integrated research perspective to study co-creation in commercial settings with a focus on co-creation as a source for knowledge and form of innovation in product and service development (in particular, e-commerce marketplaces). The research that we present here forms part of a larger project that compares how different theories apply to the same empirical data, and we have applied other theoretical foundations and conceptual models in investigating the PC3G project (Kautz, Bjerknes, Fisher, & Jensen, 2018; Kautz, Bjerknes, Fisher, & Jensen, 2019; Kautz, Bjerknes, Fisher, & Jensen, 2020).

IS researchers have deployed Zwass’s (2010) taxonomy to develop a framework to research social information systems (Schlagwein, Schloder, & Fischbach, 2011) and a formal, unified model of the co-creation process (Durugbo & Pawar, 2014). However, researchers have not yet empirically validated the taxonomy in its entirety. Thus, in this paper, we also 1) empirically validate the taxonomic framework, which we derived from the taxonomy 2) investigate to which extent it is useful and applicable in our context given the taxonomy’s original intention, and 3) how, if necessary, we can expand its applicability to

this context. The framework comprises elements such as categories of co-creators and their motivations; different modes of co-creation; characteristics of the development tasks and the governance process; and types of value, economic beneficiaries, and product and service aggregation.

We narrate the case, map our case study onto the framework, analyze the project in terms of the framework, and discuss the actual occurrence of its elements and their impact on the project and its outcome. In doing so, we position the framework and the way it conceptualizes value co-creation in relation to the wider literature on value co-creation and to IS research on service innovation that emphasizes the role of digital technologies. We examine how this positioning better explains the role and effect that co-creation has on ISD practice.

The paper proceeds as follows: in Section 2, we introduce the theoretical background and analytical framework. In Section 3, we explain our research approach. In Section 4, we present the case narrative. In Section 5, we analyze the co-creation project in the case setting. In Section 6, we discuss our findings and their implications for research and practice (in particular in reference to some prominent IS research on service innovation). Finally, in Section 7, we summarize our contributions and conclude the paper.

## 2 Theoretical Background

Kambil, Friesen, and Sundaram (1999) originally defined value co-creation as a firm's directly engaging its customers in producing or distributing value. Prahalad and Ramaswamy (2004) extended this definition by stating that value co-creation's purpose involves producing a unique customer experience. Alves et al. (2016) recently reviewed and systematized the literature on value co-creation and identified four research clusters.

One cluster focuses on co-creation and the relationships between companies and their customers (whether other companies or final consumers). This cluster emphasizes how companies can design these relationships to obtain resources and advantages that foster value, but it does not mention the service concept. The other three clusters explicitly relate the concepts value co-creation and service to each other.

The first of these three clusters builds on three different perspectives on service; namely, the service logic perspective, the service science perspective, and the service-dominant (S-D) logic perspective. Service in this cluster refers to one party's applying resources or competences (i.e., knowledge and skills) to benefit another party or itself (Vargo & Lusch, 2004; Lusch & Nambisan 2015). This cluster agrees that co-creation drives comprehensive business innovation where services, not goods, form the basis for all exchange; goods are only of service to a customer if they have value-in-use (Vargo et al., 2008). Thus, this cluster emphasizes that value co-creation represents a business logic. However, it lacks consensus about the ways in which suppliers and customers interact and when and where co-creation processes occur. For example, distinguishing customer value-creating processes and supplier value-creating processes, Payne et al. (2008), taking a service science perspective, conceptualized encounter processes as the processes and interaction practices that occur in the customer-supplier relationships and that need to be managed to develop co-creation opportunities. The different perspective of S-D logic (Lusch & Vargo, 2019) is, in its current form, summarized in a cyclic process model that comprises actors in actor-to-actor networks. These actors participate in resource integration and service exchange, which endogenously generated institutions and institutional arrangements both enable and constrain. These institutions and institutional arrangements establish nested and interlocking, self-governed and self-adjusting service ecosystems of value co-creation. In every exchange, the customer returns something, such as a monetary payment, information about the purchase including personal details, product feedback, or its behavior as a consumer. Thus, the customers are not passive recipients of goods but value co-creators (Kazman & Chen, 2009; Agrawal & Rahman, 2015) as every value exchange provides (or at least should provide) value to both the producer and the customer (Grönroos, 2012).

The second of the three clusters focuses on the relationship between co-creation experiences and loyalty (Alves et al., 2016). It emphasizes service "co-production" in the S-D logic perspective. To do so, it explicitly distinguishes two co-creation components: value-in-use (which denotes that one creates value when consuming or using it) and co-production (which denotes the consumer's participation in actually producing or creating a service) (Alves et al., 2016).

The third of the three clusters focuses particularly on service and product development and understands co-creation as a form of innovation and a source of knowledge for innovation in service and new product

development. This literature also explores and strongly emphasizes the impact that digital technologies have on value co-creation and how they encourage consumers to participate in co-creating value. Based on an extensive literature review, Zwass (2010, p. 11) offered an “inclusive taxonomy for Web-based co-creation” as a foundation for an integrated research perspective for developing a co-creation theory. He took co-creation to stand both for consumer creation and collective creation. With its grounding in digital technologies’ enabling role and its focus on primarily digital product and service development, his work belongs in this cluster. Against his work’s strong emphasis on digital technologies, services, and products, we consider it an appropriate framework for our subsequent analysis.

Zwass (2010) defined co-creation as consumers’ and producers’ participating in creating value in the marketplace in the commercial realm (particularly e-commerce). He suggested that digital technologies, infrastructures, and ecosystems (particularly the Internet and Web technologies) enable co-creation. He posited that co-creation occurs in virtual communities with collective intelligence, occurs through open innovation that involves unaffiliated individuals and customers, and leads to outcomes that to a large extent are placed for open access. His taxonomy specifies actors who participate in co-creation beyond producers through the co-creator concept, which includes both consumers and customers who act as volunteering performers. These performers have various motivations. The concepts of co-creation mode, task characteristics, and process governance and the relation between the latter two typify how actors perform the co-creation process. In the taxonomy, co-created value refers to what actors create, and several concepts determine it: value type, economic beneficiary, and product and service aggregation.

The taxonomy distinguishes between prequalified individuals, skilled contributors, community members, and any individual that can contribute to the best of their ability, called world in the taxonomy, as co-creators. These co-creators act as volunteers and reveal their knowledge for free based on various motivations, which range from acquiring social capital to altruism to signaling capabilities to potential employers (see Figure 1 for a full list of motivations).

Co-creation has two modes: 1) autonomous co-creation (where actors conduct co-creation activities independently of any established organization, although they may use platforms that such organizations provide) and 2) sponsored co-creation (where actors conduct co-creation activities at the behest of a producing organization). The tasks that actors perform as part of co-creation activities can have a different structural complexity, effort intensity, and time frame and pose varied intellectual demands for knowledge, skills, experience, creativity, and diversity. The forms of governance that co-creation activities use vary from adhocracies to formal bureaucracies; in practice, hybrid forms of governance generally emerge.

The taxonomy suggests a typology of co-created value including the co-design of (digital) products and services, procedural content such as software and declarative content such as knowledge compendia and consumer reviews, and consumer-side customer service and testing. Beyond the primarily economic value which is co-created through these outcomes and through the new and changed distribution of tasks in the co-creation process, Zwass (2010) also listed the value that lies in the co-created social capital, new relationships, and trust between the involved co-creators. Various actors can benefit from co-created economic value, such as the aggregator that provides the platform and amasses the co-created content, a particular user or brand community, the contributors individually, the sponsoring firm or organization, or, more generally, the “world”. Lastly, digital products and services such as searchable or linked textual or multimedia wholes are aggregated in multiple forms that range from competitions to statistical ratings and rankings.

Figure 1 summarizes all concepts of the taxonomic framework, which we derived from Zwass’s (2010) taxonomy and which we subsequently use as the theoretical background for our investigation.

