Edited by
Agnessa Spanellis · J. Tuomas Harviainen

Transforming Society and Organizations through Gamification

From the Sustainable Development Goals to Inclusive Workplaces

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Contents

List of Figures

Gamified Emissions Through the Wisdom of Crowds

Gamification and Virtual Reality for Communicating Ecoliteracy and Climate Science: Carbon Transport in the Essequibo River at Iwokrama Guyana

Echoes of the Past: A Gamified Initiative for Audience Development of Cultural Heritage

Gamification Design for Behavior Change of Indigenous Communities in Choco, Colombia, During COVID-19 Pandemic

Disaster Prevention and Awareness

Disaster Risk Reduction Towards Community Resilience: Empirical Model of Decision-Making Process Through Stop Disaster Game

List of Tables

Gamification Service Framework and Transformative Services: Applications for Environmental, Social and Organizational Changes

How Socially Sustainable Is Social Media Gamification? A Look into Snapchat, Facebook, Twitter and Instagram

Disaster Prevention and Awareness

Disaster Risk Reduction Towards Community Resilience: Empirical Model of Decision-Making Process Through Stop Disaster Game

PART I

Introduction

An Introduction to Societal Transformation Through Gamification

Agnessa Spanellis and J. Tuomas Harviainen

This is a book about tools for societal transformation, many of which were actually invented decades or even centuries ago. This volume is about the power of play, games and gamification. The ongoing pressures of climate change combined with the recent disruptive events of 2020 signify that the challenges we are facing are complex and highly interconnected. They put a strain on carefully constructed social and economic systems and unveil structural problems in economic and social relationships in our society. They also illustrate the essence of sustainable development and the three pillars of sustainability, whereby economic, environmental and social systems must co-exist in balance with one another to ensure sustainable development for future generations.

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The need for balance is captured in the United Nations Sustainable Development Goals (SDGs), which succeeded Millennium Development Goals (MDGs). Unlike SDGs, MDGs were very much focused on the social and economic development, and by far not all the targets have been achieved, for example, MDG1 (Eradicate extreme poverty and hunger) or MDG3 (Promote gender equality and empower women). This relatively modest progress signifies how complex and challenging the problems are to solve even when world resources are pulled together in the service of a noble cause. Among SDGs, we see a much more diverse range of problems to be addressed, many of which are grounded in more than one pillar of sustainability. For instance, SDG1 (No poverty), SDG4 (Quality education) and SDG10 (Reduced inequality) all contain social and economic aspects in them. SDG1 looks at multidimensional poverty that goes beyond economic poverty (Hammler in this book), SDG4 focuses on equal access to education (Marin, Lee & Landers in this book) and employment (Ghaly in this book), while SDG10 includes economic growth and social inclusion (Hassan & Leigh; Petridis et al. in this book).

These epic challenges require epic solutions (McGonigal, 2011), new solutions to these problems, such as the use of gamification and serious games. For instance, it is quite likely that players learn more about climate change by playing Sid Meier's *Civilisation VI: Gathering Storm*[1] than by listening to experts on climate change. In this book, we present different cases of how gamification can be used to address different sustainability issues by looking at them through one of the three sustainability lenses, paying particular attention to the social sustainability lens. In the gamification literature, many studies address the issue of sustainable behavior to promote environmental sustainability (Froehlich, 2014; Ouariachi, Li, & Elving, 2020; Rajanen & Rajanen, 2019). Fewer studies look at social sustainability or are framed in such manner. Thus, we considered it necessary to draw more attention to this lens, particularly because the importance of and the stand for human rights might fade to the background, as the climate change issues become more pressing.

Gamification has gone through the hype phase (Thibault & Hamari in this book), with over 7500 academic articles published to date (in Scopus database) and thousands more published in related fields, for example, serious games. It is now reaching adolescence and invites for a more serious conversation in the field. The first larger academic volume on the topic

[1] https://civilization.com/en-GB/civilization-6-gathering-storm/

was *The Gameful World* by Walz and Deterding (2014). It invited the readers to look at gamification beyond the surface level of points, badges and leaderboards and was targeting primarily gamification researchers and designers, engaging them in a serious conversation about the topic. The other key volume, *Organizational Gamification*, edited by Mikko Vesa (2021), brought together and conceptualized the emerging interest and experiments of using gamification in the organizational context, thus consolidating the conversation about gamification in organization studies.

In this volume, we take the next step and start a conversation about the use of gamification in development studies. We build on the already existing examples of using gamification and serious games to address major challenges our society is facing. Although the use of gamification is called for by some of the most passionate about the topic researchers and practitioners, this topic is, however, absent from the development research and ongoing conversations in this field. Here, we show the theoretical, methodological and deployment value of using gamification to address these issues in new ways. We hope you find it useful.

This volume encompasses 17 chapters, which range from theory to very practical solutions. Mattia Thibault and Juho Hamari (Thibault & Hamari Chap. 2 in this book) represent the former, providing a critical look at how gamification is viewed. Their "punk" gamification takes the topic and establishes a new maturity to the field. The remaining chapters are grouped in three sections, each representing one of the sustainability lenses.

Providing contrast to the opening theoretical chapter, Katharina Hammler (Chap. 3 in this book) discusses the application of gamification within the field, in Paraguay. Addressing the topic of multidimensional poverty, Hammler's work shows how gamification is able to contribute to poverty alleviation by engaging with behavioral aspects of the problem. This chapter opens the discussion about economic sustainability in this book and gives new insights into the complexities associated with poverty.

Lobna Hassan and Elyssebeth Leigh (Chap. 4 in this book), in turn, examine two games set half a world apart, and point out that similar mechanics can function in very different circumstances. In particular, they discuss the role of storytelling in the context of fundraising.

Mina Ghaly (Chap. 5 in this book), while building on the previous chapters, engages us in a discussion about development aid. Ghaly's work presents two cases of engaging youth with games in employment and workplace contexts, in Egypt, and shows how games can help to improve

employment opportunities by matching jobs with job seekers, and facilitate productive discussions about workplace issues, such as sexual harassment, to make the workplace more inclusive.

Petridis et al. (Chap. 6 in this book) display how a serious game can be used to teach people about household energy consumption and help them to get more with limited available energy. The chapter emphasizes the ways in which play can make a difference in people's understanding of their everyday life practices.

Mikko Vesa and Mikeala Krohn (Chap. 7 in this book) delve into a 39-month ethnographic study of online play communities. Using this data, they outline the ways in which participation in playful communities allows us to understand voluntary contribution to communities that are dependent on people contributing their time and financial resources. Then they draw parallels between this study and modern organizations and theorize about the ways in which modern organizations can become more sustainable.

Ronald Dyer (Chap. 8 in this book) initiates the discussion about the environmental sustainability lens and treats one of the most pressing concerns of our time, carbon emissions. Using gamification and crowdsourcing, Dyer presents ideas with which people can be motivated to reduce their carbon footprint.

In a similar tone, David Cole, Ryan Pereira and James Spray (Chap. 9 in this book) also address climate change by focusing on a specific case. They present a virtual reality game about being experts in the Amazonian rainforest of Guyana by the river Iwokrama, and attending a climate summit, with the goal of understanding the subject matter at hand and developing a set of policies to reduce the global temperature rise.

Sol Klapztein and Carla Cipolla (Chap. 10 in this book) develop their work on the gamification service framework further (Klapztein & Cipolla, 2016; Harviainen & Hassan, 2019), and demonstrate the ways in which gamification can be used to support sustainable services like carpooling.

Sebastian Marin, Vivien Lee and Richard N. Landers (Chap. 11 in this book) initiate the discussion about social sustainability by giving us an expanded understanding of how gamification-based learning can make education more inclusive. A critical voice is needed in this field, as the introduction of game elements is way too often presented as a solution, but the facts may not support that conclusion at all.

Analyzing several social media platforms, Dayana Hristova and Andreas Lieberoth (Chap. 12 in this book) raise questions of whether the business

use of gamification actually brings benefits and what impact it has on social well-being of social media users. Through its critical voices, the chapter points out that despite its history, the application of gamification is still immature.

While criticality is necessary, Elina Koskinen and Mikko Meriläinen (Chap. 13 in this book) provide us with another uplifting note. Their work on the ways in which *Pokémon GO* brings families and friends together reflects a rather unique situation in these challenging times and gives insights into how games can help to bridge generations.

Vincenzo Idone Cassone and Fabio Viola (Chap. 14 in this book) echo the chapter by Hassan and Leigh (2021) and discuss the role of storytelling in the preservation of cultural heritage through gamification. A topic earlier addressed by scholars such as Olle Sköld (e.g., 2019), it is an area where much more research is needed.

The work of Philipp Busch (Chap. 15 in this book) brings us to the ways in which playing together can support peace. Taking examples from Yemen, Busch shows the use of gaming to initiate peace discussion in the conflict area and bring solutions to the table in a safe environment that can unlock answers acceptable to all concerned parties.

Borzenkova et al. (Chap. 16 in this book) likewise go for an understudied topic. Researching the use of gamification with the indigenous people of Colombia in the context of the pandemic, they bring forward issues not only related to gamification, but to wider scholarship taking place. This chapter also demonstrates how gamification can become a mediator and help to bridge understanding between the "Western" and indigenous world to help the communities face the pandemic.

Serious gaming has been used in this field far longer than gamification. Toshiko Kikkawa (Chap. 17 in this book) brings this forth in her chapter on the ways in which Japan has been using simulations to prepare for natural disasters. Referring to the Game Market, the work shows how much more could be accomplished in the area.

Tri Mulyani Sunarharum, Hilya Mudrika Arini and Indah Sepwina Putri (Chap. 18 in this book) finish this volume also with a disaster prevention chapter, from Indonesia. They too work with serious games and provide complimentary results to those of Kikkawa. They reinforce the idea that gamification can help make communities more resilient. This emphasizes the goal of this book: we have sought to provide you with texts that are in dialogue with either earlier articles or parts of this volume. We hope that you will engage in dialogue with them.

Chapters 7, 10, 12 and 13 went through an additional round of anonymous peer review. We therefore want to thank Igor Pyrko, Paula Alavesa, Tobias Wolf and Kathryn Waite for their contributions to the peer review process.

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Seven Points to Reappropriate Gamification

Mattia Thibault and Juho Hamari

1 Luddites and Ludification

The industrial revolution, while often celebrated for its technological advancements, also harshened the living conditions and social status of the working class (Williamson, 1982). The high unemployment and inflation that invested Britain in the beginning of the nineteenth century gave rise to a popular movement that targeted what workers believed to be the cause of their harsh living conditions: the machines. It was the beginning of the Luddite movement, owing its name to the fictional figure of Ned Ludd (an apprentice who destroyed several textile machines) and later of General Ludd, an equally mythical figure hiding in Sherwood forest and leading a revolutionary movement against mechanization (Navickas, 2005). The peculiar form of protest of Luddites, destroying industrial machinery, was meant to economically harm the owners of the factories and to materially allow the return of a previous era, in which the control of the production was entrusted to the workers themselves.

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While the Luddite movement was forcefully contrasted by the British government and disappeared in a few years, failing its fight against industrialization, the ideas of Luddites were destined to fascinate many generations to come. The term Luddite has since acquired a political meaning, where some see it as a diffidence toward technological advancement that goes beyond reasonable skepticism and legitimate wariness, while others see in the movement one of the precursors of labor unions and of the fights for worker rights (Thompson, 1991).

The Luddites' aversion to technology, nevertheless, has become the main trait of their existence in popular culture. In 1995, for example, journalist Kickpatrick Sale smashed a personal computer in front of an audience at New York City Town Hall, claiming that "Luddites are back!" (Minard, 2007). The fight of humanity against the machines has often been fictionalized, and films such as *Terminator* (1984) and *The Matrix* (1999) have often been defined as Luddites (Lehman, 2015).

Beyond the political implications, we can see that Luddites are mostly defined by a specific relationship with technology, rejecting the ideology of progress and proposing alternatives to technological development often driven by nostalgia. In other terms, we could call them *apocalyptics*, as Umberto Eco (1994) defined the tendency of interpreting technological advancement as something intrinsically bad that will have primarily nefarious effects on human life, when not potentially bringing an end to civilization itself. On the opposite side of the spectrum to Luddites, Eco places the *enthusiasts*, who welcome acritically every new technological innovation and ignore or dismiss any potential threat emerging from them (a modern example might be the climate change deniers).

Technological advancement has always faced both apocalyptic and enthusiastic reactions, moral panic and hasty implementations. The fact that both approaches are irrational and present severe risks was not enough to spare research and academia from such perspectives. Nevertheless, scientific research is epistemologically required to have a critical approach toward the development of technologies that will strongly impact our lives and societies. An enthusiastic approach, oblivious of these consequences, is highly irresponsible. At the same time, however, research cannot limit itself to point out the dangers of technological developments: Luddite and apocalyptic approaches in academia go often unheard, as they fail to propose convincing alternatives.

Discussions around the risks and benefits of new technologies are continuously arising in society, and academia is often called to investigate the

pros and cons of these developments—for example, in artificial intelligence (Floridi et al., 2018), automation (Nof, 2009) or Big Data (Boyd & Crawford, 2012). Academic discourses and research, then, face the challenge of going beyond enthusiasm or diffidence and avoid moral panics and judgmental attitudes. Neither enthusiast nor apocalyptic, the researcher has to question the assumptions of emerging fields so to find ethical, sustainable and effective ways of *handling* the emergence of new technologies.

The Luddite diffidence toward the adoption of new manufacturing technologies was not unreasonable: they did indeed cause economic imbalances and put workers in a weak position where they were often subject to abuse. Technological development, when not guided by ethical principles, can cause immeasurable misery. Nevertheless, today, two centuries after the Luddite battles against the machine, several bottom-up movements appear able to successfully challenge the schemata of industrial production, by sharing horizontally the means of production: fab labs, 3D printers and sharing economy have the potential to revolutionize the systems of production and distribution of goods (Walter-Herrmann & Büching, 2014), and not by destroying the machines, but by democratizing them.