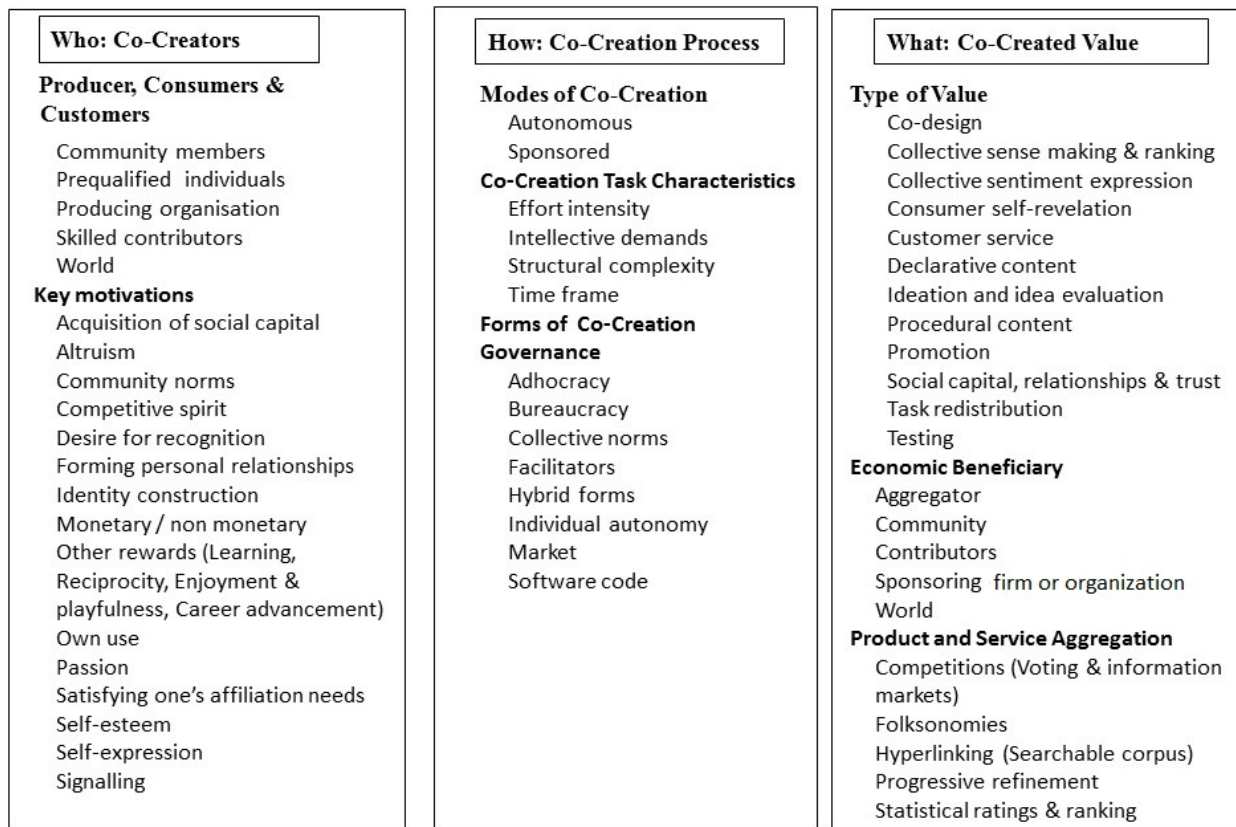


Figure 1. The Concepts that Define the Taxonomic Framework of Value Co-creation

### 3 Research Approach and Method

We present interpretive research in this paper. Interpretive research involves analyzing people's actions through a detailed study in their "natural settings", which leads to a richer understanding (Neuman, 2003; Walsham, 1995). Given the limited literature concerning our research topic (i.e., understanding the role of co-creation in ISD and how it unfolds), we based our investigation on an exploratory, qualitative, single case study (Creswell, 2003) of an ISD project that involved several different organizational units and stakeholder groups. While researchers often state that one cannot theorize and certainly not generalize from a single case study, Walsham (1995) suggests that one can generalize case study findings among others in the form of rich insights. In contrast to selecting a representative case, we selected a revelatory case that the IS literature has not described before and that one or more accentuated points of view might have formed. Researchers consider such cases prototypical or paradigmatic of a phenomenon of interest (Gerring, 2007). By studying such a case setting and the involved co-creators, we could illuminate key aspects of the phenomenon we investigated (Gerring, 2007). As such, the findings exhibit an instance of theorizing through idealization (Ghazawneh & Henfridsson, 2013), which research needs to further validate but, as Hughes and Jones (2003), argue, contributes to the existing body of knowledge by providing detailed empirical findings.

We needed access to the case organization for our investigation, which we directly obtained from two key informants. The first informant had participated in the PC3G project as a representative of UNICEF-P and a communications specialist. He served as project sponsor and project coordinator throughout all stages in the game's development, and we refer to him as the project sponsor or the sponsor for short. He shared email correspondence and all relevant documents and provided reflections on the process. As an employee and insider sharing an identity, language, and experiential base with the sponsoring organization, UNICEF, he enhanced how deeply and broadly we could understand the case setting, knowledge we may have lacked without his access (Kanuha, 2000).

The second key informant also participated during the whole project as a consultant and facilitator. This individual also worked as an IS professor and academic at a university, though we mention this

information only for completeness (see also Section 4.1). She had joined the project as unpaid, voluntary, and pro bono professional in a non-academic role. Thus, despite the fact that the consultant worked as an IS academic, she and the sponsor did not design the development project as an action research project with significant researcher intervention (Rapoport, 1970). In our research, we present an ex post, empirical case study on actual practice; we had no direct influence on the course of the project. However, the consultant brought her distinct IS expertise on the interplay between people, processes, information, and digital technologies to the project. As such, she impacted the game's design and development.

We conducted this research to investigate how co-creation occurs in practice. Thus, we conducted interviews with the key informants and independently analyzed all available empirical material. In line with the research topic and the interpretive approach, we came to understand co-creation in the PC3G project through an iterative process in which we collaboratively interpreted, compared, and connected prior research and empirical data. We used the taxonomic framework as a guide to conduct our analysis so we could study the features and the governance processes by which co-creation unfolds.

### 3.1 Data Collection

We gathered perspectives from various co-creators using various mechanisms (e.g., we obtained usage data for the developed game and social media site). We collected the usage data to establish whether the co-creation project had generated any value for UNICEF-P in terms of increasing how much Pacific Islander youth engaged with UNICEF-P's social media activities. The data also included social media activity on the UNICEF-P fan page regarding posts after the game's implementation.

Given the co-creators' distributed locations, we used the extensive email trail between the different co-creators as our main data source. Lee (1994) argues that email communication can help one richly understand what has occurred. Emails included those from and between the UNICEF-P project sponsor, the consultant, the three members in the technical development team, three testers, four adolescent social media facilitators, UNICEF headquarter staff in New York, climate change experts, and learning experts from the Commonwealth of Learning (COL) Canada (<https://thecommonwealth.org/commonwealth-learning>), an intergovernmental organization from the Commonwealth of Nations that provided advice and some funding. These emails contained status information and reflections before, during, and after the game's development and implementation. They also included conceptual feedback, reflections, and recollections about input into designing the game, the climate change elements it addressed, test results, and technical feedback. We provide more detail about the different co-creators, their relationship, and their location in Section 4.

In addition, the empirical data comprised social media posts from the four adolescent social media facilitators, which included an invitation for input and further feedback on the game. The sponsor and the four adolescent social media facilitators launched a Facebook album with text announcing and encouraging design contributions to the game via Facebook. The album included 16 initial responses to the request for input and the feedback posts from Pacific Islander youth.

Other valuable data sources included project documentation such as UNICEF-P's strategic plan for digital engagement, the COL's terms of reference for the project, the project description brief and evaluation, the design document that the developers produced that outlined the game's concepts, and project notes from the sponsor and the consultant. Further, we collected empirical data from semi-structured, open-ended interviews that the consultant conducted with technical development team members and that we conducted with the consultant and the UNICEF-P project sponsor concerning their role and experience during the co-creation project. All interviews lasted about one hour. During the analysis, we regularly discussed our emerging results with the two informants and, through their feedback, increased our study's interpretive rigor.

### 3.2 Data Analysis

In case study research, researchers need to identify an investigated case's boundaries (Miles, Huberman, & Saldana, 2014). We take the starting point for our analysis as September, 2010, when the sponsor conceived the project and the ending point as August, 2011, when UNICEF-P launched the game. Following what Miles et al. (2014) describe as "data condensation" and based on our earlier work (Kautz, 2009), we first produced a timeline for that period and a case narrative, which we include in Section 4 in concentrated form. The narrative builds a conceptual model and provides a progress or sequence of events; it also serves as a frame of reference to further analyze and interpret the data (Fincham, 2002).

We then returned to the literature and, as we state above, identified Zwass's (2010) taxonomy as appropriate and interesting to use as a research framework. Therefore, we refer to the taxonomy in this research as a taxonomic framework. To assess if, how, and to what extent the PC3G project fulfilled the criteria that the taxonomy outlines and to evaluate the taxonomy (the taxonomic framework) itself based on our empirical findings, in the next stage of our data analysis, we revisited the empirical data and the narrative and mapped the empirical data to the framework. In this way, we identified the co-creators, their motivations and relationships, their co-creation modes, the task characteristics, and the project's governance features and value types, and we categorized our findings accordingly. By mapping the data against the taxonomic framework, we could better understand ISD practice and define, identify, and characterize co-creation as significant in the context of the development process in our case setting. Before we provide the detailed analysis of the case, we present the timeline and a narrative account of the investigated project in Section 4.