Most technological and social innovations do face both enthusiastic and apocalyptic reactions, sometimes with Luddite undertones. It is the case also of the ludification of culture—a trend that sees growing the prestige and influence of playfulness and games (Bonenfant & Genvo, 2014; Raessens, 2006)—which has a similar disruptive potential of that of industrialization. Beyond the often-cited commercial success of digital games, paired with the growing influence of their imaginaries, the most evident effect of the ludification of culture is the rise of practices of gamification, and of heated debates around them. Enthusiastic approaches to gamification, mostly by the corporate world, have been harshly criticized (e.g., DeWinter, Kocurek, & Nichols, 2014; Kim & Werbach, 2016; Mollick & Rothbard, 2014; Woodcock & Johnson, 2018). On the other hand, academia has been increasingly adopting an apocalyptic approach to gamification. Again, many concerns about the impact that it can have on society at large are well justified—it is certainly the case with the Chinese Social Credit System, a gamified ecosystem of initiatives that are being implemented in the People's Republic of China, sharing a similar logic and aiming at social control (Liang, Das, Kostyuk, & Hussain, 2018). This system is purportedly making use of a reward system based on points, to gamify

loyalty to the state, adding to data surveillance a playful layer that naturalizes it. Similarly, the metrification of academia increasingly gives rise to game strategies in regard to citations and publications that can be played to maximize employability without necessarily improving research quality (Lorenz, 2015). The examples of dangerous and unethical gamification could be many, including the infamous *Disney Electronic Whip* (Lopez, 2010).

However, as for the industrial revolution, we believe that a Luddite reaction to ludification (alliteration intended) would not do any good. While a critical perspective to ludification and gamification is necessary—and it is within the mission of academic research to investigate it—catastrophism and apocalyptic attitudes would be counterproductive. We believe that instead of a Luddite reaction we would need a "ludite" one: we should embrace the pervasiveness of play in our societies and discuss how this cultural change could be harnessed for good. We should devise ways to distribute its potential and democratize gamification.

2 Make Gamification Punk Again

While it rapidly became a popular buzzword and was somewhat sanitized in the process, gamification was born punk. When it was a novel idea, it had a strong critical perspective, overturning the common ludophobic stereotypes about games being overall detrimental to society and individuals, and proposing that, in fact, they could help fix real major challenges that humanity is facing (McGonigal, 2011a). Gamification in its beginning was openly questioning the *status quo,* proposing to revolutionize fields such as education and healthcare, accusing them to be too serious and top down, to drive away people instead of motivating them. Gamification was advocating for a new way of doing things, one that would imitate the ability of games to be engaging, to create meaningful experience, to convey feelings of autonomy and mastery (e.g., Malone, 1981; Ryan, Rigby, & Przybylski, 2006).

Why do we call these characteristics "punk"? Punk is a concept derived from a music genre, that indicates a specific way of doing things and relating to power. Punk is anti-establishment and promotes individual freedom. It endorses diversity (Simonelli, 2002) and has a do-it-yourself (DIY) character, strongly focusing on a bottom-up approach (Moran, 2010). The first approaches to gamification shared this spirit and aimed to use play to desacralize and humanize various fields.

What went wrong? With time, gamification became a victim of its own success. The fact that its ideology resonated well in a society undergoing a moment of ludification, engaged in a "ludic turn" (Henricks, 2017), made the concept appealing for many. Oversimplifications and poor implementations attracted criticisms to the whole concept, as did purely rhetorical attempts to exploit the term (Landers, 2019). Gamification has then often been used to tap into the economic and cultural success of digital games in order to "sell half-baked marketing strategies to Vice Presidents and Brand Managers" (Bogost, 2011). Gamification, from a groundbreaking perspective on how to do things, was then transformed into a product, a "magic formula" to be sold by self-proclaimed experts and consultants. The whole concept of gamification, then, started descending the Gartner *hype curve*, increasingly surrounded by a bad reputation, accused to be top-down, exploitative, simplistic and of risking to be a tool of capitalism (DeWinter et al., 2014; Fuchs, 2014). Many proponents of gamification, recognizing its potential misuses, started to distance themselves from the practice (e.g., McGonigal, 2011b) or to switch to other, less controversial terms, such as "eudamonic design" (Deterding, 2014) or "gameful design" (Dichev, Dicheva, Angelova, & Agre, 2014). Despite the fact that valuable research on gamification and well-designed implementations have never ceased to be produced as indicated by reviews surveying the field (Bai, Hew, & Huang, 2020; Koivisto & Hamari, 2019), the conversation around gamification got finally stranded on terminology debates and ideological stances, among which it is easy to find apocalyptic and Luddite positions.

3 Seven Points to Reappropriate Gamification

Today gamification is slowly creeping up to the "plateau of productivity" through the "slope of enlightenment" on the hype cycle. In this short treatise, we outline some of the points needed on the journey up that slope. We aim to go beyond the disputes about definitions and the criticism based on its worst implementations and rhetoric uses. *We aim to reappropriate gamification.* To do so, we have prepared a list of seven cardinal points.

3.1 One: Beyond Definitions

The concept of "gamification" and its definitions have been at the center of many disputes—and has ended up being almost a taboo in some circles. This has happened for several reasons. We have identified the four most critical ones.

First of all, the idea evolved in an intensely neologistic period. A decade ago, academics and practitioners were trying to define the many emerging phenomena that were increasingly tying games to non-ludic fields. According to their perspectives, they outlined these phenomena as "persuasive technologies," "exergames," "serious games," "game-based learning" and so on and so forth. Each concept had its own nuances, but many competed and overlapped. "Gamification" was sometimes proposed as an umbrella term encompassing them all, and sometimes as a subset of one of the other terms. Eager to defend their own metalanguage, researchers and practitioners rarely tried to systematize this terminological cornucopia in a collaborative way.

Second, gamification is difficult to define. It inherits its indeterminacy from one of its components, the word "game." Game and play are also tough concepts to define, being expressed in radically different ways in many languages (Huizinga, 1949) and often referring to an inhomogeneous set of activities (Wittgenstein, 1953). Game studies have been accused of having an obsession with definitions (Salvador, 2015), and gamification was somewhat caught in the crossfire.

Third, because of the difficulty of defining exactly what gamification is, the concept has often been dealt with according to its secondary connotations. As gamification was appropriated by consultants and marketing experts, then the concept itself started to be associated more and more with these environments and therefore perceived by researchers as an external threat. The ludification of culture, a cultural trend that made games more and more relevant for culture and society, has also caused defensive reactions and game romanticism. This is quite evident in critics of gamification such as Bogost (2011), that sees gamification as an attempt to hijack the prestige of games by people that do not really care about them. It is, in a way, a "not a real gamer" argument, similar to those generally used against "gamer girls" (Shaw, 2011) and that accounts for a perceived invasion of external actors in the field of gaming. This is often reflected in the recurring prejudice toward gamification scholars seen as people that do not enjoy playing games.

Fourth, the difficulty of defining gamification is also reflected outside the field of gaming and game studies. Enthusiastic non-experts generally conceive gamification either too broadly or too narrowly, associating any multimedia application to gamification or simply just those that concretely resemble specific game mechanics. Both cases lead to irrelevant and naïve discourses. The general confusion within ludic terminology does not help disambiguating. The result, however, is an oversimplification and dilution of the concept that feeds directly the shallow understanding and implementations of gamification which, in turn, shed a bad light over the whole concept. It is a vicious circle.

To overcome these challenges, we propose to look beyond the terminology and definitions. We believe that the ludification of culture has indeed an effect on how humans conceptualize and interact with non-ludic practices and objects, and that playfulness and gamefulness are becoming more and more widespread modes of interpretation of reality. Beyond the labels that we might want to use to describe these phenomena, we believe that they are worth studying in order to understand contemporary culture. In order to do that, it is important to distinguish several layers and nuances:

- Culture vs. practice: it is important to distinguish between the cultural trend that affords the rise (or fall) of gamification, from its practical implementations.
- Abstract vs. specific: while gamification may be an elusive umbrella concept and cultural phenomenon and useful concept on certain abstraction level, when investigating or implementing gamification, specificity, granularity and acuity is needed to the extent that the word gamification becomes void.
- Intentional vs. emergent: we must distinguish between the top-down-oriented intentional, strategic and willful attempt to gamify from the bottom-up-oriented phenomenon of the cultural fabric where gamification emerges naturally and implicitly.
- System vs. consequence: we should distinguish between gamification as a system (i.e., what is it composed of) from its consequences (i.e., what experiences, behaviors or societal ramifications it gives rise to).

The variety of these levels is symptomatic of the complexity of the cultural trends, design strategies and emergent experiences related to gamification. Far from being a depleted field, there is still a lot of work to do in

order to deepen our knowledge about these different dimensions, to describe and distinguish them and to device ways of designing and evaluating their implementations.

3.2 Two: Latu Senso

Nomina sunt consequentia rerum. This Latin phrase, derived by the *Institutes of Justinian*, reflects the ancient belief that the things in the world are somehow defined by the names we give them. On the contrary, words generally fail to point unequivocally to facts of life, their meaning emerges from their multiple uses and interpretations. The same is true for the word "gamification," which has assumed, across the years, several meanings according to its uses, creating further confusion and miscommunication. We identify three main interpretations of the term:

(1) A "pop" use of the term. The term has entered in the common language at the height of the hype curve, and hence it has inherited some of the characteristics of the opportunistic uses that were made of it. This rhetorical use of the term has already been criticized and is often based on an opportunistic adoption of the term purely for its symbolic value (Landers, 2019) and not for its response to a specific identified need nor on the sought-after consequences (Högberg, Hamari, & Wästlund, 2019; Huotari & Hamari, 2017; Landers, 2019; Landers et al., 2019) beyond signifying innovation or virtue. Gamification in such cases is often seen by critics as a form of sugar-coating if not as a simple misplaced keyword to add to one's project to prove its innovativeness. In this acceptation, more often than not, the term gamification is merely used as a band-aid word to signify, in lack of better conceptual understanding or linguistic expression, the work's interest in growing prominence of positive psychology (e.g., Seligman & Csikszentmihalyi, 2014) in contemporary culture.
(2) A specialistic but restricted use of the term. Beside its appropriations, the term, even when used in a sensible way, has often been used to define specific rule-based systems applied in non-game contexts. The classic idea of gamification being based on the simplistic notion of "game elements" (Bonenfant & Genvo, 2014; Huotari & Hamari, 2017; Landers, 2019), or on the adoption of

game design guidelines to create things that are not games, are good examples of this way of understanding gamification.

(3) "Gamification" has also been used in a broader way to indicate a sort of user-centered fun-enabling philosophy of doing. In this case, the label "gamification" indicates the many ways in which playfulness can be used to promote cultural, psychological and societal good, rooted in positive psychology and in the cultural drive of the ludification of culture.

While the restricted use of the term might be the most common one, we argue that the expanded one might be more desirable. At any rate, the meaning of words is often the result of a negotiation. If the common use of a term is simplistic, that is not necessarily a good reason to abandon it entirely. The many misconceptions and misrepresentations of quantum physics in pop culture did not convince scientists to ditch the term for a new one. For the same reason we believe that we should reclaim the term "gamification" in its broader acceptation, and make it a solid concept that will help us investigate and understand the changing role of play and games in contemporary societies.

3.3 Three: When Does Gamification Work?

Philosopher Nelson Goodman suggested replacing the traditional question "what is art?" with a new one: "when is art?" (Goodman, 1976). In other words, he dismissed the ontological claim that art is something separate and definable, and instead adopted a pragmatic approach based on the features of a specific kind of symbolic activity.

Similarly, we want to de-emphasize the question "does gamification work?" as a gatekeeping notion. The utilitarian ideology behind this question reinforces the idea that everything that fall under the gamification umbrella are tools the worthiness and efficiency of which we need to establish. This question has an intrinsic defensive nature, motivating its own legitimacy through a utilitarian argument, and therefore, linking the value of empirical research on gamification to its ability of improving the efficacy of gamification techniques.

Instead, we believe that we should start from the fact that gamification *is happening*. Empirical research, from this perspective, is and will be an ongoing process requiring granularity more than grand statements. For this reason, the question "when does gamification work?" can be far more

productive, as it evades the utilitarian approach, and recognizes the variety of gamified practices and places them in their sociocultural context. This does not mean that we should not assess empirically gamified implementations, but that we should stop to try to "prove" that gamification is worth our attention, and instead focus on studying its many effects on us and the reality, culture and society we inhabit. Beyond the obvious systemic publication bias favoring demonstration of positive results and "proving" gamification was successful in the current corpus, several other issues remain with the empirical assessment of gamification strategies from inadequate sampling, to non-standardized measures and conceptualizations of both gamification and outcomes to non-randomized, uncontrolled study designs to ignorance of theory (as documented by, e.g., Koivisto & Hamari, 2019; Landers et al., 2019; Nacke & Deterding, 2017; Rapp, Hopfgartner, Hamari, Linehan, & Cena, 2019).

3.4 Four: Enabling or Controlling

Traditional forms of gamification have been criticized for being controlling, top down, manipulative and paternalistic (see, e.g., DeWinter et al., 2014; Kim & Werbach, 2016; Linehan, Harrer, Kirman, Lawson, & Carter, 2015; Mollick & Rothbard, 2014; Thibault, 2019; Woodcock & Johnson, 2018). It is true that gamification often puts in place asymmetrical power relations, where the designers get to "make the rules" and the users need to follow them. The fact that gamification is generally applied in projects that aim at behavioral change (be it for commercial reasons, or for humanitarian ones, like favoring exercising) is sometimes depicted as problematic, as behavioral change is indeed the result of an exercise of *power*.

Nevertheless, the idea that changing the mind of people is intrinsically linked to exploitation is a prejudice, probably rooted in the uneven power relations among the people involved. This however is not universally true, as there is some wide consensus, for example, that educators should indeed be able to change the mind of their students—without manipulating them. Maybe it is for this reason that the field of education has often made use of various forms of gamification (Connolly, Boyle, MacArthur, Hainey, & Boyle, 2012), even centuries before the term was invented. We can think of the works of thinkers such as Rousseau and Schiller, who underlined the importance of play as a key part of the education of children, as well as educators such as Montessori, which shared similar views. The idea that

gamification is intrinsically manipulative is probably linked to an overestimation of the commercialization in gamification applications, again due to the popularity of the concept in the early 2010s. This would explain why similar concepts, such as serious games or game-based learning, do not encounter the same amount of opposition or criticism.

We believe that the risks linked to a manipulative use of gamification are very true. We see dangerous and problematic implementations everywhere in the world, from the Chinese Social Credit System (Liang et al., 2018) to the dopamine loops put in place in USA-based Social Media. Denying the dangers of gamification would mean adopting an acritical, enthusiastic position. However, focusing only on the risks and disregarding the opportunities would be an equally acritical apocalyptic position. To reappropriate gamification, therefore, we need to explore how and when control can be an enabling force. Some forms of control over the markets as well as control over society are considered necessary to ensure equality and justice. The control of the gamifiers over their users' needs to be of the same kind: a way of creating a space of freedom and self-expression, where constraints are to spark creativity and fun is meant to motivate and not to manipulate.

3.5 Five: Wider and Deeper

By the standards of stand-alone games and the sheer richness of games and play in our culture, early gamification attempts often seemed either poorly designed or naively simplistic in comparison. This situation is often attributed to the (unintended) design philosophy of employing isolatable game elements into extant systems while the design of games commands a much more nuanced, holistic and integrated thinking. While being an understandable early step in the development of gamification, of its conceptualization, understanding and literacy, this was a far cry back toward the infancy of game design in general. Unfortunately, instead of making use of the vast spectrum of games and digital gaming, the sources of inspiration for gamification design seem to be quite narrow. Gamification techniques seem to ignore many game genres and types that could instead offer interesting ideas and mechanics. In some cases the issue is even deeper, and some of the elements that have become central in gamification design have almost no relationship with how actual digital games work, or overrepresent some elements. It is the case, for example, of badges, which become a key element in gamification while not being extensively used in

digital games—and that are not even necessarily part of the play experience, and work as extraneous motivators.

To overcome this challenge, gamification research has, first of all, to acknowledge something that is well accepted in game research: that our understanding of games and play is still limited and requires more work. We believe, therefore, that gamification design should be recentered around three main points:

- Games and play are mysterious. Gamification needs to acknowledge this complexity and use it as a resource to explore new and innovative ways of designing.
- There are a lot of games out there. Instead of being inspired only by some very specific subsets of games or by other gamification attempts, gamification designers should look at the richness and variety of the whole gaming field.
- Gamification design should be playful in itself. Collaborative and creative design is necessary for achieving solid results: play cannot be designed without being playful.

3.6 Six: Gamification and Ludophobia

Gamification is intrinsically linked to the ludification of culture, which, as all cultural trends, does encounter resistance and opposition, often, but not always, due to a generation gap. The diffidence toward play that dominated many moral panics against games is not completely over, and it is still possible to hear arguments blaming them for mass shootings or linking them to terrorism. This ludophobic attitude is sometimes reflected on gamification, which inherits the fears that surround new technologies as well as those focused on the relations between play and reality. Religious values themselves have often had an ambivalent relationship with play, sometimes becoming open hostility. In Italy in the fifteenth century it was not uncommon, after the sermon of some radical religious figure, to participate in a "bonfire of vanities" (*falò delle vanità*) that involved the burning of game sets and playing cards alongside mirrors, high-heeled shoes, perfumes and other frivolities. Puritan ethics has often been described as hostile to play (Daniels, 1995) and Max Weber, in his famous work on Calvinist ethics, insists on their hostility toward frivolous pleasures. While the attitude of Abrahamic religions toward play has not always been hostile (Leone, 2016) and some of its hostility might have been exaggerated

(Johnson, 2009), the roots of ludophobia do run deep in the ethical systems of most of the West.

Even when they do not reach open hostility, older generations are often less passionate about games and gamification. Lifestyles and ways of thinking oriented toward instrumentalism tend to see enjoyment and fun as opposed to utility and efficacy. Play has, for a long time, been considered as the opposite of "seriousness," and the idea that games can be used to do something useful can still be met with disbelief.

One widespread solution has been answering these concerns by adopting the same mindset. It is the case of arguments that point out at the prosperity brought by the revenues of the game industry and equate the ability to generate wealth to the worth of a certain cultural artifact. Similarly, proving the effectiveness of games and gamification in affecting behavior, for example in education, and in generating results goes to great lengths in changing people's attitude toward them. For these reasons, we believe that it is of capital importance to contextualize gamification in its cultural and historical background, to be able to understand the different reactions, opinions and prejudice that different people can have toward them. For this reason, the effectiveness of gamification is also strictly linked with the ways it is communicated and presented—and any gamification that aims to be inclusive needs to take into account the variety of relationships that people can have with play due to their culture, age, gender, beliefs and personality.

3.7 Seven: Gamification Is Not a "Thing"

Gamification is typically described as a strategy or a technique. It is seen as a technology, or an objective of design. We believe that, instead, gamification is better understood as a "lens" through which we can look at the world. If the current cultural context made it more prominent and heightened its influence over society, forms of gamification *ante litteram* have always existed. It is a very human thing to do, to try to alleviate a boring task by making it fun or exciting. We can find traces of it in Mary Poppins' philosophy as well as in Stakhanov's productivity records, and far before that (Vesa, Hamari, Harviainen, & Warmelink, 2017).

A diachronic approach to gamification, hence, can help us understand the past by looking in a fresh way at the role of play in past societies. It allows us to reflect on the present, going beyond the practical applications of gamification, and engaging the sociocultural positioning of games and

the ideologies and practices that emerge from it. It can, finally, offer us a way to imagine the future, to speculate on the role that games can have it, be it dystopian or utopian, and to try and steer toward the latter.

Gamification, finally, can become an analytic category. It can be a way to investigate the dynamics and negotiations between everyday life and enjoyment, between different ways to create value and give meaning to our everyday life.

4 Conclusions

With our seven points we tried to map the current status of the conversation about gamification. We outlined the misunderstandings and the main issues that pollute it, and we tried to offer possible solutions to go beyond them, to bridge across perspectives and address fears and misconceptions. We tried, in other words, to reappropriate gamification and to restart the discussion on the role and productivity of this concept in academia.

To this end, we advance a final note. There seems to be a confusion between researching gamification and trying to implement it successfully (for whatever reasons). While many researchers working on gamification engage in experiments to study the effects (both in good and in bad) and the efficacy of gamification techniques, the two things are still clearly separate. There should not be a divide between researchers criticizing gamification and others that insist on the positive sides. Research does not need enthusiasts nor apocalyptics. Gamification research needs to engage both positive and negative sides of the phenomenon realistically and at the same time. This might take time: we should not forget that the concept is still relatively new, and that research on it is still not mature. Instead of becoming frustrated with the shortcomings of the current state of the art, however, we believe we should be excited about its potential, and about what this new lens to look at humanity has still to offer.

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PART II

Economic Lens

The Competitive Disadvantaged: How Competitions Can Contribute to Poverty Elimination in Paraguay

Katharina Hammler

1 Introduction

In recent years, the idea that behavioral sciences might be able to contribute to the fight against poverty has gained ground. With the publication of the World Bank's, 2015 World Development Report titled "Mind, Society, and Behavior" the idea has reached mainstream development thought. The report brings together evidence on human decision making, arguing that people often decide automatically (rather than deliberately), think socially (i.e., their cultural environment matters), and use an array of mental models (they use interpretative frames available to them) (World Bank, 2015). This is a fundamental departure from the idea of the *homo economicus*, the basis of the neoclassical economics idea of the fully rational and independent individual. In particular, what we know today about

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human decision making and thus behavior, has important implications for how anti-poverty policies and programs could and should be designed.

A fast-growing field of academic research and practical experimentation explores how behavior and poverty are related (e.g., Bryan et al., 2017; Macours & Vakis, 2009; Mullainathan & Shafir, 2013). The idea that behavior and poverty are related is, per se, not new. However, in previous discussions on this relationship, poverty was often explained by moral shortcomings of those experiencing poverty that resulted in unfavorable behaviors and thus poverty, effectively blaming those experiencing poverty for their fate (Watkins-Hayes & Kovalsky, 2016). In contrast, the contemporary discussion draws on research from psychology and neuroscience, among others fields, and is interested in analyzing the root causes of certain unfavorable behaviors, often understanding observed behaviors as being both the cause and the effect of poverty (Bernheim, Ray, & Yeltekin, 2015; Bertrand, Mullainathan, & Shafir, 2004). More importantly in this context, this newer line of research explores how certain unfavorable behaviors can be discouraged, and certain favorable behaviors can be encouraged—in a context where structural and environmental factors favor the former.

One organization experimenting with these ideas is Fundación Paraguaya (FP), a social enterprise from Paraguay that was founded as a microfinance institution in 1985 in order to provide small loans and business training to small and microenterprises. Most of FP's clients are women living in poverty or vulnerability. These women form loan committees (or village banking groups) consisting of 12–25 women handling microcredits and providing a supporting network for clients. This chapter presents how FP uses gamification as one tool to encourage behaviors that can help its clients overcome specific deprivations. After a brief introduction to the work of FP and its perspective on behavioral change, Sect. 3 provides a case study of the gamification initiatives carried out by FP with diverse objectives such as promoting dental hygiene, upgrading home sanitation, or improving public spaces. The case study indicates that the gamification strategy has large promise, but also faces challenges such as a high dropout rate. Section 4 therefore analyses FP's strategy through the perspective of the Octalysis framework (Chou, 2016) and finds that the current program design is not making effective use of all core drives for human motivation. Finally, Sect. 5 draws conclusions about the use of gamification in anti-poverty programs in general, arguing that while the Octalysis framework has some limitations in this context, it has the potential to contribute to global poverty elimination efforts.

2 Fundación Paraguaya and Behavioral Change

From the early days, Fundación Paraguaya has experimented with social innovations in order to fight poverty (Burt, 2013, 2019). Since the turn of the millennium, this approach has gained more steam—initially with the development of a self-sustaining agricultural school model where students learn by doing, selling, and making profits (Burt, 2009). A few years later, FP started developing the Poverty Stoplight (PS) program, a poverty self-assessment and mentoring tool that seeks to activate the potential of individuals to eliminate their own poverty. The PS aims to increase participants' agency and the collective agency of their communities, while simultaneously providing organizations that adopt this framework with the information and tools to support the participants in addressing more systematic drives of poverty. Central to the PS is a self-assessment survey containing around 50 indicators, each of which is defined in three levels: green (no poverty), yellow (poverty), and red (extreme poverty) (Burt, 2019; Fundación Paraguaya, 2020a).

The PS program is built on the notion that poverty is multidimensional and affects each family differently, which is why a holistic analysis of potential causes for each deprivation needs to be carried out in order to understand what holds back a particular family or an individual. For instance, if the self-assessment reveals that a woman has dental health issues that are not attended to, the PS approach, drawing from the works of Wilber (1996), asks whether the reason is a behavioral issue (e.g., not taking care of her teeth and not going to the dentist), a systematic problem (e.g., no affordable dentist available nearby), a cultural issue (e.g., the community perceives bad teeth among elderly women as normal), or a question of intentions (e.g., the woman is afraid of going to the dentist) (Burt, 2013). In a second step, the PS program works with participants to identify specific behaviors that can support positive change. For this purpose, the PS draws from the work of Grenny, Patterson, Maxfield, McMillan, and Switzler (2013), integrating the Social Cognitive Theory and Albert Bandura's concept of self-efficacy (Bandura, 1977). The key message of Grenny et al. is that people will change their behaviors if they think that (a) it is worth it (motivation), and (b) they can do it (skills). Behaviors and skills each can be influenced at the level of the individual, the level of the group, and the structural level, thus resulting in six sources of influence (see Table 1). Within the PS program, FP attempts to make use of all possible sources of positive influence in order to support its clients on their

Table 1 The six sources of positive influence (adapted from Grenny et al., 2013)

	Motivation	*Skill*
Personal	Doing what is not (per se) fun	Surpassing personal limitations
Group	Peer pressure	Group support
Structural	Incentives, prices, awards	Physical changes in the environment

pathway out of poverty. The strategies developed on this basis, include gamified competitions that make available several sources of positive influence. On the personal level, they help to make something dull like cleaning one's town a fun activity. On the group level, group-based competitions provide both pressure and support for carrying out the necessary activities. On the structural level, these gamified competitions afford incentives in the form of cash or in-kind prizes or other forms of awards. The next section describes the competitions in more detail.

3 Gamified Competitions to Address Deprivations

Over the years, FP has developed and implemented fourteen different gamified competitions, addressing topics as diverse as house sanitation, healthy eating habits, dental hygiene, or breast cancer prevention (Fundación Paraguaya, 2015, 2016, 2017, 2018, 2019, 2020b; unless otherwise stated, the data on the competitions presented in this section is retrieved from these annual reports). Most of these competitions follow a similar structure, as described below. Loan officers promote a competition among their loan committees, often based on sign-up targets established by FP. After signing up, loan committees identify a committee member with a deprivation in the thematic area of the study, as identified in the PS self-assessment evaluation. They then take a photo of the "before" situation and register for the competition. Over the duration of the competition, typically several months, the committee works together to support the selected committee member in achieving the competition goal of moving the respective PS indicator to green. At the end of the competition, they take an "after" photo and upload it together with the "before" photo to a voting platform, where the general public is invited to vote for a winner. The winning committee receives cash or in-kind prizes that are awarded in a small ceremony organized by FP's founder (a well-known

person in Paraguay), which also carries a status symbol. To provide more detailed examples, the following sections describe four competitions. These specific competitions were selected in order to show the range of topics and design elements employed by FP.