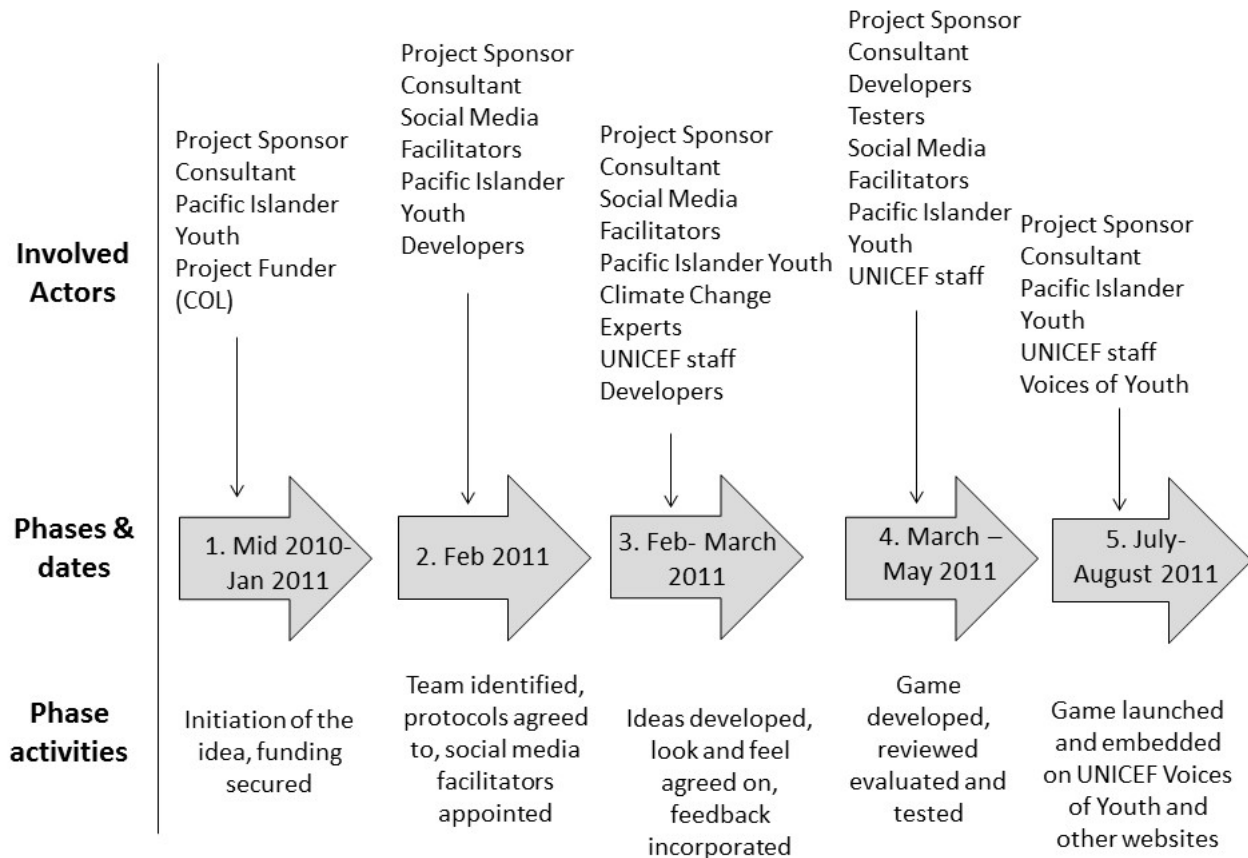


Figure 2. Timeline

## 4 A Narrative and Timeline of the Case

Figure 2 provides a timeline and depicts the main activities of the PC3G project and the involved co-creators. By using the timeline, we identified five project phases: 1) idea and funding initiation, 2) team establishment, 3) conceptual game design, 4) consolidated game development, and 5) consolidated game launch. We describe each phase in Sections 4.1 to 4.5.

### 4.1 Phase 1: Idea and Funding Initiation

Based on critiques about the UNICEF-P's website from Pacific Islander youth, the communications specialist and project sponsor at UNICEF-P proposed a project to the organization in mid-2010. He had concerns that, although UNICEF-P had a strong social media presence and regularly communicated with its audience via social media, Pacific Islander youth interacted only minimally with the organization. Thus, he wanted to ensure that Pacific Islander youth engaged more with UNICEF. He had a vision to engage



youth through encouraging them to participate in a co-creation project via social media. Given the threats that climate change posed to small Pacific Islands, he made a proposal to develop a co-created game, which would also help Pacific Islander youth to learn more about how to respond to climate change. He made this proposal to COL in November, 2010, which provided modest funding in early January, 2011. The project sponsor then approached an IS professor in Melbourne, Australia, whom he knew from a previous collaboration, with a request to join the project as a consultant to help establish and, if necessary, manage a development team, and she honorarily joined the project in this capacity.

## 4.2 Phase 2: Team Establishment

In January 2011, the consultant approached three young research students in her network. All three accepted the invitation and begun working at the same time as developers for 30 working days with an original project runtime from 1 February to 15 April, 2011. Two were born in China and one in Bangladesh. One developer lived in Hong Kong, another lived in regional Victoria, Australia, and the third lived in Melbourne, Australia. The latter two knew each other, but they did not know the other developer, nor did they meet this developer in person during the project. The sponsor's first email to the development team and the consultant described his vision and what he wanted to achieve: the game would not concern climate change but how people could respond to its impact.

Also, in January 2011, the sponsor identified and contacted four adolescents from Fiji to act as social media facilitators to solicit and gather ideas from Pacific Islander youth about the game. The social media facilitators posted a photo with a message inviting input on the game and launched the message as a Facebook album that encouraged UNICEF-P Facebook fans to participate and to contribute to the design of the game. Initial input and comments that related directly to the game came from 16 fans, and 15 fans hit the "like" button for these posts; subsequently, many more fans visited the UNICEF-P Facebook page, provided feedback on the game under development, and eventually subscribed to the page (see Sections 4.3 to 4.5).

During the same period, the consultant facilitated a process among the core development team members and the sponsor to agree on the communication protocols between them. Afterwards, she played no direct role in the development process. The sponsor happily allowed the developers to manage the project themselves in terms of the ideas for the game and how they undertook work. In their first meeting, the developers conversed over the telephone about how they would manage the process given they resided in different locations. They agreed that they would email each other every couple of days to cater to the quite short timeline to finalize the game. They also planned to use Skype to talk regularly and instant messaging and chat to communicate. Although the team had no formal leader, the student from Bangladesh quickly became the person who took charge of managing how things would work: she kept minutes of the meetings, which included what decisions the team took, the next discussion topics, and who would determine what the tasks would be. The team reviewed the tasks at each meeting to confirm what had been done and establishing the next tasks and responsibilities. At the end of each meeting, the informal leader sent an email that summarized the team's progress to the sponsor. He reviewed the progress. If he thought the team needed to change something or wanted to provide feedback, he would email the informal leader or call her using Skype. The informal leader took brief notes from the Skype meetings that focused on any requested changes.

## 4.3 Phase 3: Conceptual Game Design

In the first development stage, the sponsor and the three developers had to reach agreement on what the game would be and its look and feel. One developer researched relevant aspects of climate change, another looked at different approaches to and types of Facebook games, and the third investigated appropriate technologies, tools, and development approaches. As the developers worked on developing ideas for the game, the sponsor became an intermediary who shared these ideas with experts from the funding organization, international climate change experts, and UNICEF staff members. The sponsor sought input on things such the game's direction. The relevant experts also provided further information on climate change in particular on a regular basis. The sponsor provided all feedback to the developers, including the ideas that Pacific Islander youth provided through the Facebook page, which the four adolescents from Fiji mediated.

The sponsor's requirements and ideas from the key stakeholders, Pacific Islander youth and UNICEF-P staff, guided the developers. Team members used the following process to decide on their final game: at the very beginning, the sponsor asked the developers to think about some ideas. They gave themselves a

week to open their minds to brainstorm and think about every idea without technology and then collected their ideas to see which ones they could combine. This process led to three major ideas—one from each developer—that reflected what they individually thought the youth and UNICEF-P should concentrate on. They decided to integrate all three ideas into the game; thus, it represented three games in one. Each game differed in the way that the players would interact with it; the CO2 reducer challenge required players to identify potential CO2 emitters, the evacuate life challenge required players to understand the climate change threats and initiate action (e.g., to evacuate or rebuild before serious consequences arise), and the flood tales challenge required players to understand what causes floods and the need for flood mitigation. The developers followed a design principle to not make each game too difficult. They found the fan page postings helpful; the responses from the Pacific Islander youth suggested that the game needed to be interactive, interesting, and colorful; that it should have graphics; that it should be fun to play and focus on action; and that it should promote positivity and change with regard to climate change.