3.1 My Bathroom, My Kitchen, My Pride

One of the longest-running competitions is called "My bathroom, my kitchen, my pride." First launched in 2014, this competition aims at incentivizing FP's microfinance clients to improve inadequate bathrooms or kitchens. According to the data from the Paraguayan national statistics office Dirección General de Estadísticas, Encuestas y Censos, in 2014 78.9% of Paraguayan households had access to improved sanitation; by 2018, this number increased insignificantly, reaching 82.5% (Dirección General de Estadísticas, Encuestas y Censos, 2020). Similarly, as reported in the Global MPI Databank based on national household survey data from 2016, 36.69% of Paraguayan households cooked with improper or dangerous cooking fuels such as wood, charcoal, or coal (Alkire, Kanagaratnam, & Suppa, 2020). These numbers are mirrored by the PS self-assessment results: according to FP's internal database, between 30% and 40% of its clients have been in yellow or red in the respective indicators over the past six years. The "My bathroom, my kitchen, my pride" contest was started to address this major issue.

The competition is carried out among loan committees, who identify a committee member with a sub-standard kitchen or bathroom. After taking a baseline photo, the whole committee works together to improve the respective facility. The committee does not receive help or funding from FP; instead they work together to develop a plan, raise or repurpose funds (e.g., though savings plans or neighborhood sales), obtain the necessary materials, and remodel the facility. "Before" and "after" photos are then uploaded to a public voting platform, while the committee mobilizes to gain the most votes for their project. The two committees with the most votes in the categories bathroom and kitchen, respectively, win cash prizes. Since the pilot in 2014, the program design was adjusted several times based on feedback from participants. For instance, while the voting initially was carried out on Facebook, the process was moved to an independent platform in 2017 to avoid that the number of Facebook friends of participants determined who would have a chance to win. Additionally, a two-step process was introduced to pick the winner, where FP first chose

Table 2 Participants in the contest "My bathroom, my kitchen, my pride", by year

Year	*Committees participating*	*Improvements completed*	*% completed*
2014	125	n/a	n/a
2015	578	150	26%
2016	701	239	34%
2017	752	239	32%
2018	790	272	34%
2019	811	272	34%

finalists based on some (previously announced) criteria, such as the initial stage of the facilities, and consolation prizes were added to be raffled off among all committees completing their remodeling.

Table 2 shows the number of participants and improved facilities per year. While the number of participants and the absolute number of facilities that could be improved increased over the years, the percentage of committees finishing the improvements' project remained at a similar level over the past years, with only a third of the participating committees reaching the end of the competition. While still a commendable and cost-effective result for FP, this raises the question of why program attrition is and remains high. This issue will be explored in Sect. 3 of this chapter.

3.2 I Look Good, I Feel Good

According to the Paraguayan Ministry of Public Health and Social Welfare, 34.8% of Paraguayan adults are overweight, while an additional 23.2% are even obese (Ministerio de Salud Pública y Bienestar Social, 2012). In order to promote healthy eating habits and a healthy weight among its staff members, in 2015 FP piloted the competition "I look good, I feel good." In this competition, staff members form teams, which are asked to periodically register their weight over the course of several months. The team with the largest percentage of weight loss at the end of the competition wins a cash prize. A weekly team-level weight chart is shared among all the participants to track the progress and keep up a competitive spirit. FP supports the weight loss process by providing support of a nutritionist and promoting sports activities.

3.3 My Healthy Smile

According to PS self-assessment results, more than one third of FP's microfinance clients have family members with untreated dental health issues. In 2016, FP piloted the competition "My healthy smile", in order to encourage clients to take care of their teeth. Similar to the "My bathroom, my kitchen, my pride" competition, loan committees select one member whose dentures need fixing, and take a "before" photo. Then, the committee works together to enable their committee member to have her teeth taken care of—by finding the necessary financial means or an affordable dentist, by accompanying her to the dreaded appointment, or via other means. At the end of the designated period, an "after" photo is uploaded together with the "before" photo to a voting platform, where the general public decides on the winner. The winning committee and the winner herself receive cash prizes.

As can be seen in Table 3, the number of participants has grown over the years, from 244 in the pilot year to 470 in 2019. The completion rates increased in both absolute and relative terms until 2018, however, they dropped in 2019. Furthermore, the percentage of contestants completing the competition is lower than in the "My bathroom, my kitchen, my pride" contest, i.e. competition drop-out is higher.

3.4 I Take Care of My Environment

Another competition piloted in 2016, "I take care of my environment", follows a somewhat different approach. Similar to the other initiatives, loan committees are competing against each other. However, they are doing it for a public good, namely, the best improvement in a public space, for example, a neighborhood square. This competition arose out of the preoccupation that loan committee members themselves voiced about the state of their communities. Dilapidated or littered public spaces are not

Table 3 Participants in the contest "My healthy teeth", by year

Year	*Committees participating*	*Dentures completed*	*% completed*
2016	244	39	16%
2017	462	96	21%
2018	428	105	25%
2019	470	60	13%

only an eye sore, making it less attractive to socialize in public; they can also prove dangerous for children playing there, or, according to the (contested) Broken Windows theory (Wilson & Kelling, 1982), invite crime.

In the pilot year, eight committees participated in the competition. After choosing a public space, committee members cleaned up, put up trash bins, planted flowers, painted walls, among other. Then, the public voted on the best improvement, based on the uploaded "before" and "after" picture, and the winning committee was awarded a cash prize. In the first year of the competition, half of the committees completed the task. In 2017, the most recent year of this competition, 84 committees participated, of which 20 completed the task. Thus, attrition was again significant.

3.5 Reflections

The case study with four initiatives described in this section shows that gamified competitions can be used in the context of poverty elimination programs. They have the potential to support participants in overcoming deprivations as diverse as health problems, poor sanitation infrastructure, or run-down public spaces. The evidence that over the course of several years, many participants meet the competition objective, shows that poverty-related problems in some contexts can be solved through behavioral interventions alone, without much funding or other support. Some of the competitions presented in this chapter target deprivations that are often thought to be caused by a lack of resources, which is both encouraging and thought-provoking. It is an indication that questions of perceived self-efficacy, motivation, and behaviors may play a role for a larger range of deprivations than commonly acknowledged.

Anecdotal evidence, based on the feedback gathered from the competition participants, further supports this notion; testimonials often revolve around topics like empowerment or learning to believe in one's own capabilities. For instance, Eva Da Silva, the winner of the 2014 round of the "My bathroom, my kitchen, my pride" competition, stated: "Once one has made the plan, it can be done! You can do it. We did it, we made it [author's translation]" (Fundación Paraguaya, 2015, p. 35). A further beneficial effect of the competitions that has emerged through these feedback processes is what might be called micro-boosts to the local economy: competing committees procuring building materials, or engaging in new

income-generating activities in order to raise funds for completing their objective, create positive economic effects in their local communities.

Still, the case study does not allow for an assessment of the topics that the participants find attractive or important, as various competitions were rolled out with different target populations, and supported with varying amounts of effort spent on promoting the initiative and incentivizing completion. However, what seems clear is that the program attrition rates are often high: in general, only between a quarter and a third of those who initially signed up for a competition reach its completion. This raises the question whether the program design could be improved to make better use of the gamification strategy. The following section will thus use the Octalysis framework (Chou, 2016) to assess FP's gamification approach.

4 The Octalysis Framework

The Octalysis framework, developed by Chou (2016), provides a theoretical model to design a gamified experience with the objective of increasing and maintaining participants' engagement. It is used in a wide range of contexts, such as marketing, app design, or educational programs (Chou, 2019). To the best of the author's knowledge, the framework has not been used to develop or analyze anti-poverty interventions that work directly with those experiencing poverty, though it has been used for various social purposes.

Chou (2016) identifies eight core drives (CD) of human motivation that should be considered in the design of a gamified intervention. These are:

- CD 1: Epic Meaning and Calling. This CD motivates people due to a feeling of being involved in something that transcends them, something bigger than themselves.
- CD 2: Development and Accomplishment. This CD motivates people through a desire for personal growth and for accomplishing a goal.
- CD 3: Empowerment of Creativity and Feedback. Motivation via this CD is created through engagement in creative processes that let users create and transform reality.
- CD 4: Ownership and Possession. This CD creates motivation through the feeling of owning or possessing something; when a person owns something, they are driven to improve or use it.

- CD 5: Social Influence and Relatedness. This CD is based on the human nature of wanting to relate and connect to other people. People can feel motivated through social elements such as companionship, mentorship, or recognition.
- CD 6: Scarcity and Impatience. Motivations arise from this CD from a feeling that something is scarce, exclusive, or difficult to obtain.
- CD 7: Unpredictability and Curiosity. This CD of motivation works because people are kept engaged if they do not know what will happen next, they cannot predict or establish patterns or results, or are surprised.
- CD 8: Loss and Avoidance. This last CD creates motivation to avoid a loss or undesirable state, or to keep something negative from happening.

Chou groups these drives into White Hat vs. Black Hat drives, based on the level of control. White Hat drives are motivational factors that make us feel powerful, fulfilled, satisfied, and in control (CDs 1, 2, and 3), while Black Hat drives are those factors that create feelings of obsession, anxiety, addiction, or lack of control (CDs 6, 7, and 8). CDs 5 and 6 can fall into either category. This functional, if simplifying classification helps to establish a balance between different types of motivating factors, as each type of motivational factor has its advantages and disadvantages. A balanced mix of CDs is important to draw participants in and to keep them engaged. Additionally, according to Chou, different CDs vary in importance through the four phases of a gamified experience (discovery, i.e., the first contact with the gamified experience; onboarding, i.e., introducing the participant to the details of the experience; scaffolding, i.e., the main engagement phase of the experience; and endgame, i.e., maintaining engagement after the participant has lived through the gamified experience).

4.1 FP's Gamified Competitions Through the Lens of the Octalysis Framework

Table 4 summarizes the central elements of FP's gamified competitions, assigning them to the respective core drive of the Octalysis framework. The first observation that catches one's attention is that the game elements are concentrated in CD 2 (Development and Accomplishment) and CD 5 (Social Influence and Relatedness). Some design elements have also

Table 4 FP's competitions in the Octalysis framework

Core drive	*White/ Black Hat*	*FP competition elements*
CD 1: Epic Meaning and Calling	W	• Solve community problems (participation has purpose)
CD 2: Development and Accomplishment	W	• Clearly stated objective with intrinsic value • Comparison of before and after (reach specific objective) • Award ceremony with recognition • Public vote on results
CD 3: Empowerment of Creativity and Feedback	W	• Developing strategies to overcome a given problem
CD 4: Ownership and Possession	W/B	• Owning the results of the improvement
CD 5: Social Influence and Relatedness	W/B	• Team-based competition (coopetition) • Peer pressure, peer support to reach objective • Encouragement from loan officers to participate • Award ceremony with recognition
CD 6: Scarcity and Impatience	B	• Chance to meet a famous person in award ceremony
CD 7: Unpredictability and Curiosity	B	• Raffle of prizes among all
CD 8: Loss and Avoidance	B	

been identified for CDs 1, 3, 4, 6, and 7, while CD 8 (Loss and Avoidance) is not engaged in FP's approach. FP's competition design relies far more on White Hat than on Black Hat drives.

The elements employed in FP's gamified competitions are relatively similar to the design of conventional competitions. This simple and familiar design seems successful in the discovery and onboarding phases: the competitions regularly attract a steady stream of participants. However, as Chou (2016) points out, it is already important in the onboarding phase to provide a first major win state, that is, an early and easy win, in order to keep participants engaged. Similarly, Chou cautions against the intensive use of CD 3 (Empowerment of Creativity and Feedback) in this early stage, as this can be overwhelming. By not providing early win states, and by requiring from the beginning that participants develop creative

strategies to address complex problems, FP's gamified competitions may disengage some participants at this early stage.

The main part of the gamified experience takes place in the scaffolding phase. The Octalysis framework recommends the use of all core drives in this phase, ideally in a set-up that allows participants to choose between several pathways based on different core drives. However, not all CDs are present in FP's competition design, and among those present not all might be strong enough to keep all participants engaged in the medium to long term, resulting in high attrition rates. Thus, it is likely that mainly those participants who respond particularly well to CD 2 and CD 5 remain active, while others lose interest. It is also possible that the main objective turns out to be more difficult than anticipated, and in the absence of intermediate objectives participants get easily frustrated and give up.

Overall, the available evidence indicates that the discovery and onboarding phases are more successful than scaffolding and endgame. The analysis of the competition design using the Octalysis framework suggests that the high dropout rates might be the result of the current program design not making effective use of all core drives for human motivation. In order to further enhance the competitions' potential to positively impact participants' lives, it may thus be beneficial to integrate more motivational elements, corresponding to various core drives, into the program design.

5 Reflections on the Use of the Octalysis Framework in Poverty Elimination Programs

The case study of FP's use of gamified competitions for poverty elimination, the program design and available evidence suggest that such initiatives can have at least three types of positive outcomes: First, they can directly contribute to overcoming specific deprivations. Second, they may have the potential to increase participants' self-efficacy, and individual and collective agency, which in turn are associated with further positive development outcomes (Nussbaum, 2011; Sen, 1999; Wuepper & Lybbert, 2017). Third, there may be wider community-level benefits arising from the competitions, such as micro-boosts to the local economy. This case study is not suited for establishing such causal claims, but it does provide grounds for optimism in this regard. Further research should be conducted to formally test for the effects of such gamified interventions on poverty.

The case study also showed that the Octalysis framework can be applied for gamified anti-poverty interventions. Confronted with the question of why program attrition is surprisingly high for FP's gamified competitions, an analysis of the program design based on this framework suggests that more effective use could be made of the various core drives of human motivation. In that sense, gamified anti-poverty programs should strive to include a wide variety of such motivational factors and consider the varying motivational needs in the individual program stages. That being said, the question arises whether increasing the number of motivational design elements will, indeed, decrease drop-out. For this to be the case, a lack of motivation has to be the main reason that a participant ceases to take part. As argued in the introduction, we know more and more about the importance of behaviors for development outcomes, and about what influences them. However, motivation and behavior alone will not always be enough. Even if a gamified intervention employs all of Chou's core drives, and does so in a balanced and well-designed way, the binding constraint may not be alterable by behavioral changes. This is obvious in areas where clear structural barriers exist (e.g., there simply is no dentist available within a manageable radius, restricting policies are in place that legally prevent access to certain services, or a person's health condition precludes them from engaging in a specific activity). In contrast, a gamified approach will likely be most effective in situations where resources are at least in principle locally available, but the challenge is to find ways to mobilize them.

Some deprivations may well be too complex for gamified interventions. The Octalysis framework can work well in contexts where a specific game objective can be easily defined, and the pathway to get there can be designed in a way that supports participants through the engagement of a range of motivational core drives. This is the case for many deprivations that have clear solutions that can be implemented through geographically and temporally limited interventions. However, in the case of deprivations for which there are no obvious or easy solutions, or whose causes are complex, diffuse, or multi-layered, a gamified approach will likely quickly reach its limits. Examples may be issues such as racialized or gendered violence; power imbalances resulting in a lack of political representation or legal rights which in turn produce multiple and joint deprivations; or human suffering and hunger caused by wars or natural disasters.

The Octalysis framework is suitable only for issues in which participants accept a gamified approach. That is, participants have to be willing to address a given deprivation in a playful, potentially competitive way. This

likely is not the case for all deprivations, and may raise ethical issues if such gamified approach creates a feeling of being manipulated or not being taken seriously. In this sense, it will likely be harder, if not impossible, to design gamified interventions for topics that are central to people's identity or feeling of self-worth. Similarly, even a well-design gamified intervention that makes extensive use of the Octalysis framework is likely inappropriate for programs addressing deprivations in the context of basic human rights, as the Octalysis framework is not designed to guarantee the delivery of results or services, but rather to motivate certain behaviors.

While the Octalysis framework encourages gamified interventions to make use of a mix of extrinsic and intrinsic motivational drives, the interventions as a whole provide an external and thus extrinsic motivation to engage in the desired behaviors. In other words, when considering *why* program participants show a preferred behavior, by design the answer is "because we as program designers wanted them to." This has several important implications. First, the reason for engaging in a given behavior may matter. If a specific behavior is intrinsically considered good, the value of the behavior is not exclusive to the outcomes it produces. For instance, if it is intrinsically good to take care of neighborhood public spaces, a program that manages to instill an intrinsic sense of civic duty seems superior to a program that "tricks" participants into civic engagement for the sake of a different goal, such as winning a prize. Second, by providing incentives for engaging in desired behaviors, similar behaviors, or even the same behaviors at a later time, may well be devalued, especially once such incentives are no longer available. In fact, research shows that people stop doing things out of intrinsic motives once one starts to provide external motivations for the same behavior, even if such external incentives are later withdrawn (Deci, Koestner, & Ryan, 1999). A final and related implication concerns the sustainability of gamification interventions. While some outcomes, such as an upgraded bathroom, may be long-lasting, the same is not true for all deprivations that may be addressed through gamified interventions, and deprivations may well re-emerge. The question then becomes whether gamified interventions are able to equip participants with the tools to address the issue again outside the game environment. In short, the Octalysis framework is likely most appropriate for anti-poverty programs addressing issues where outcomes are more important than processes, adverse incentive effects are unlikely, and long-term effects are not of concern.

Of course, the Octalysis framework is not the only available gamification framework, as the multitude of contributions in this volume shows. Some of the shortcomings of the Octalysis framework in the context of anti-poverty programming may well be surmountable by other gamification models. Overall, the conclusion that can be drawn from the present case study is that despite some limitations, gamification in general and the Octalysis framework in particular have the potential to contribute to poverty elimination, as it can be an effective approach to mobilize locally available resources.

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Do You Have a Moment to Increase World Awesome? Game-Based Engagement with Social Change

Lobna Hassan and Elyssebeth Leigh

1 Introduction

Playing and seeking out positive experiences is innate in all beings. Most individuals wish to enjoy time they spend on activities they carry out. Many go so far as to restructure their daily activities to afford more autotelic hedonism. Thus, it is no surprise to observe the growing pervasive spread of entertainment, play and games in our culture (Deterding, 2015;

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Hamari, 2019; Landers, Auer, Collmus, & Armstrong, 2018). This pursuit of autotelicy is reshaping our society, work, play, organization practices and perhaps all facets of modern life (Koivisto & Hamari, 2019). Work is merging with play, giving rise to phenomena such as playbour, where the lines between what is work and what is play have been blurred (Dippel & Fizek, 2017; Törhönen, Hassan, Sjöblom, & Hamari, 2019; Törhönen, Sjöblom, Hassan, & Hamari, 2019). Serious careers are being built around activities that were traditionally seen as fruitless, such as the playing of games, as seen in the rise of esports (Hamari & Sjöblom, 2017). Educational practices are being transformed by serious games and gamification to become more self-purposeful and enjoyable (Lee, Ceyhan, Jordan-Cooley, & Sung, 2013; Majuri, Koivisto, & Hamari, 2018). These are all facets of a phenomenon many have come to coin as the gamification of culture (Dippel & Fizek, 2017) among other terms. Our society and practices are being consciously transformed through intentional gamification and unconsciously transformed as society grows accepting of the perceived virtuous of these practices (Hamari, 2019). Social change, altruistic and prosocial activities are no exception.

It is argued that most, if not all, prosocial acts of kindness or altruism involve some degree of personal gain or enjoyment even if they require the doer to sacrifice resources such as money, personal time or even their survival in extreme cases (Judson, 2007). Giving to charity, organizing a march or a larger societal movement bring its' doers positive feelings of, for example, happiness, accomplishment and self-actualization, quite aside from the possible positive changes from these activities that the doers hope to see achieved. Nonetheless, many of these prosocial acts require a level of coordination of, for example, social and financial capital (Batson & Powell, 2003; Riar, Morschheuser, Hamari, & Zarnekow, 2020). Larger-scale impact is often facilitated over long periods of time, through accumulations of small contributions. On the short run, however, potential gains from this altruism are often small compared to the coordination work, effort and time invested. Hence, a large number of organized, motivated volunteers engaged for longitudinal periods of time are imperative to social change, especially when such change could not be facilitated through the work of one person.

Social change, altruism and prosocial activities, however, are essential to the well-being of most societies and the world as a whole (Judson, 2007). Efforts by large organizations with relatively larger funds and social influence can have a wide scale impact on, for example, poverty, education and diseases management (Dy & Ninomiya, 2003; Pittet et al., 2009).

Individual, smaller contributions may accumulate to relieve, for example, natural disasters (Hinck, 2012) or attempt to bring about political and social change (Abdelghaffar & Hassan, 2016). The question, hence, becomes: *How can we engage organized, motivated individuals for longitudinal periods of time, to bring about social change?* One approach to attempt to uncover an answer to this question is to investigate existing communities that have managed to engage a large number of organized volunteers, over longitudinal periods of time, to attempt to bring about a level of social change in their societies.

Accordingly, this chapter examines two examples of such communities; *Nerdfighteria* and a *Change.org* campaign for the "*Bilo family*" in Australia. These two communities emerged organically—and perhaps accidentally—on online platforms, and grew unexpectedly larger than their leaders imagined. They are of similar social purpose, although of different size and locality. The purpose is to showcase how game-based organizational practices can, and actually are, utilized to create, manage and grow communities dedicated to social improvement.

2 Background

2.1 Games and Altruism: Two Sides of the Same Coin?

Societies are complex, socially constructed webs of activity and meaning in constant flux, actively shaping and being shaped by their members. As societies and life unfold, change occurs to and through them due to these fluxes and natural developments. The status and experience of its members change: some fall into poverty while others acquire excessive wealth. Some find themselves living under empowering social rules or institutional laws. Others begin to lose those feelings of connection and belonging that are important to happy living.

As societies change, individuals may choose to engage in social or political prosocial activities to alter some of the negative circumstances befalling themselves or others and better their community. It can even be argued that many individuals have a genetic disposition to pursue and enjoy such altruistic, activities (Batson & Powell, 2003; Judson, 2007). Bettering a society, however, is a complex concept raising questions about what betterment is and for whom. Nonetheless, individuals around the globe continue to come together working toward this elusive goal (e.g., Abdelghaffar & Hassan, 2016; Dy & Ninomiya, 2003). For example: *The Harry Potter*

Alliance, run by fans of the fictional novel and movie series, has channeled fandom of average individuals into activism toward social, gender and educational equality as well as toward natural disaster relief (Hassan, Harviainen, & Hamari, 2018; Hinck, 2012). Many churches, mosques and communal groups provide, on a daily basis, important avenues of socialization, community building and altruistic activities for individuals around the globe toward the same goal of bettering communities. Muslim communities in the UK, for example, in collaboration with local businesses of different faiths, lead fast responses to the pandemic of 2020, providing safe meals and medical donations to healthcare workers as well as financial and social support to individuals economically impacted by the pandemic (Nazeer, 2020).

A significant and growing trend in our changing societies, however, is that individuals are, in contrast, increasingly spending their time on entertainment activities in general and on video games in particular. Where games were previously often seen as a foolhardy, casual activity for children, nowadays, the average gamer is 35 years old and invests increasing time and financial resources into playing games (ESA, 2019; Juul, 2010). This playing of games is seeping into all aspects of life, including, but not limited to, education, exercise, productivity and even social and altruistic activities (Hamari & Keronen, 2017; Koivisto & Hamari, 2019).

Playing games, and altruistic activities, could seem to be at opposite ends of a spectrum in terms of their purposes: one focuses on personal entertainment, while the other is about giving to society. Despite this apparent disconnection we propose the unconventional idea that these two activities could be quite similar in terms of motivations, experiences, immediate outcomes and possible impact on society, although the outcomes and impact of these two activities are usually likely to be on different individual and societal levels.

Both playing (video) games and altruistic activities can occur individually (single-player games, individual donations to charity) or through organized groups (multi-player games, NGOs and organized groups). Both also require investments of money and time. In the short term, prosocial, altruistic activities can bring individuals feelings of connection, build communities and contribute to improving mental health self-actualization and accomplishment (Batson & Powell, 2003; Judson, 2007). Similarly, playing games is connected to feelings of connection, accomplishment, achievement, community building and self-actualization and perceived development (Deterding, 2015; Riar et al., 2020; Rigby,

2015). Wherever dedicated gamers are found, we also find individuals willing to go beyond the call of duty to volunteer their time and resources for society (Asquer, 2014; Thiel, 2016). Outcomes, however, from many altruistic, prosocial activities are not always as clear nor as immediate as those from games and might involve large personal sacrifices, that can, on some metrics, be considered significantly higher than the returns (Judson, 2007). Hence, a key difference between playing games and undertaking altruistic, prosocial activities remains that of their respective purposes: giving mainly to the self (playing of games) and giving mainly to others (altruistic social activities).

2.2 Gamification of Altruistic, Prosocial Activity

While altruistic, prosocial activities are essential to the wellbeing of both individuals and societies, in societies that are growing increasingly hedonistic, a key challenge is to motivate individuals to actively and consistently engage with altruistic, prosocial activities that may not bring about the same levels of personal gratifications as other activities (e.g., playing of games) do. It is often the case that intrinsic interest in altruistic, prosocial activities is a key driver for engagement with them (Batson & Powell, 2003; Judson, 2007; Riar et al., 2020) and the question arises whether there are ways to stimulate intrinsic motivation and interest in these activities. Furthermore, could altruistic, prosocial activities be structured in ways that highlight the gratifications that game-based activities provide so that they become engaging to more people?

There is an increasing amount of work being done, seeking to uncover answers to these questions. Policy games, designed to engage citizens with policymakers in their societies have existed for decades (Duke, 1995; Mayer, 2009). Simulations have been designed to show people different future scenarios for the development of their community based on how they choose to engage with these communities (Duke, 2011; Gnat, Leszek, & Olszewski, 2016). Games, gamification and gameful designs have been channeled to engage people for altruistic and prosocial purposes (Hassan, 2017; Hassan & Hamari, 2020; Riar et al., 2020). All these developments indicate a growing movement to utilize game-based means to foster and support prosocial altruistic activities.

Arguably, a common thread in these game-based efforts is the breaking down of large goals and connecting the resulting manageable goals and activities to a framework of meaning-making that can be more attainable,

engaging and comprehensible for people. For example, many exergames take the looming goal of losing weight or becoming more fit and break it down to smaller goals of a certain number of steps per day that are relatively more manageable and attainable for people. Then, attainment of these smaller goals is supported through various design mechanics; such as badges, points, missions, narratives and competitions, that are thought to speak to people's inner motivations for mastery, self-development, achievement and relatedness (Hamari, Hassan, & Dias, 2018; Rigby, 2015) among other motivations. The resultant gamified/game-based design, seen in many exergames such as Fitocracy, Runkeeper or HeiaHeia among other applications, is thought to be engaging because of how it invokes a gameful experience around an activity that many would wish not to engage with, namely, exercise (Hassan, Xi, Gurkan, Koivisto, & Hamari, 2020). Furthermore, unintentional gamification of exercise and other activities is seen in how individuals, for example, sing while working out to entertain themselves or impose meaning on their walks by imagining that lava is seeping through the cracks of the pavement that they are walking on, and hence, they should not step on the cracks while exercising.