#### 4.4 Phase 4: Consolidated Game Development

After the developers and the sponsor agreed on the consolidated game's design, the developers could begin development proper, which included designing, coding, testing, and evaluating the game. Managing the process, one developer commented: “[The development process proper] was very challenging because we would not face each other and sit together, this was a challenging part”. The development team members took an active role in ensuring that they effectively managed input in the form of further information and feedback and encouraged the sponsor and UNICEF staff members to further participate in the development activities. As there was no opportunity to discuss, elaborate on, and clarify ideas and concerns face to face, they had to ensure they concisely communicated and conveyed information. Because the team members worked independently and developed each game component separately, several issues concerning the consolidated game's build and layout arose during this phase. A statement from one developer highlights these issues:

*The game came in three different formats, totally different interfaces. The developing process of the three people was quite different. It came as three totally different styles of game, different user interface, different color, a lot of things were different. There was no standard look to the three different games. Fortunately, finally we got this sorted out—the three games now look quite similar.*

The sponsor and UNICEF staff members reviewed the first version of the consolidated game and provided feedback, such as about the game's color, typefaces, graphics, text, and help that the game provided. The sponsor highlighted that developers needed to undertake further work on standardization and to ensure the three components linked together as one game. He also reinforced the need for each game to include links to further information.

The development team iteratively tested and evaluated the consolidated game's technical features. The developers each first conducted technical unit and system testing to uncover programming errors. For this purpose, they identified criteria to test the game's features and to ensure that the various games linked internally and that the color schemes, text size, files, and so on were correct and consistent. Each developer tested the other two developers' work and provided feedback through their regular phone and Skype meetings and email. While the developers tested for programming errors, UNICEF-P staff functionally tested the consolidated game and provided feedback to the sponsor. A technical person in UNICEF also tested the consolidated game and provided technical feedback once the team had incorporated earlier feedback. The sponsor asked the developers to find a platform on which to run the game. After assessing options, they proposed Google as the platform as it offered a free service. Three friends of the developers in China, young people who used Facebook, further evaluated the game in a way similar to user acceptance testing. They played the game and suggested that the graphics and artwork still needed to be more attractive. They thought the game would encourage players to play longer if the game also even more interesting. Based on this feedback from their peers, the social media facilitators also provided feedback along these lines in suggesting the game be more colorful and easier to play. The development team considered all feedback and made further changes, and the sponsor ultimately accepted the final version of the game.

## 4.5 Phase 5: Consolidated Game Launch

An email to various international UNICEF groups announced the launch of the game in July, 2011. The game garnered a favorable reception from UNICEF, Pacific Islander youth, and Facebook fans. A media release showed that UNICEF positively assessed the initiative (J. Fisher, personal communication, 5 July, 2015):

*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. ...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.*

Posts on the UNICEF-P fan page highlighted the game's success and requests to translate it into Pacific languages and to include it on the Madagascar UNICEF page. Voices of Youth, a UNICEF organization designed to support young people and to give them the opportunity to learn about their world, requested approval to embed the game on its website, which the developers then did. The launch event marked the end of the project for the development team and sparked the developers' pride about their achievement. Three Facebook sites now use and distribute the consolidated game: UNICEF-P, Voices of Youth, and Unite for Climate.

## 5 Analysis and Findings: Similarities and Differences

In the following analysis, we revisit the PC3G's development as an instance of value co-creation and apply the taxonomic framework to it. We present our findings and the similarities and differences with regard to the three key areas that Zwass (2010) identified (see Figure 1): who the co-creators were, how they undertook the co-creation process, and what value they generated.

### 5.1 Co-creators: Roles, Categories, Motivations

The taxonomic framework distinguishes between the producer (usually a profit-making organization that produces a commodity) and consumers and customers who act as different volunteering performers as co-creators. We identify 10 different entities who contributed to creating the game in the sense of collective creators. However, in our not-for-profit context, we cannot easily identify a producer or producing organization among the 10 recognized co-creating entities. We could consider UNICEF and specifically UNICEF-P, which includes the Fiji-based sponsor and staff and UNICEF in general through its New York headquarters as the producer since they owned the game. However, in the strictest sense, the three developers produced the game, though they did not do so as part of a traditional organization but rather in a transient project, and yet another organization (COL) paid them. The developers were not Pacific Islander youth, and they were not consumers or customers either. Similarly, the Chinese testers were not consumers or customers since, although youth, they did not come from the target area. We could consider the COL who contributed funds to the co-creation process or the Australia-based consultant who had recruited the developers as part of the producer organization. However, we definitely could not consider the consultant a consumer or customer. The same goes for the internationally based climate change experts who contributed advice on the game's content.

In contrast, both the Fiji-based Pacific Islander youth social media facilitators and the Pacific Islander youth Facebook fans who contributed requirements for the game were consumers but not in the strict economic sense of the taxonomy as they would not pay to consume the game as a goods or a service.

Categorizing the 10 co-creating entities further poses similar challenges. We could consider the Pacific Islander youth who contributed requirements and feedback prequalified individuals based on their earlier experience with digital and/or Facebook-based games; however, in that sense, they were also skilled contributors. They were also members of the target community (i.e., Pacific Islander youth) and part of the "world". In addition, the social media facilitators had a standing in their community as members with good communication skills. Indeed, the sponsor, who participated in the co-creation process as a prequalified individual as a communications specialist to reach out to youth in regard to engage them in serious matters such as climate change, chose the facilitators due to that background. We could categorize the consultant in a similar way; she participated in the co-creation process as a prequalified individual who

had access to and knowledge of available, capable, and affordable developers. In turn, the developers were both prequalified individuals and assumed skilled contributors in developing digital information systems. The testers were members of their community. As members of the same age segment as the target consumers, we could consider them both prequalified individuals and, to some extent, skilled feedback contributors as experienced digital game players and Facebook users. Due to the input and feedback they provided, we could also consider UNICEF's headquarters in New York, the Fiji-based UNICEF-P staff, and the international climate change experts prequalified individuals and skilled contributors in their fields of competence. They were also community members in the different communities from which and to which they contributed though not members of the target audience community. In this regard, we found it even harder to categorize the COL. We could consider it a prequalified contributor, which, based on prior experience, provided monetary resources; however, it seems potentially farfetched to consider providing monetary aid a particular skill.

The framework also caters for and helps one to identify and analyze co-creators' motivations. In the PC3G project context, which a not-for-profit organization initiated, altruism constituted a major motivator. Both the Pacific Islander youth who contributed requirements and the adolescent social media facilitators expressed an altruistic desire to contribute to developing the game, and they also wanted to use it. The consultant also stated altruism and a passion for the task to support an important cause involving youth, young researchers, and climate change as her main motivators. She also expressed a motivation to work with UNICEF-P and learn during and about the co-creation process. With no direct data available from all co-creators, we made some informed assumptions concerning their motivations. Working for a not-for-profit organization presupposes a certain level of altruism; thus, altruism and a passion to work for and with young people certainly constituted factors for the sponsor and the UNICEF-P staff members and involved employees at UNICEF's headquarters. We can presume the same for the COL staff. We can assume passion for climate changes as motivating the international climate change experts, who contributed their knowledge. We can also suppose altruism, enjoyment, reciprocity, and an interest in learning as motivators for the Chinese testers who helped out their friends who developed the game.

The developers themselves had joined the project for a small monetary reward but expressed a passion for the task and the opportunity to learn both about co-creation, game development, and climate change. Non-monetary rewards such as personal satisfaction with the intended and ultimately achieved outcome and the opportunity to signal competence to possible employers also motivated these individuals. We can also speculate about whether the desire for recognition, at least for the project member who took on a management role, served as an additional motivator.

## 5.2 Co-creation Process: Modes, Tasks, Governance

The framework helps one to analyze co-creation mode and the development task's and process governance's characteristics. Although UNICEF did not constitute a producing organization in the traditional sense of a for-profit company, we can consider it the sponsoring organization with the communications specialist as the personified sponsor. Thus, we can consider the PC3G project an instance of sponsored co-creation. However, the situation involved more intricacy as the COL, through its funding, also appeared as a sponsor. We could not determine whether the consultant acted independently and autonomously from the sponsoring organization. She sovereignly chose and appointed the three developers; however, we cannot clearly answer whether she selected them for that UNICEF-sponsored process or did so at the behest of the organization. We return to this issue when analyzing the process governance methods with regard to the concept of individual autonomy.