Similarly, work has been done to intentionally and unintentionally make altruistic, prosocial activities more manageable and engaging (Gnat et al., 2016; Hassan & Hamari, 2020; Riar et al., 2020; Thiel, 2016). Larger goals such as, for example, to eradicate poverty, are broken down into smaller goals that can, for example, focus on eradicating poverty in a certain community. That goal in turn is further broken down into smaller fundraisers and community activities where immediate gratifications for engagement are easier for participants to attain. Different roles are assigned to those participants, depending on their interests and skills in manners that reflect traditional human resource management practices, as well as collaborative, multi-player gameplay.

3 Case Examples

Communities, dedicated to altruistic, prosocial, can be organized and initiated in various manners (e.g., organically or hierarchically) and have a wide range of purposes. Nonetheless, when observed, these practices pertaining to breaking down of large goals to manageable ones, meaning making, role assignment and collaborative work/gameplay are common to most of them. While a systematic study of these altruistic, prosocial communities is needed, this chapter examines two case examples of such

communities, that have managed to remain longitudinally active and affect some level of social change and dialogue. The aim is to highlight and initiate a discussion of their game-like practices to altruistic, prosocial engagement.

3.1 Nerdfighteria

In 2007, YouTube was still a new, fascinating technological development. The platform was sluggish, offered low quality videos, many of those videos infringed copyright laws, and the platform faced several legal and technological threats. Many analysts predicted the platform to go under in a few months. Meanwhile, two brothers with the names of John and Hank Green attempted to utilize YouTube and investigate if and how it can one day become a meaningful means of human connection. John and Hank Green created the channel *Brotherhood 2.0* (Green, 2007), now named *Vlogbrothers* (Vlogbrothers, 2020), a channel they shared and used to send public video updates to each other daily, for a year, while eliminating other text communications between them:

> Hello John, by now you have received my message that we will no longer be communicating through any textual means. No more instant messaging, no more emailing. Only video blogging and possibly phone calls. Starting on January 1st, today, I will send you a video blog. Tomorrow you will reply to that video blog. We will continue like this until the year is up. If one of us fails to send a video blog on a weekday, there will be certain punishments. The punishments will be outlined later. Brotherhood 2.0 commences today! Does that make us crazy? Probably! (Green, 2007)

While this was perhaps an extreme experiment that the brothers argue was initially started for pure curiosity purposes, they gradually grew a dedicated online community of followers that eventually started to go by the name: *Nerdfighteria* (Green & Green, 2009; Nerdfighteria, 2020). By the end of 2007, the brothers decided to continue their YouTube channel and grow *Nerdfighteria*. *Nerdfighteria* grew to include several modes of communication outside YouTube, including dedicated wikis and websites, Facebook groups and face-to-face meetups and even an annual conference (NerdCon). Hank and John Green involved that growing community in their videos through polls for video suggestions and an annual survey to gauge the demographics and interests of *Nerdfighteria*. *Nerdfighteria*

grew relatively slowly yet became highly connected with clear, though diverse interests and rules of conduct to ensure the inclusivity and diversity of the community across individuals of different genders, religions and sexual identities. It is perhaps this slow growth of the community and the tending of the brothers to it that contributed to its relative cohesion that allowed it to carry out larger projects, such as P4A.[1]

In December 2007, the brothers launched what is now known as the Project for Awesome (P4A) (Project for Awesome, 2020), cementing the goal of *Nerdfighteria* to "*increase world awesome and decrease world suck*" (Green & Green, 2009; Nerdfighteria, 2020). This goal was to be achieved through raising donations to support notable NGOs and humanitarian organizations selected by *Nerdfighteria* members. Interested members were to produce videos about an organization of their choice, outlining why the community should support it. Collective contributions by the community were to go to the organizations depicted in the videos that receive the most up-votes (likes).

During 2007, *Nerdfighteria* produced approximately 400 videos for the first P4A run, promoting several charities during Christmas 2007. In 2020, P4A completed its 13th run, raising close to 1.5 million US dollars, directed toward various charities selected by *Nerdfighteria* through member contributions, donations from the Green brothers, as well as matching funds from notable donors. Donations have gone to notable organizations, such as partners in health to support the healthcare system in Carilion, save the children, planned parenthood, crisis text line and the clear air task force, among many other organizations.

3.2 Bilo (Biloela) Family

In Australia, a similarly motivated community with a purpose to increase world awesome and decrease world suck, was created in 2018, with a single focus on changing the lives of a small family living in a small, remote Australian town. The, parents, of the *Bilo* family arrived independently in Australia as refugees from Sri Lanka in 2012 and 2013, individually, fleeing the persecution of the Tamil people there (ABC news, 2019). After they met and married, they moved to Biloela a small town with a population of 5758 in Queensland, where their two daughters were born. One morning they were woken up in their home, arrested and moved to a

[1] Project for Awesome homepage: http://www.projectforawesome.com/

deportation center in Melbourne 1864 kilometers from Biloela. From that point on, the legal and emotional complexities of the situation have grown as attention paid to this case has expanded.

Notably for our analysis, this family's home community of Biloela has heavily influenced their fate and present situation, taking matters into their own hands. The first step was creating an influential petition on "the world's platform for change"; *Change.org*[2], that has become a center of resistance to this (and similar) cases of perceived excessive use of governmental force against individuals.

Created on March 10, 2018 by Angela Fredericks, the Change.org petition has been signed by **355,751 individuals and has raised funds to fight several court battles, all focused on the goal to** "[b]ring Priya and her family back home to Biloela, Queensland". Like many aspects of life and action in the second decade of the twenty-first century, the petition began as a simple and apparently straightforward, goal of righting an obvious and demonstrable wrong. While the *Bilo* family remains in detention as we write in September 2020, they are now detained on the remote Christmas Island, where they are currently the sole residents of a multi-million-dollar facility, reopened to house them as far from home as possible while still on Australian soil. The relevant Government minister claims that Australia has "no children in detention" (ABC news, 2019) conveniently overlooking the ages of the two "*Bilo* girls" who are 2 and 4 years old, born on Australian soil. The ongoing battle about the "*Bilo* family" has made visible many factors in Australian society, including that

> Australians want to share their concerns and to demand action. However, they no longer see parliament as the primary forum to do this. Instead, people increasingly join petitions through online movements or petitioning platforms such as Change.org. (George Williams, *The Australian*, 2019)

The initial intention of Angela Fredericks' petition was simply to "bring the family home". There was no thought that such a simple intention would arouse nationwide attention or create a large social movement, yet the petition did just that, achieving and passing many milestones for petitions of this type and delayed the family's deportation for an extended period.

Following the work that has since been accomplished as reported in the Change.org page, the goal has remained constant while the action plan

[2] Change.org homepage: https://www.change.org/

has repeatedly had to adapt to changing tactics—including an effort to remove the family from Australia without allowing the law to complete its course. Like a game of chess, each move against the family has been countered with action to achieve their continued safety in Australia. During the time since the petition first went live in March 2018, upward of a dozen other similar cases have achieved outcomes favorable to the petitioners. The *Bilo* family—however—is now apparently caught as pawns in a giant and expensive case of the chess situation called the 50-move rule (Björnsson, 2012), which occurs when the player with the stronger side cannot demonstrate a winning technique within 50 consecutive moves. In such conditions, if a pawn is moved or other exchanges occur for either side, the count starts over.

As long as the Minister chooses to play the 50-rule game the petitioners must also play the rule of peaceful petitioning. As time has passed efforts have extended far beyond the *Change.org* petition. Media news items, videos, collaboration with parliamentary members and legal action to impede or deny government efforts have proved successful enough that the family continues to live in limbo on Christmas Island. The local community of Biloela, original petitioners, lawyers and other members of a (by now) widely extended community of observer/petitioners are all waiting for the "next move" with energy still to find and make the return move that keeps the game in play—while hoping to find a way to achieve the end goal of "bringing the family home".

4 Gamified Prosocial Activity: Initiating a Discussion

In this chapter, we understood gamification or ludification of culture and activities as motivational, organizational practices that allow individuals to strive toward and possible attain goals larger than themselves as outlined in the background section of this chapter. The cases illustrated shed light on how these practices can be used for altruistic, prosocial purposes and engage organized, motivated individuals for longitudinal periods of time, to bring about a positive impact on their communities.

It has been postulated that gamers are in search of "epic meaning" from games (McGonigal, 2011); a profound purpose that motivates them to invest time and effort into solving challenging of the virtual world that gamers know they can solve because these challenges are matched to their

skill—a feature rarely present in the physical world. Through P4A, the Green brothers gave their communities an epic goal larger than their individual selves—to make the world a better place. This epic goal, arguably, is facilitated in game-like mechanics that made it appear more attainable and easier to engage with, and so, the community did. P4A is annually organized by a highly dispersed, multinational community (Green & Green, 2009; Nerdfighteria, 2020; Project for Awesome, 2020) with the purpose of increasing world awesome and decreasing world suck, for example by supporting organizations such *as Save the Children*. It may be easy for bystanders to rally behind that epic goal to save the world on face-value, however, this cohesion can be challenging to the religious or political ideologies of some of community members and bystanders. An example is when *Nerdfighteria* supports organizations such as *Planned Parenthood*, which provides abortion services that some individuals may not favor.

The petition to bring the *Bilo* family home is of a national scale, compared to P4A, however it similarly utilized mechanics of epic meaning, digital means of orchestration as well as traditional activist practices. Like the Green brothers, Angela is an accidental leader of a social movement. As a member of the Anglican community she was aware of the family in question and how they had worked to settle into, and contribute to, the community of Biloela. Shocked by the sudden the arrests and moved by the unfairness of their plight she has worked tirelessly to keep their plight in front of public attention, farming it as a mission to bring the family back home.

The brothers' interests and missions in life, while serious, appear comparatively humorous in approach. This difference in approaches between the two discussed cases is perhaps dictated by the sensitivity of the issues the two initiatives have addressed. The *Bilo* case appears one with more immediate negative consequences and in urgent need of collective action. It is of a comparatively manageable scale and local significance that a serious approach to it could be enough to give volunteers a clear participation goal. The brothers' goal to make the world a better place through P4A appears more of a daydream. Perhaps their relatively humorous and clumsy phrasing of the goal to make the world a better place has contributed to how *Nerdfighteria* embraced the goal. Additionally, perhaps by phrasing *Nerdfighteria*'s goal in a subjective, humorous manner: "to increase world awesome and decrease world suck", the brothers gave individual *Nerdfighteria* members the room to each interpret and execute the goal in a manner coherent with their interests and ideologies, while respecting

community diversity and codes of conduct. This possibly increased the likelihood that *Nerdfighteria* would then be willing to invest the time and resources needed to attain that goal. Such personally relevant purpose-making is indeed linked to motivation, goal-commitment and increased activity (Hamari et al., 2018; Rigby, 2015), and the purpose of increasing world awesome and decreasing world suck does not seem to have been any different.

The leaders of both communities have, similarly, attempted to build unifying narratives to create and grow said communities; a practice often referred to as storification (Deterding, 2016), where a story/meaning is connected to an activity and then employed as a motivational mechanic of onboarding and continuous member engagement. The organizing narratives in these two communities were different in tone, one being more humorous than the other, yet they both where emotional narratives. Such affect allowed community members to feel deeper and perhaps more intrinsic connections to the causes, rather than they would possibly have felt if the narrative was organized around fairness/unfairness of governmental action (Bilo) or the need for social fairness (P4A). It is also these engaging, affective narrative that perhaps contributed to growing the communities. Although, *Bilo* the narrative was more sensitive around immigration and human rights, it also opened the door to increased challenges on societal and governmental level (Truu, 2020). The tone and intensity of the organizing narratives are important not only because of how they can impact the cohesion and engagement of the community itself but also because of how others will perceive it and interface with it.

The leaders of the two movements publicly invested time and resources needed to attain that goal. They were not bystanders asking the community to incest resources while they watched. Tending to followers through such means is often linked to increasing the popularity of content creators on YouTube and other streaming services, and growing the dedication of the online community to shared causes (Törhönen, Hassan, et al., 2019; Törhönen, Sjöblom, et al., 2019). Through P4A, the brothers also outlined what *Nerdfighteria* needed to do to make the world a better place: create videos, spread them, raise donations through community contributions. Through the Change.org petitions, Angela did the same indicating that to bring the *Bilo* family home, the petition was to be signed and shared so as to gain support and impact. Without the breaking down of looming, large goals to make the world a better place, they would have perhaps remained wishful thinkers.

5 Conclusions

This chapter examined two examples of social change communities, that have managed to remain active and affect a level of social change over an extended period of time. Employing practices of gamification and game-based engagement, although possibly unintentionally, larger narratives of "bringing a family home" and "increasing world awesome" were used as unifying narratives for the communities. Additionally, those looming challenges that the communities were facing were broken down into smaller manageable chunks that community members were then guided through utilizing mechanics similar to those utilized in games. Charisma and intensive personal investment from community leaders, has helped grow the communities, although there is a stark contrast in the tone of the two communities: between humor and humanitarianism. Accordingly, this chapter shows the practical potential of the unifying narrative and game-like practices in engaging individuals with altruistic, prosocial behavior. It also shows how these practices can be implemented differently yet with similar intent and impact. As this is an initial theoretical treatise of the phenomenon of game-based engagement with altruistic, prosocial behavior, we encourage empirical studies of these strategies, potentially through interviews with social change catalysts and volunteers so as to discern their recruitment and/or engagement strategies with social change.

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Serious Gaming and Development Aid: A Case Study from Egypt

Mina Ghaly

1 Introduction

Social challenges are on the daily agenda of national and international communities. The challenge of ending poverty is the main area of interest of governments, development aid agencies, NGOs and other relevant stakeholders. Exploring new innovative techniques became a need to deal with the existing challenges that have been around for decades in different ways.