Concerning the task characteristics, we classify the co-creation process as an endeavour of varying intellectual demands for the various types of performers. The project needed specific content about climate change issues, which climate change experts and UNICEF staff members provided. The latter, together with the communications specialist and the Pacific Islander youth as the initiative's target, knew how to communicate these complex issues in a simple, playful form to potentially affected adolescents. Beyond providing and presenting adequate content, the project demanded project management and coordination skills and experience, which the UNICEF-P sponsor, the consultant, and, to some extent, the developers provided. The developers faced challenges in developing some of these skills during the process using their study-based experience. They also needed ISD and, in particular, game development skills. While the developers had the former, they had to acquire the latter during the process. They could do so based on their education since it enabled them to gather and analyze ideas and requirements, to provide functional and technical designs, and to program, test, and react appropriately to test results, feedback,

and evaluations that other co-creators provided. Other stakeholders, such as the Pacific Islander youth and the UNICEF staff members, did not have as challenging intellectual demands since they could base their valued contributions on their mundane everyday experiences.

Concerning the process timeframe, the project occurred in a limited period with no a priori defined deadline other than the original contract deadline for the three developers. The sponsor and the three developers subsequently renegotiated the timeline as the whole process lasted 12 months. In the first six months, the sponsor initiated the idea for the game and applied for and obtained funding. In the next six months, which ended with the game's launch, the consultant first identified the development team and together with the sponsor and the three developers established a governance structure and process. The remaining four months involved intensive development work. The three developers received pay for 30 working days each to develop the game. The steps in the process involved effort at varying intensity levels: from moderate (though important) effort to initiate ideas and secure funding to intensive effort to establish and coordinate the team. The process also involved intensive effort for various other activities (e.g., providing, gathering, and analyzing requirements; designing the game's functions and evaluating it; programming the game and designing its technical aspects; and technically and functionally testing and validating the game). All these activities ultimately lead to the sponsor's accepting, approving, and launching the game.

Developing the digital game with a confined number of involved performers involved some structural complexity. While we cannot easily determine the game's structural complexity without taking the individuals' skill demands and actual skills into account, we argue that the project involved medium to high structural complexity when we consider the project's organizational structure. The co-creators resided in at least three continents and several regions and time zones with numerous collaborative relationships between them.

We can characterize the project's governance as a hybrid form that comprised elements from all governance methods that the framework defines. It was both distributed and centralized. The co-creation process had bureaucratic traits with formal rules that the sponsor established to approve designs for the game's intermediate and final versions. It also had adhocracy traits given the sponsor's relationship with UNICEF's headquarters and the collaboration between the three developers and their cooperation both with the testers, the Pacific Islander youth social media facilitators, and the consultant, who helped facilitate the process. The latter two stakeholder groups operated, as their roles indicate, as facilitation links and moderators between different roles. The Pacific Islander youth social media facilitators linked Pacific Islander youth UNICEF fans, who contributed requirements and feedback to the project's co-creation process both to the developers and to the sponsor. The fans' activities and the facilitators' actions in this regard enacted a market mechanism. The internationally based climate change experts and the Fiji-based UNICEF staff members also enacted such a mechanism when they contributed knowledge about the game's topic and provided feedback, respectively.

The developers' mechanisms for their collaboration and coordination for the distribution and documentation of their work strongly resembled collective norms as the collaborators did not define these mechanisms as strong formal rules. They had negotiated some simple ground rules; these rules evolved in the course of the project and included one developer's unforeseen self-appointment as project manager for the game's development. In analyzing the co-creation process, we found that individuals who provided knowledge and feedback as representatives of the "world", community members, skilled contributors, or prequalified individuals such as the consultant showed strong individual autonomy. Notably, the developers and the social media facilitators when performing their individual tasks did so too.

Finally, software code and possible governance rules embedded in it did not in any strong way implement a governance regime. Email enabled project members to communicate with one another and coordinate the process, which included organizing the incoming feedback. Standard software tools helped the project members design and develop the game.

### 5.3 Co-created Value

The PC3G came into being through various development tasks that the different co-creators distributed and redistributed among themselves in a way that one does not typically find in traditional development projects. If they had not executed the redistributed tasks, the game as an asset would not exist. Thus, as the framework argues, the task's distribution contributed to co-creating value.

Applying the taxonomic framework further, we can identify several types of value. The PC3G delivered both procedural content in the form of the software that constituted the game and declarative content in the form of information about climate change and possible future counter actions. Pacific Islander youth and the different stakeholders in UNICEF perceived both the game and the embedded materials as informative, interesting, and attractive. The project strengthened the relationship between various participant groups (e.g., between UNICEF and Pacific Islander youth, between the sponsor, the consultant, and the developers, and between the developers themselves). In that way, the project co-created social capital, relationships, and trust as intangible values for these participant groups.

The project co-created value for both individuals involved in the project and others beyond it. Such value emerged from the Pacific Islander youth's, the testers', the developers', the UNICEF-P sponsor's and staff's, and the climate change experts' input into ideation and idea evaluation, their co-design activities, and their work on testing the game.

Beyond these activities, the developers performed the technical design and programming activities for modest remuneration, which we can best characterize as monetary rewards according to the original taxonomy. Through all these activities, the developers co-created value among and for themselves as they gained new knowledge, skills, and experience. Pacific Islander youth's involvement throughout the uptake and their appreciation and recommendations expressed through Facebook likes contributed to promoting the game.

The PC3G co-creation process occurred in a not-for-profit environment. In this context, the economic beneficiary concept does not apply except for the three developers who received a financial compensation for their work. By applying the framework beyond a for-profit context to examine the non-economic and intangible values that the project participants co-created, we identify the larger game community and, through possible diffusion, the "world" as the project's beneficiaries. The project participants acquired and spread information and knowledge about the issue of climate change and created awareness that might trigger future action; this type of social value was not part of the original taxonomy. The contributors and the sponsoring organization benefitted from the co-creation process either as game players, conscious young citizens, or as UNICEF representatives or climate change-aware organizations that focus on raising awareness about climate change. UNICEF in particular gained value, though not an economic one as the project achieved their objectives: the project provided a proof of concept, it offered greater insight into the potential of social media to engage and mobilize youth, and both the co-creation process and the resulting game led to youth contributing and engaging more with UNICEF-P's FB site.

Although not directly involved in the project, Facebook as the platform provider and game content aggregator might benefit from an image as supporting this important societal issue. Finally, in contrast to other co-creation projects, the PC3G project had a rather simple outcome: three games in one multimedia artefact that contained a partially searchable corpus and hyperlinks to further relevant material. The project team frequently refined the software and its content throughout the project, however, once approved and launched, the game has remained unchanged.

## 5.4 Differences between the Framework and Co-creation in the PC3G Project

In our case study, we investigated an actual ISD project through mapping our research data against the theoretical taxonomic framework that builds on Zwass's (2010) taxonomy. Keeping in mind that Zwass originally developed the taxonomy that the framework builds on for a related but different purpose (i.e., understanding and researching Web-based co-creation in commercial contexts), we have identified what in practice resembled and what differed from the framework. Figure 3 summarizes our findings that we obtained from applying the framework. While we observed all elements in the taxonomical framework and, therefore, can conclude that we can regard the PC3G project in this respect as an act of co-creation, we also found important differences.

We identified performer roles or types as well as categories in the PC3G project that differed from those that the framework provides. However, we found it difficult to categorize most co-creators and co-creator groups and could not uniquely classify them. The co-creating individuals did not have clearly defined roles as producers and consumers, and, naturally, the project involved no customers in terms of the framework. We also found the provided categories challenging to use to clearly recognize the particular contributions that the role bearers made to each task.

The framework provides broad categories of co-creator affiliations and assumes that co-creators affiliated with one group make similar contributions. However, in our case, due to the link between roles and tasks,

affiliations and contributions lacked uniformity and had more specificity, and they varied depending on the co-creators' actual involvement. The framework introduces the category "world", which assumes that any individual can be a potential contributor to the best of their ability. However, it also highlights the importance of contributors' skills for a given co-creation project and the possibility that contributors may be removed from a project due to lack of such skills. In our case, expert skills—apart from the developers and the climate experts who had existing qualifications—had less importance. Otherwise, individuals made contributions based on their experience, knowledge, and geographic location, and no contributor was removed; on the contrary, contributors joined and left as they saw fit. Therefore, we found it more effective to not further rely on the distinction between producer and consumer and on the four categories but to introduce rather specific task-based labels for actors' roles such as developer, facilitator, and requirements contributor to identify the co-creators' contributions. In this context, although the framework mentions the facilitator role, it does not define it in much detail or describe its tasks. In our case, the different facilitators, most notably the social media facilitators, played an important role in engaging their community to contribute and conveying their input to the project sponsor and coordinator.

Co-creators	Co-creation Process	Co-created value
No single producing organization	No pure, but a hybrid of sponsored and autonomous mode of co-creation	Task (re-)distribution uncommon for traditional ISD
Not all other co-creators were consumers or customers	Limited, not continuing time period, but extended during course of project	Both procedural and declarative content Interesting, informative game with attractively presented materials
Co-creators fell into multiple categories	Varying level of intensity depending on phase of development	Strengthened relationships Social capital, trust
Roles less aligned with type and categories of co-creators, but more aligned with actual tasks such as project co-ordinator, social media facilitators, developers, climate change experts etc.	Minor structural complexity of the game Medium high structural complexity of organizational structure	Ideation, idea evaluation, co-design activities, technical design, testing, programming
Multiple motivations with altruism and passion dominating, and instances of own intention to use, enjoyment, reciprocity, learning, signal competence, desire for recognition, etc.	Hybrid form of governance with elements of all governance methods Distributed responsibility and decision making based on expertise Some degree of individual autonomy with sponsor as the ultimate decision maker Managed by co-ordinator and facilitators through collective norms and simple rules	Social value through acquisition and spreading of knowledge on important societal issue, awareness recreation, possible stakeholder mobilization, Promotion of game and its mission
	Simple technology to implement governance	Proof of concept Insight in potential of social media Economic value subordinate, small monetary reward Economic beneficiary not applicable New knowledge, skills and experience

**Figure 3. Findings Based on the Taxonomic Framework**

Based on the motivations for co-creators in the framework (see Figure 1), we could better understand why co-creators participated in the PC3G project. The main difference between our not-for-profit project and other commercial, co-creation settings concerns intrinsic motivation: participants did not obtain any substantial economic benefit from the project, nor could anyone command them to participate in it as employees. In this context, we unsurprisingly found only some motivations from the framework, such as altruism and a passion for a socially responsible cause. The types of value we found had less emphasis on economic value and more emphasis on social value in the form of education and knowledge about a societal critical issue such as climate change. The framework also stresses the continuous evolving outcome that represents co-created value. In our case, beyond a possible growing awareness concerning the issue at hand, we cannot assume that the co-created games will continue to evolve.

In terms of the co-creation process, we found that the co-creation modes in the framework did not apply in their pure form; the PC3G project received only partial sponsorship, and no one sold its final product. However, although co-creators could participate voluntarily, they were not fully autonomous either since they did not conduct all activities independently of UNICEF or the established project organization. We found most forms of co-creation governance that the framework identifies. In our case, different co-creators collaborated in different ways; thus, the project generally followed a hybrid form of governance, and we could not find one category that fit the project. Beyond the general co-creation mode, the project showed bureaucracy traits with a small set of formal rules and distributed decision rights where the project sponsor had the ultimate decision mandate, although he delegated decisions in areas outside his expertise to other project members. This form of co-creation governance emerged as the project progressed. The taxonomic framework lists effort intensity and timeframe as task characteristics but does not particularly emphasize changes that occur over time such as we found in tasks that varied in intensity through the project, tasks that emerged as the project unfolded, and other tasks that varied according to individuals' roles and experience as commonly occurs in ISD.

## 6 Discussion

One could discuss co-creation in the PC3G project from many theoretical perspectives. For example, one could examine the project according to intergovernmental, non-governmental, or not-for-profit organizations' low degree of IT use (Cockerill, 2013; Chang & Chang, 2011) or according to the challenges they face in engaging with youth (Henderson & Bowley, 2010) and empowering this specific user group (Clement, 1994; DiSalvo, Clement & Pipek, 2013)—in particular through gamification (Hamari, Koivisto, & Sarsa, 2014). User participation (Bjerknes & Bratteteig, 1995), participatory design (Kensing & Blomberg, 1998), distributed participatory design (Öberg, Gumm, & Naghsh, 2009; Lukyanenko, Parsons, Wiersma, Sieber, & Maddah, 2016), crowdsourcing (Kazman & Chen, 2009), or even open innovation (Chesbrough, Vanhaverbeke, & West, 2006) constitute other possible theoretical starting points for further discussion. However, in this paper, we focus on ISD as value co-creation and how the involved actors perform co-creation as an ISD approach.

As we state above and unsurprisingly given the taxonomy's original intended purpose, we could not apply all elements in the taxonomic framework in their defined way to the presented case. Nevertheless, by using the framework in our analysis, we could comprehend the PC3G development project as value co-creation in a not-for-profit environment in depth.

To further address the differences between our findings and the taxonomical framework, we turn to the IS literature on service innovation that emphasizes the role that digital technologies play in value co-creation. Grounded in S-D logic, which considers value co-creation as a business logic (Alves et al., 2016) (see Section 2), Lusch and Nambisan (2015) proposed a broadened view of service innovation that transcends the tangible-intangible and producer-consumer divides. This view covers various performer roles beyond producer and consumer and accentuates service as co-creators' applying their specialized competences, knowledge, and skills for mutual benefit, the benefit for other co-creators, and for themselves.

This view highlights, but does not privilege, the element of the value co-creation process that occurs when a customer consumes or uses a product or service rather than when one develops or produces it, which some S-D logic studies refer to as co-production (Payne et al., 2008). This perspective emphasizes service innovation as a collaborative process that occurs in actor-to-actor networks where goods and products are only of service to an actor if they have some value-in-use beyond any value-in-exchange (usually determined through a price).

Lusch and Nambisan (2015) offer a tripartite framework of service innovation based on the concepts: service ecosystems, service platforms, and value co-creation. They define a service ecosystem as "a relatively self-contained, self-adjusting system of mostly loosely coupled...actors connected by shared institutional logics and mutual value creation through service exchange" (p. 161). Understanding the PC3G as a service innovation, one can understand and depict its ecosystem as a network of actors (see Figure 4).

The co-creators as actors in the network were connected through their common interest in contributing to developing a digital game to help share knowledge about climate change. In addition to their individual motivations to participate, the ecosystem depended on the value co-creation during co-production and the value-in-use for the co-creators. In the PC3G project, beyond any specific values-in-use for the individual co-creators, the overall social value of education and information about climate change most likely



represented the shared value-in-use, which points to a relationship between motivation and value-in-use. As such, the concept of a service ecosystem links those two concepts more explicitly than the taxonomic framework does.

In the project, the participants expressed the necessary institutional norms through social rules. The norms manifested in an effective social infrastructure and good social relations in the network, which comprised a broad range of different, highly motivated co-creators who contributed to an ecosystem in which co-creation could strive.

The concept of service ecosystems as emergent network structures also explains the network's ongoing changes and evolution. The co-creators create and recreate these network structures through their actions in an ensuing tension between structural flexibility and structural integrity. However, the original taxonomy puts little emphasis on such network structures and effects.

The network in our case expanded and contracted as necessary and allowed new relationships to emerge. Expansion occurred when the UNICEF-P sponsor contacted climate change experts to obtain information on climate change and when the developers contacted some Chinese acquaintances for help with testing the game. Originally, the development team and the social media facilitators communicated via the sponsor, but, as time passed and the decisions became less strategic, they established their own connection. In contrast, the consultant played an important role in the project early on, but, as the project progressed, the need for her decreased and her coupling with the other actors and the network loosened considerably. The Chinese testers even disappeared completely from the network after they had performed the requested tests.

A key issue for a service ecosystem involves developing a participation architecture, which provides a road map for actors to exchange services through shared institutional logic and rules for engagement and coordination (Lusch & Nambisan, 2015). As such, the concepts of service ecosystem and participation architecture relate to the concepts of co-creation mode and forms of governance—essential elements in the taxonomic framework. In the PC3G project, the sponsor with the assistance of the consultant had set up a sophisticated governance structure that distinguished between co-creators based on their different roles and that connected different co-creator groups. In addition, the sponsor and the three developers had implemented a communication structure with weekly and further regular virtual meetings. The project sponsor, the developers, the social media facilitators, and UNICEF as the principal sponsoring organization also negotiated, clearly communicated, and shared the developed approach and rules of engagement. Different actors in the network also had agreements to facilitate exchanges (e.g., the project sponsor communicated with one member in the project team). He also filtered requirements that came from many sources, such as the social media facilitators and climate change experts, and input that came from UNICEF staff members.

A service platform refers to “a modular structure that comprises tangible and intangible components (resources) and facilitates the interaction of actors and resources” (Lusch & Nambisan, 2015, p.166). In the PC3G project, the participants' access to electronic communication was essential. They used easily accessible technology such as email, Skype, and the UNICEF-P's Facebook page, and they agreed on when and how to use what medium. This structure helped them to overcome project challenges such as their differences in location and time zone, limited time, high change rate, and evolving developer competences. The coordinating project sponsor's and developers' close interaction with each other and the other co-creators compensated for minimal documentation and the limited number of tests and helped resolving any issues concerning the developers' growing competences. Together with the communication structure, the close interaction also managed the high change rate and helped the project ultimately succeed. The technology provided the necessary resources (or resource density in the terms of Lusch and Nambisan (2015)), which allowed co-creators from different parts of the world to cooperate despite their geographical distribution.