The importance of the innovation was stated clearly in the Sustainable Development Goals (SDGs), which have been set by the United Nations General Assembly in 2015 for 2030. Goal 8 focuses on "promoting sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all." Goal 9 aims to "[b]uild resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation" (UN General Assembly, 2015). Accordingly, the Egypt

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Vision 2030, which has been developed and based on the above goals, has four main pillars. Innovation is one of the pillars and reflects the importance of innovation to the long-term vision of the government (Ministry of Planning, 2015).

The complexity of development challenges is increasing rapidly; accordingly, the need for innovation within development cooperation projects is required. Various efforts have been initiated in the social development sector; however, rapid disruptive innovation is still not aligned with the social needs. In addition, there is a lack of motivation in implementing it in the social sector.

This chapter aims to understand how digital innovative solutions such as gamification and serious gaming influence the development cooperation and youth social development in Egypt. This chapter contributes to a better understanding of the impact of social innovation on the development cooperation sector, especially as there is limited research in this area, particularly in Egypt. The data was collected from target groups and stakeholders. Descriptive analysis method was followed to provide clear outcomes regarding the impact of technological social innovative tools on youth. The analysis was based on a case study from the International German Cooperation (GIZ) projects.

This chapter showcases the Labor Market Access project (LMAP), which is one of the International German Cooperation projects aiming at improving the employment situation for young Egyptian men and women. It seeks to facilitate young people's access to the labor market and focuses on tapping the employment potentials of currently vacant positions, as well as the future demand for workers in the non-academic segment of the labor market. The project aims at establishing sustainable structures in the field of employment services, as well as improving the availability of fair and decent job opportunities for Egyptian youth. In addition, it provides Egyptian youth with measures to increase their employability beyond technical skills: by motivating them, increasing their self-esteem, preparing them to engage in a job and take on responsibility. Finally, the project aims to enhance the quality of employment in small- and medium-sized enterprises (SMEs).

The results will help us to derive policy implications in terms of using innovative methods and tools in the international development and social change projects, especially the projects that target economic development in general. A deep understanding of the evolution that happened in the development aid in general and main trends in official development

assistance flows will allow us to analyze the evolution of the development cooperation sector. This will involve setting a baseline to evaluate the effectiveness of the new interventions, which have been used by new innovative approaches both digital and non-digital. The literature review will focus on innovation, specifically social innovation and its relationship with development cooperation.

Since the 1950s, economists have had various discussions and arguments around the foreign aid significances. Numerous literatures discussed the effectiveness of aid on many levels such as economic growth, investments and a set of social outcomes such as behavioral change in the gender projects. The outcome of these discussions found that it has limited effects on all the above factors (Licht, 2010; Doucouliagos and Paldam 2011; Bjørnskov and Schröder 2013; Dreher et al. 2018). This dimension will be considered by reflecting on the foreign aid results and the usage of social innovation techniques.

2 The History of Development Aid

The development aid concept was introduced for the first time in 1949 by US President Harry S. Truman who mentioned that, for the first time in history, humanity possessed the knowledge and technique to free half of the world population from poverty. Poverty is considered as a threat for wealthy countries. However, the main goal was for spreading the ideology of the developed countries. Accordingly, the development aid was seen as an instrument to promote one's ideology and to prevent communism from spreading. (Berger and Beeson 1998)

One of the hidden goals of the development aid at that time was to prevent the spread of communism after the Second World War. The concept of development aid was inspired by the Marshall Plan; the plan was proposed by the United States because it was the only country actively participating in the Second World War that had not suffered much damage during the war. The plan provided the development aid to all the European countries, including those who lost the war, to rebuild the economy of their countries after the Second World War.

A new world order emerged in the 1950s after the Second World War, the First World was led by the United States and their allies from high living standard countries such as Australia, Argentina, South Korea and most Western European countries. Meanwhile, the Soviet Union formed the so-called Second World, together with the other socialist countries such as

Eastern European states, but also states like China, Cuba and Ethiopia. The common ideology between these countries was the shared identity as socialist societies. Finally, the so-called Third World became a union of the remaining, mainly Asian and African, countries who belonged neither to the First nor to the Second World. The main purpose of aid for this group is to improve their economic situation in addition to fighting against colonialism and racism (McGuire 1952; Amuzegar 1958).

As a result of the conflict between the First and the Second World, many missions and interventions tried to influence the Third World in order to spread their respective ideologies and therefore impose their economic and political interests. Development aid served as an instrument in achieving this goal.

In 1968, the purpose of development aid started to be reformulated. The head of World Bank, Robert McNamara, prompted the idea of matching the basic needs of people to the donor funds in many sectors, such as health, education, water and sanitation.

In 1980s, as a result of the global recession caused by the oil shock of the 1970s, the idea of financing basic needs was no longer the feasible approach and the debt of the developing countries escalated, as a consequence. The donor countries shifted their approach to lending money to developing countries in order to manage their debts and to restructure their economies, as well as limiting the expenditure on social services.

After the collapse of the Soviet Union in 1991 and the end of the cold war between the eastern and western countries, another milestone was achieved, where many countries transformed to democracy and started working on increasing participation in development projects. This also included non-government organizations and wealthy philanthropists during the 1990s. However, many countries were still overwhelmed by debt.

In 1992, a great shift happened at Rio Conference for Environment and Development by the United Nations when the meeting marked a fundamental rethinking, away from development aid and toward development cooperation. In Agenda 21, new principles were introduced, such as the principle of "help by helping yourself." The policies aimed at enabling the underprivileged groups to help themselves by following empowerment strategies, such as providing micro-credit programs to enable independent investments.

In 2000, at the Millennium Summit, the United Nations stated that the number of people who were still living in extreme poverty was over a billion. At that time more than 700 million people could not afford food for

themselves. About 150 million primary school children were neither able to read nor write. Over a billion people did not have access to drinkable water, and about two billion did not have access to healthy sanitation. These disadvantaged people had hardly any chance to take part in social, economic and political processes. Accordingly, the eight Millennium Development Goals (MDGs) were set and agreed on.

The major target of the MDGs was achieved by adopting relevant policies together with the economic boom that happened in many countries by 2010. The absolute poverty in the world was reduced by half and some other achievements were accomplished such as increasing the number of children who joined primary education, access to drinkable water, improving health care systems, as well as fighting infectious diseases. For instance, this led to the reduction of mortality rates of children and mothers and the reduction of HIV infections.

In 2015, the Sustainable Development Goals (SDGs) were adopted at the UN General Assembly, to be implemented from 2016 to 2030. That year was a landmark year for multilateralism and international policy shaping, with the adoption of several major agreements: Sendai Framework for Disaster Risk Reduction (March 2015), Addis Ababa Action Agenda on Financing for Development (July 2015). Transforming our World, the 2030 Agenda for Sustainable Development with its 17 SDGs was adopted at the UN Sustainable Development Summit in New York in September 2015. The Paris Agreement on Climate Change was signed (December 2015). The annual High-level Political Forum on Sustainable Development was set up and serves as the central UN platform for the follow-up and review of the SDGs (UN General Assembly, 2015).

The world leaders agreed to 17 Global Goals (SDGs), aiming at ending poverty, fighting inequality and addressing the urgency of climate change by 2030. In contrast with MDGs, which focused on poor countries, the SDGs focus on all developing and high-income countries by engaging governments, businesses, civil society and the general public to work together to build a better future for everyone. Thus, it puts a stronger focus on sharing responsibility and demanding a contribution from all the countries.

They considered a list of priorities such as ending poverty and hunger, combating climate change and its consequences, protection of ecosystems in addition to the promotion of sustainable economic activity and growth.

SDG 9 is focused on fostering innovation and accordingly many of UN and EU projects established clusters and packages of innovation activities

to make a change in the innovation culture and environment in the social and industrial sectors. On the national level, the vision of Egypt 2030 indicated innovation in the third pillar as "[k]nowledge, innovation and scientific research. A creative and innovative society producing science, technology and knowledge, within a comprehensive system ensuring the developmental value of knowledge and innovation using their outputs to face challenges and meet national objectives" (Ministry of Planning, 2015).

3 Innovation approaches

This part will highlight the term Innovation and the various understandings and definitions around it.

The aftermath of the Second World War changed the way of thinking and using development aid. It was also facilitated on the technology innovation level. Starting from the 1940s the United States, through the federal government, started to foster scientific and technological evolution through funds and research contracts in order to widen and promote the technical careers and also to accelerate the process of innovation. According to Franklin et al. (2017) the launching of the Device Research Conference (DRC) was the kick-off for innovators from public and private sector to present their innovations for the first time. Consequently, numerous investments were formed in many fields such as antibiotics, vaccines, electronics, computers and promising low-cost nuclear power (Franklin et al. 2017, Howaldt and Schwarz, 2010).

In the 1970s, two main factors affected the innovation industry; the first one was the promotion of the free market of capitalism by the governmental policies, and the second one was the revolution in the field of personal computers and the biotechnology industries. Many small businesses started, and entrepreneurs became encouraged to establish the business innovation sector. As a result, the Innovators have created high-tech start-ups which helped to reshape the technology landscape (Kevles, 2015).

According to Godin, the linear model of innovation was the first concept to remark the relationship between science and technology for economics. The model identified the steps of innovation starting with basic research, followed by applied research, development of the R&D, finalizing the production and finally the launch of the innovation (Godin, 2006).

During the rapid evolution of innovation concepts, the concept of social innovation was not feasible to be used in the social development

sector. According to Puelles and Ezponda (2016) the only source of innovation is the combination between scientific research and technological developments, including the implementation and the dissemination in the market. However, according to Hubert (2010), the rules have changed and the promotion for social innovation is one of the priorities on the European policy makers' agenda.

Started by Francisco Adro and Cristina I. Fernandes, the idea of innovation shifted from just serving the problems of market competitiveness, technological advances in the most varied areas from medicine, sciences or even military industry to social aspects in order to improve the quality of life and society. Accordingly, the social agents can be considered as social innovators, not only the companies (Puelles and Ezponda, 2016; Adro and Fernandes, 2020). An innovation process usually starts by recognizing a need, which then leads to creating and selecting an idea, and its implementation (Tidd & Bessant, 2018).

Social innovation is defined as a new product, process, procedure, policy or design that aims at profoundly changing authority and resource flows, and as a result, creates greater social resilience and sustainability (Westley, Zimmerman and Patton, 2006). According to the Centre of Innovation's (Stanford University) definition, its essence is in developing reliable, feasible and desirable solutions for social challenges such as environmental and systematic social challenges. The form of social innovation usually comes in an initiative formed by community and other parties, it can be the result of collaboration between the stakeholders, government, volunteers and NGOs, however, formal organization do not normally lead these initiatives.

The elements described above help to understand the foundation of development cooperation in a case study in the Egyptian development cooperation using social innovation as a new approach used in the Egyptian development community. New tools such as serious gaming were used to create the impact of this application.

3.1 Serious Gaming

The concept of serious games, which Clark. C. Abt coined in 1970, suggests that games target the player's behavior or change their thinking instead of providing the entertainment elements only. As Abt described it, "these games have an explicit and carefully thought-out educational purpose and are not intended to be played primarily for amusement." He

applied gaming for improving the indication system for the physical and social sciences, occupational choice and training, and planning and problem solving in government and industry (Abt, 1970).

Playing games is an idea that can be traced to ancient times. It played an important role in societies' cultures and human social interaction, the dice is considered to be the very first game used by humans, found in South Iran 3000 years ago. Early examples of serious games include Mancala, designed in 1400 BC, which was used for trading animals and food purposes (De Voogt, 2010).

In Egypt, Senet is one of the earliest board games dated to 3500 BCE. It was played on a board of 30 squares and the players aimed to reach the edge of the board. Further development happened to the game over time to reflect the religious beliefs of the Egyptians. The pieces of the game represented human souls and were moved to symbolize the souls travelling in the afterlife. Senet was also used for the purpose of religious rituals (De Voogt, 2010).

Modern Serious games are largely digital and are not exclusively for entertainment, although they do contain elements of it. Their main purpose is to provide information and education. Most serious games follow the principle that the game contains and reveals knowledge that is otherwise hidden from the player (Djaouti *et al.* 2011).

According to Djaouti *et al.* (2011), various areas and fields are using the concept of serious gaming, for example, in education, healthcare, marketing and other businesses and industries. These games include a combination of learning strategies, knowledge and structures, and game elements to communicate and to improve specific skills, knowledge and attitudes as an end result. The advantages include higher engagement and immersion, achieved by influencing motivation through design elements such as rewards, story progression or different feedback mechanisms and attractive environment. The games provide a safe space for experimentation without consequences that could affect you in real life, in this virtual environment the player will not have any fears to cause any damage or serious harm. Furthermore, positive emotions caused by playing games lead to an improvement in learning and have been measured on students who went through serious gaming for learning purposes and compared with other traditional methods of learning (Squire 2008).

For example, in 2008 a game called Foldit was developed by a team at the University of Washington. The purpose of the game was to predict the native structures of various proteins using special computer protein

structure prediction algorithms. The team made it appealing and engaging to the general public, "players working collaboratively develop a rich assortment of new strategies and algorithms; unlike computational approaches, they explore not only conformational space but also the space of possible search strategies" (Cooper, et al. 2010). Further evaluations of the results showed that Foldit players were able to "build protein structures into crystallographic, high-resolution maps more accurately than expert crystallographers or automated model-building algorithms" (Khatib et al. 2019).

Apart from serving as an entertainment activity, games serve as instruments to reshape the behavior of people. There is, however, a need for exploring the effectiveness of applying serious gaming as an innovative solution for social development.

These games are particularly engaging for young users. The social development community and especially the innovation teams in this field therefore started to get involved in this group of users to achieve social improvement. The area of social development in Egypt started to cope with innovative solutions to achieve their goals.

This chapter presents a case study of the Labor Market Access Project (LMAP) developed by the German International Cooperation (GIZ) in Egypt. The purpose of the project was to develop and apply innovative solutions to improve the employment quality of blue-collars workers.