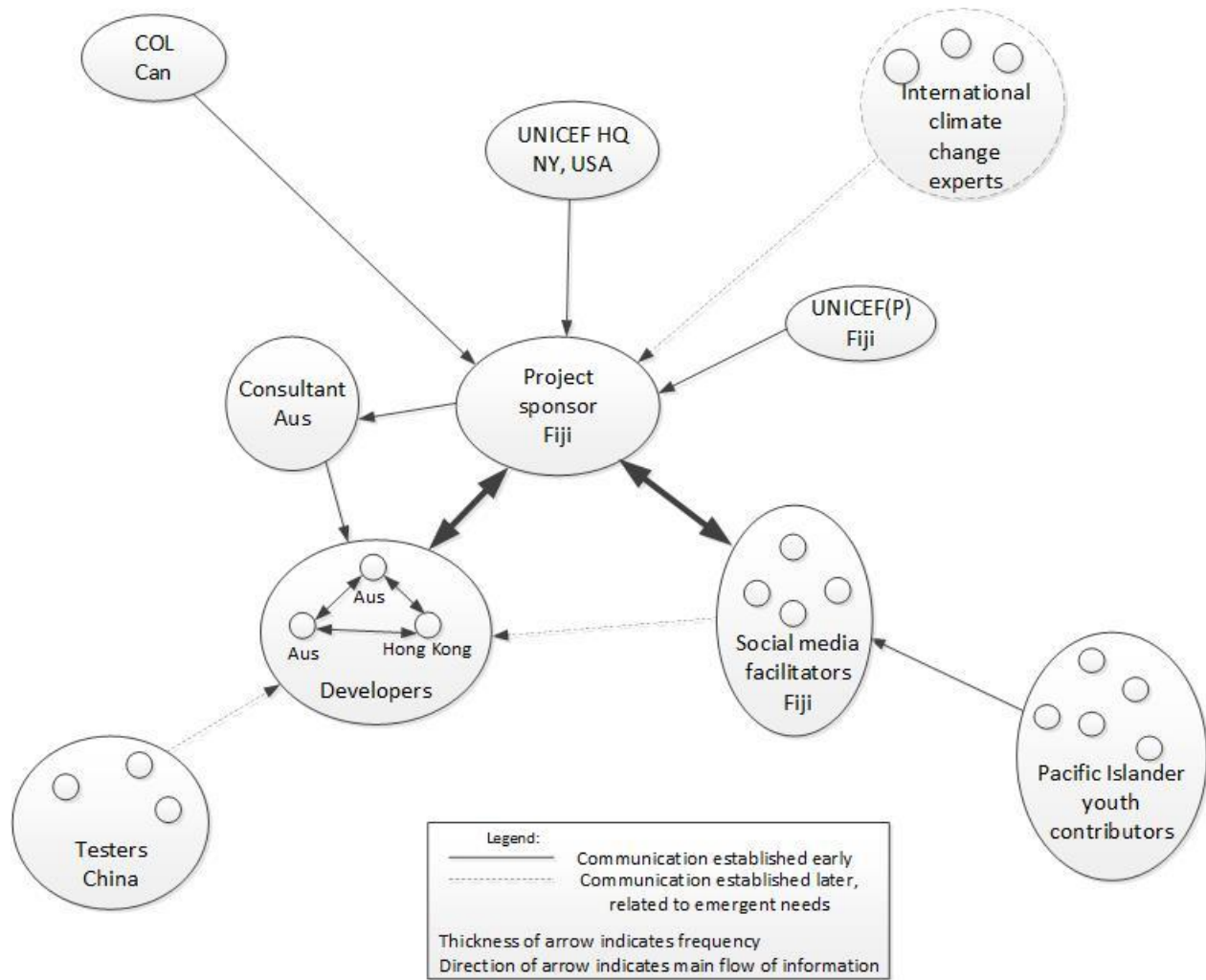


Figure 4. The Service Ecosystem of the PC3G Project

Lusch and Nambisan (2015) emphasize the significance of value co-creation's underlying roles and processes. They identify three roles: ideator, designer, and intermediary. An ideator reflects the capabilities of service beneficiaries, usually customers, to provide knowledge about their needs. In the PC3G project, we identified three main ideators: 1) the project sponsor, who proposed the project; 2) UNICEF-P, the organization that triggered the project to gain insights into the potential to use social media to engage youth; and 3) the Pacific Islander youth, who wanted more engaging content on UNICEF-P's website. A designer mixes and matches existing knowledge components or resources to develop new services. In the PC3G project, we identified three main designers: 1) the project sponsor, 2) the facilitators, and 3) particularly the developers. The intermediary cross-pollinates knowledge across multiple ecosystems. In the PC3G project, we identified the project sponsor, the consultant, the social media facilitators, and the developers as intermediaries. In the tripartite framework of service innovation, the same co-creators can have different roles, and tasks and roles are strongly related in contrast to the taxonomic framework that might imply that they are independent from each other.

Zwass (2010) categorized different types of value and economic beneficiaries. Among others, he lists social capital and relationship value as one category of value, and individual contributors as one category of receivers of revenue (see Figure 1). However, he does not refer to other social, intangible values through, for example, spreading and acquiring knowledge or to new skills and experience as value co-creation outcomes. The taxonomic framework also does not (or only scarcely) emphasize mutual benefits and values that individuals (either as individual stakeholders or as members of a stakeholder group) co-create through interacting and exchanging services in digitally mediated encounters. In contrast, Lusch and Nambisan (2015) do so in their conceptualization of value co-creation.

Mutual value co-creation in the PC3G project produced too many and complex individual-level outcomes and benefits that we cannot exhaustively list here. Therefore, we illustrate the mutual benefits with a particular instance that began with UNICEF-P as a stakeholder and sponsoring organization. Beyond the aforementioned overall social value of education and information about climate change as a mutual benefit for all parties involved, UNICEF-P and its staff members achieved a proof of concept that digital games and their development on social media can increase the degree to which Pacific Islander youth engaged with the organization. More precisely, the project sponsor co-created this proof of concept to the mutual benefit of himself and other parties who participated in the project through exchanging his communication, coordination, and networking skills. The project sponsor and his immediate co-creators—the consultant, the social media facilitators, the developers, UNICEF-P and other UNICEF staff members, the COL, and international climate change experts—together co-created this proof of concept to their own and all other involved parties' mutual benefit.

The consultant exchanged her knowledge about organizing ISD projects and access to suitable developers, which both benefitted the sponsor and, beyond him, the developers. The developers, in turn, increased their ISD knowledge and experience and, in exchange, provided an interesting, informative, and engaging digital game for UNICEF-P and its staff, the project sponsor, and the Pacific Islander youth. The developers also co-created these values in exchange with the social media facilitators to both these two groups' mutual benefit. The social media facilitators engaged in mutual value co-creation with the Pacific Islander youth. Lastly, by providing feedback and making their opinions heard, the Pacific Islander youth ultimately benefitted in that they received an interesting and engaging game. Thus, by exchanging their mediated engagement, they benefitted both themselves and UNICEF-P.

The elements in the tripartite framework of service innovation (Lusch & Nambisan, 2015) show that one can understand the PC3G project as a value co-creation process. In particular, the concept of a service ecosystem captures the PC3G project's essence as a value co-creation project beyond the co-creation modes and co-creation governance concepts. The S-D logic and IS service innovation literature on value co-creation (Vargo et al., 2008; Lusch & Nambisan, 2015; Vargo et al., 2017) emphasizes the co-creation of mutual benefit and value. However, beyond the distinction between value-in-exchange and value in-use, it lacks specificity about the types of values that co-creators derive from the co-creation process. Through applying the taxonomic framework to the PC3G project, we found that the individual co-creators and co-creator groups to a large degree obtained the mutually created value they looked for in the co-creation process: UNICEF-P achieved a proof of concept that digital games on social media platforms can engage their target group, youth obtained an engaging game, and the developers gained skills, knowledge, and experience. Most co-creators developed social relationships, and all participants contributed to disseminating knowledge about climate change—a major driver for them all. In our analysis, we also found further value types, such as social value in a not-for-profit context, and extended the beneficiaries concept beyond mere economic receivers. Given the importance of value-in-use in the PC3G project, research that further examines this aspect might bring additional insight to light.

Lastly, while distinguishing some co-creator roles, Lusch and Nambisan (2015) did not emphasize co-creators' motivation to the extent the taxonomy does. We assumed and identified altruism as the major motivation for participation in the PC3G project. Although we have confidence that our assumption in our not-for-profit context holds, work that further investigated altruism as the main intrinsic motivation and as part of co-creators' psychological contract (see, e.g., Kautz & Bjerknes, 2015) in a not-for-profit project would be interesting.

In summary, prior research on co-creation has focused on commercial (mostly e-commerce) environments with some exceptions (notably in open source software development in the not-for-profit arena). In contrast, we examine genuine value co-creation through not-for-profit, intergovernmental organizations and mainly youth in an ISD project to develop a digital game. We empirically confirm most parts of the taxonomic framework that we derived from Zwass's (2010) taxonomy for understanding Web-based co-creation. We extend the framework's applicability by using concepts derived from the IS literature on service innovation in the S-D logic perspective: ecosystem as emergent network structures of co-creators, service platform as rule-based means for co-creator interaction, and value co-creation focusing on process and value-in-use (see, e.g., Vargo et al., 2008; Lusch & Nambisan, 2015).

Finishing this discussion, we offer some propositions for how future ISD research could benefit from adopting a value co-creation perspective. IS research has examined how organizations can create value, in particular business value, through IS and IT for some time (Schryen, 2013). However, we lack empirical research on value creation and, in particular, value co-creation in ISD. In their empirical study, Kautz,

Johansen, and Uhldahl (2014) focused on how one can create business value through agile project management and ISD. The agile approach deals with dynamic environments and change as they occur commonly in contemporary ISD projects. However, such research focused on the value that the agile ISD method generates for a development organization. In this respect, by adopting a value co-creation perspective, we uncover further directions for future ISD research.

We propose that researchers empirically investigate the value co-creation process particularly in a context in which one applies agile methods, which we do not particularly focus on in this paper. Agile methods have a co-creative nature (Babb & Keith, 2012) and emphasize customer goals and values (Wipfler & Vorbach, 2015).

Therefore, we recommend researchers apply the value-in-use concept to research the explicit tie between value-in-use and particular beneficiaries. In doing so, we can better identify and understand the different types of value for the different beneficiaries in ISD projects. A value co-creation perspective suggests that, beyond hard measures and indicators of value and success such as time, cost, and scope, one also needs to consider perceived impacts and benefits and their relation to the respective stakeholders. Thus, we advise further ISD research to refine the project success concept. Further, we suggest that researchers explore the value-in-use concept in an agile context to assess what value preliminary IS versions have for different stakeholder groups. In this way, researchers can study and better understand how the approach affects an information system's continuous evolution. As the emphasis on value co-creation with its focus on customers and its tight relation to some beneficiaries also resonates well with the many contemporary digitalization and digital transformation projects (Urbach & Röglinger, 2019), we also need further research into ISD's changing role in (among others) IT and ISD departments (Urbach & Ahlemann, 2019) in such projects.

The value co-creation perspective recognizes that value co-creation occurs in dynamic network structures. Thus, we believe that future ISD research has to go beyond the traditional perspective in which development projects are often considered as closed entities with clear organizational boundaries. Such research might reveal further stakeholders who are involved and impacted by the development activities, and all their contributions to the co-created values. The value co-creation perspective in this context provides a new outlook on the traditional roles and coordination in agile ISD projects. Therefore, we propose that researchers investigate actors' changing roles and, in particular, the degree to which they self-organize and the emerging facilitating function that project leaders play in relation to the traditional control and governance regime in conventional ISD. Research should examine the coordination between the multiple, involved participants in and between projects and between projects and their commissioning organizations and their more open surroundings. Researchers have done some initial work along these lines. For example, Dingsøyr, Moe, and Seim (2018) examined coordination in large-scale agile development, and Bjerknes and Kautz (2019) examined agile development projects as service ecosystems. Lastly, researchers also need to consider the role that digital technology (e.g., development tools, automated testing tools, configuration management tools, and communication tools, and even digital platforms) play in ISD from a value co-creation perspective. Rolland, Mathiassen, and Rai (2018) conducted an initial study on the latter (i.e., digital platforms). Against this background, we note that researchers need to further examine how such digital technology impacts, supports, or hinders both coordination and the co-creation of value in contemporary ISD.

Finally, we suggest that a value co-creation perspective should fuel a renaissance of participatory and distributed participatory design research in ISD. We have begun to provide such work (Kautz et al., 2020), but more future ISD research in this respect (beyond concentrating on instrumental outcomes and values) should focus on approaches that focus on achieving humanistic outcomes and values such as empowerment, equality, wellbeing, and individual and societal liberty and security.

## 7 Conclusion

In this research, we investigate ISD as value co-creation and how various actors performed co-creation as an ISD approach in a not-for-profit, intergovernmental environment with limited resources and with several youth in a project that used a social media platform. We found that, by using an analytical framework that we derived from a taxonomy of Web-based co-creation that Zwass (2010) originally developed for a commercial context, we could more deeply comprehend the PC3G development project as value co-creation in a not-for-profit environment, especially with regard to co-creators' motivation and the types of value they co-created.

In discussing the discrepancies between the taxonomic framework and our empirical data, we found that IS literature that examined service innovation from an S-D logic perspective with an emphasis on the role of digital technologies further explained the value co-creation process. We could fruitfully use this literature in a not-for-profit environment, and, with it, we could understand more generally what value co-creation is and how, when, and where actors can perform it as an instance of ISD practice. We obtained additional insights into the co-creation process by considering the three elements in the tripartite framework of service innovation (i.e., service ecosystem, service platform and value co-creation (Lusch & Nambisan, 2015)) and the two concepts of co-creator motivation and value type in Zwass's (2010) taxonomical framework.

Although we derived these findings from a specific project in a particular setting, we argue that one can combine and use them to 1) prepare any co-creation project, 2) cope with co-creation during the development process by explaining co-creation as an approach to ISD, and 3) reflect and derive lessons learnt. While we need further empirical validation to justify these claims, we provide insight into co-creation in ISD with respect to participatory approaches to ISD beyond conventional environments, roles, and types of participants and contributors.

Our work demonstrates how stakeholder groups can actually organize co-creation in ISD to result in a process and outcome that they all appreciate. Research that examines ISD in practice and subsequently presents empirically grounded theories can enhance researchers' and practitioners' knowledge and introduces new concepts that both groups can bring to their respective practice (Madsen et al., 2006). In this case, we introduce a taxonomic framework that we derived from Zwass's (2010) taxonomy for Web-based co-creation, position it in relation to the wider value co-creation literature, and discuss it in particular with regard to Lusch and Nambisan's (2015) work, which considers value co-creation's role in service innovation from a S-D logic perspective. We also contribute with a practice study on co-creation as Zwass (2010) requested to broaden the perspective on co-creation research, and we provide a sound, empirical study on co-creation as Kazman and Chen (2009) requested. Our research adds to the body of knowledge on ISD with rich insight (Walsham, 1995) into value co-creation as a possible and vital approach to ISD and provides a link between the otherwise often disconnected research areas and research communities of value co-creation and ISD.

Our work provides an example of IS research that transcends the traditional organizational focus and boundaries as, for example, Majchrzak, Markus, and Wareham (2016) and Sørensen (2016) requested in their recent calls for relevant IS research. Our work also follows Sarker, Chatterjee, Xiao, and Elbanna's (2019) plea to recommit to the sociotechnical perspective as a foundation of the IS discipline by not only synergistically connecting instrumental results, which usually dominate IS research in business and commercial contexts, with humanistic outcomes but also by emphasizing the latter and by demonstrating how IS practice and research can contribute to this important pursuit.

The taxonomic framework for value co-creation that we derived from Zwass's taxonomy for Web-based co-creation is only one possible framework to analyze co-creation in ISD and beyond. We discuss this framework against Lusch and Namibisan's (2015) tripartite framework of service innovation, which builds on the broader S-D logic perspective. Alves et al. (2016) identified Payne et al.'s (2008) conceptual framework, which distinguishes between customer and supplier value-creating processes and between customers' and suppliers' encounter, interaction, and dialogue processes. This framework also has its foundation in the S-D logic perspective. Vargo and Lusch (2004) first presented S-D logic as an alternative to a goods-dominant logic and have developed their own S-D logic framework further during the last 15 years (see e.g., Vargo & Lusch, 2008, 2016; Lusch & Vargo 2019). By applying this general framework, which builds on the five foundational concepts actors, value, service, resources, and institutions, researchers might provide further insight into value co-creation in ISD. While we could not undertake such an extensive endeavor here, we have begun performing such an analysis as a separate project to determine how well multiple theories apply to the same data.

## Acknowledgments

We acknowledge and express our gratitude for the support and valuable input for this article to Tomas Jensen, who was the UNICEF-P communications specialist and project sponsor of the Pacific Climate Change Challenge Game (PC3G) project, and to Julie Fisher, who served as a consultant on that project.

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