4 The Case study: Labor Market Access Project (LMAP)

LMAP is supported by GIZ on behalf of the German Federal Ministry of Economic Cooperation and Development (BMZ). It aims at improving the employment situation for young Egyptians with a focus on placement structures and job quality. The project started in 2017 and ends in 2022, and is one of the Economic Development for Employment Sectors at GIZ.

Youth unemployment and the lack of job prospects is one of the most urgent problems in Egypt. According to Egypt's Central Agency for Public Mobilization and Statistics (CAPMAS), the nation's unemployment rate in the first quarter of 2014 was 13.4%, the highest in ten years. At the same time, private businesses in all sectors have difficulties in recruiting staff and filling their vacancies. Especially in sectors providing

blue-collar jobs, where a significant number of jobs are offered, the problem is immense.

The project is aimed at improving the employment situation for young Egyptian men and women. It seeks to facilitate young people's access to the labor market and focuses on tapping the employment potentials of currently vacant positions as well as the future demand for workers in the segment of the labor market that does not require graduate qualifications.

The project is implemented in the framework of BMZ's special initiative "Stabilization and Development of the MENA Region."

In order to achieve that objective, LMAP will

- provide advice and support with regard to strengthening the capacities of the Network of Employment Promotion (NEP) for job matching and job preparation of young people and disseminating the NEP approach;
- provide advice and support with regard to strengthening the capacities of the Federation of Economic Development Associations (FEDA) for improving employment quality in SMEs in the Suez Canal region; and
- develop innovative approaches to both job placement and improving employment quality. LMAP is looking to gather diverse expertise and experience on labor market related topics in order to co-create specific, demand-driven solutions and subsequently test them.

LMAP chose to endeavor into social innovation techniques and human-centered design in order to have a creative look at the challenges in the field of employment promotion, coming up with new solutions and most importantly trying them out. The aim is to create a long-term and sustainable platform which is guided by the ownership of its participants.

Social Innovation, as a field of activity, is responsible for creating innovative solutions for the above-mentioned challenges. Accordingly, the team started the first Hackathon in Egypt for creating a serious game as an event in the international Run Double Jump gaming jam (Global game jam) in 2017. Since 2017, LMAP supported the development of eight serious games and the gaining of experience in the organizational and development part. The journey of LMAP will be reviewed in the following part to understand the design of the program and the challenges that the

teams face on the implementation level in the development and international cooperation level/ projects.

The developed social innovation solutions include serious gaming (Android, PC and Virtual Reality) and had an impact on many areas related to the employment sector such as, job preparation, health and safety, punctuality at workplaces, ensuring a safe work environment for women at workplaces, transferable skills and hygiene. In addition, gaming was used to build a professional team working on 360-degree filming to help introduce job candidates to experience the work environment which they will be nominated for.

The job preparation program to be implemented for the young blue-collar workers is using the serious gaming. The usage of the social innovation tools such as serious gaming made a significant impact to the blue-collar workers and made the process easier for the facilitators to deliver the content that contained skills and knowledge for youth.

Currently, the team is working on developing another game to deal with the pandemic situation. The game is targeting the transferable skills topic, for example, response to the economic effect that Covid-19 pandemic has caused to the labor market in many fields. There are many industries affected by the pandemic, especially the construction and tourism sector, where private informal workers and women employment decreased. The main objective of the game is to help the unemployed workers who got affected by the pandemic to explore the skills that they have and redirect them to other jobs or sectors. The game allows them to explore their skills and guided them to the available jobs in the market that are in high demand during the pandemic, such as health production, health care, customer service and retails in general.

One of the early outputs that came out of it and supported the NEP was a new game on transferable skills, following the digitalization wave after Covid-19 pandemic. The game is called Lantern (El Fanoos) and it helps the players to increase the knowledge of the employers without a direct contact with them and to reach bigger number of job seekers above the capacity of the employment centers.

The Lantern game is an Android game that consists of many mini-games based on psychometric assessment tools to discover the transferable skills that the job seeker has. Based on the results, it recommends another line of work to the player from the available jobs at the employment centers. The game is a dissertation project of a group of students who graduated from Information Technology Institute (ITI) in 2020, the year of the

pandemic. They got interested in the idea of redirecting the unemployed workers to another job in different fields less affected by the pandemic.

The Lantern game is about a journey of a player who falls into a lantern and finds the genie powers that are captured by four evil wizards. Inside the lantern, the genie asks for the player's help to be set free and gain his powers back. To do that the player has to collect keys of magic chains that hold the genie while each key is in possession of one of the wizards.

The player searches for the wizards and traps them to get the keys. During the gameplay the player has to solve puzzles in order to set the genie free and progress. Each puzzle measures a skill such as detailed orientation, quick counting, logical thinking and problem solving. At the end of the game after the genie is set free, the genie helps the player to know more about his skills and connects him with the available jobs in the employment centers.

This game is designed to be played in the employment centers, the employment facilitators ask the job seekers to play the game on the tablets of the centers and get the results to ease the placement process.

A significant area of improvement is employment quality, which is another objective of LMAP. The social innovation team developed a game called Here is Safe (Hona Aman), which is a serious game that has been implemented in more than 50 factories in Egypt. It is a journey from point 1 to point 36. The game allows for up to eight players playing in two teams. During the game the player use dice to move in three levels. Each level has a theme, combating sexual harassment at the workplaces, improving the work ethics, and health and safety. The game sets situations to the player and opens a discussion about them. The fun part in this game is high as the design and the wording is easy and funny in addition of using the situations that are very close to the workers in their daily life.

4.1 Main Findings from the Interviews

Semi-structured interviews were designed for data collection purpose to evaluate the impact of the developed games, social innovation and development cooperation in Egypt. The questions posed to the interviewees focused on the serious gaming aspect. Twelve interviewees were selected according to their current positions and previous professional background, as well as representative field, for example, serious gaming, development cooperation. The following main themes have emerged from the interviews.

Understanding the social innovation approaches is one of the weaknesses in the development sector and is often confused with digitalization. Interviewees mentioned that their beneficiaries and partners' understanding of social innovation is limited and mixed with digitalization. In addition, there is a confusion between gaming, gamification and serious gaming, while the purpose of serious gaming is not clear for the target groups among the interviewees. However, on the decision-making level, there is a need for promotion, using accurate results from previous projects to consider using any of the social innovation tools.

Regarding the awareness of serious gaming, most of the interviewees mentioned that their knowledge about serious gaming came from direct contact or presentation by GIZ- LMAP team through an event or activity.

Regarding the short-term impact of Lantern game, the tourism sector is one of the main sectors that was affected during Covid-19 pandemic, while the retailer sector is growing. There was an increase in requests for retail jobs at the employment centers but it was not easy to convince the youth who used to work in the tourism sector to accept those jobs. The game gave a justification for offering those jobs to the job seekers based on their qualifications rather than job availability only.

The employment facilitator mentioned that the game supported the transferring process especially that the target group is not flexible to change their jobs or the sectors they used to work at. On the other hand, the job seekers enjoy the game without any stress which was associated with the employment process in the past. Moreover, the game increased the self-esteem of the job seekers and their willingness to accept different jobs in different sectors.

Regarding the Safe game, the feedback from the human resource department in the factories was positive and the project was getting requests to do more implementations to further raise awareness on the topics mentioned in the previous section. On the other hand, the workers enjoyed the experience and asked to repeat the game with their friends in other factories. Through the journey, they learnt about the different ways to extinguish fires, first aid, positive behaviors toward work ethics, sexual harassment and how to deal with situations around this topic.

With regards to the project implementation, the organizational culture was one of the recurring topics during the interviews, there are many tools and approaches that can help the organization to move forward toward social innovation such as design thinking. Design thinking is considered one of the most innovative tools for problem solving, which was the main

tool for GIZ that helped to formulate solutions such as serious gaming and 360- degree filming among other. Such projects also require knowledge about new methods for software development management such as Agile methods, Scrum and Kanban. The gaming company worldwide are using these methods to break down big tasks and organize their projects in an agile way and deliver them in a short time. The learning culture was also mentioned by the interviewees who applied social innovation solutions, including failing forward and celebrating the failure as a success story. These terms came from a deep understanding that trying new approaches is risky and one will never create or even apply new solution if they are afraid of failure. Speaking out loud about the failure is a sign of being mature in the innovation world.

In most development organizations, the direction to follow these approaches comes from the donors or boards or steering committees who mostly prefer to implement the traditional ways to guarantee the outputs. However, some organizations, such as GIZ, show some flexibility for trying new approaches, which is understandable as the results are still not guaranteed. It has also been mentioned that donors have to contextualize as much as they can to push responsive activities based on the situation they face and the local context at times. In the case of The UN Refugee Agency (UNHCR), developing a concept note and pitching it to the innovation department can help to pilot new ideas in the projects. To apply a serious game, better articulation of the main objective is required, as well as the acceptance or improvement the work environment.

However, sometimes society or the local community is not ready for certain ideas and activities, as they are used to the traditional tools and methods. Hence, the work has to be contextualized and adjusted to be implemented in such society while still achieving the best outcomes. It is crucial to consider the culture factor in the implementation. In this particular case, Egyptianizing the content to meet the needs of its people made the process of adopting such tools easier, more accessible and welcomed at the community level.

The choice of partners and stakeholders is very crucial in taking decisions to apply innovative tools. Engaging political partners is particularly difficult. In contrast, the private sector is much easier to adopt innovation, however, they were rarely included as partner in the development project in the past.

Preparing an organization and a community needs time. Partially, the resistance to change can be explained by the perception that these

innovative solutions replace workers with technology solutions. This kind of resistance used to be from the implementer who has direct contact with the beneficiaries. From the managerial point of view, using technology solutions with high levels of impact has high investment potential. On the other hand, the beneficiaries can have a good bond with these tools if the developers consider the usability part and the personal characteristics of the users such as their preferences, level of education, the technology which they are familiar with and so on. In this project, the pandemic helped to accelerate this phase.

Serious gaming can be a suitable solution, when working with children or youth, because it usually includes the fun factor. Additionally, the budget limitation and timelines are essential factor in making such a decision. Using innovative methods such as design thinking can help to identify the challenge and decide about the suitable solution after testing it for viability, feasibility and desirability.

The positive impact of serious gaming on the community in the described projects is a recommendation to others who are working with youth. The feedback from the interviewees who applied serious gaming was positive in terms of confidently reaching the beneficiaries and improving their knowledge in a simple and innovative way. However, a stronger structure and constructive monitoring and evaluation systems need to be established. The preliminary results suggest, the learning outcomes for the selected topics are increased by using gamified solutions. However, the impact is usually hard to measure when it comes to measuring behavior change. Pre- and post-questionnaires, together with follow-up questionnaires after a longer period of time (e.g., three months), can help to evaluate longitudinal changes in behavior. According to the preliminary feedback from the student, the quality of the educational and professional content is very high and meets the market needs.

The learning model of ITI has been developed after the partnership with GIZ, two main courses were added. Design thinking became one of the main courses that is delivered to the students to solve a problem by developing innovative ideas. Moreover, the program offers Agile training as a project management and software development method to increase team productivity and to have the ability to create and respond to change.

5 Policy Implications

This research has the following policy implications. Highlighting the results of using innovative solutions, such as serious gaming, and using quantitative evaluation results and testimonials, could help to encourage the leaders responsible to take the step forward to try the suggested method. More studies and research are needed in the area of serious gaming social impact, as the uncertainty of the results is considered as a barrier for new organizations in applying it. Accordingly, studies, monitoring and an evaluation system will help to provide the technical measurements of the social impact on the ground, which can give justification for using serious gaming instead of more traditional tools. The above-mentioned ideas can be integrated as topics of research projects in the Ministry of Higher Education and scientific research with an attractive incentive for research purposes.

Considering building the culture of learning among the undergraduate students to join the tech field will help to enrich a bigger segment in this age group. Based on the new digitalization approaches that the government is promoting, especially in the ministry of education and higher education, by integrating new projects to the running digital educational system, the educators can gain more knowledge on the new methods and additional content that will be delivered. Such content can be delivered by using students' tablets which will make the learning processes and sharing knowledge more convenient.

6 Conclusion

The chapter provides a review of the topics of development aid, social innovation and serious gaming for a clear understanding of the study framework. The chapter also provides examples of the responses to the challenges of the Covid-19 pandemic at the example of GIZ-led project for the improvements of employments opportunities of the youth in Egypt. The interviews focused on two dimensions: investment opportunities in the serious gaming industry, and the social impact, concerns and opportunities for the application of the serious games based on experiences of one of the International German Cooperation's projects.

The Lantern game supported the employment facilitators to identify the job seekers with their skills and abilities, and the available jobs in an attractive and more engaging way. The other game, Here is Safe, engaged

the players in many workplace-related topics, such as gender-based violence. The interviewees reported positive impact of the developed games. The process of the raising the awareness and adding the worker knowledge through serious games was much easier than using the traditional techniques, and more convincing. The sensitive topics such as sexual harassment at the workplace was delivered and explained in a safe environment context with the support of a team of trusted experts. These topics are not easy to tackle using the traditional ways, especially with this target group of young workers.

Policy implications and recommendations were developed based on the literature framework and the research methods. Many dimensions were considered on the economic and social level, such as organizational culture, readiness of the society, readiness of the organizations, the impact assessment system, the investment opportunities and the potential of developing the serious gaming industry further. Further researches and publications are needed in the social impact level on a long term as well as on the feasibility and sustainability levels.

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The EN-Survival Game: An Environmental Game for Residential Accommodation

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1 Introduction

Addressing climate change may require behavior change at the individual level. Such change is typically more important than technological solutions, as changing people's behavior and attitudes toward energy consumption will allow to generate long-term reductions (Minx et al. 2017).

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Behavior change programs can be effective in encouraging people to use less under some circumstances (Nauges and Wheeler 2017). For example, evidence suggests that provision of comparative usage information to end-users can lead people to change their behavior. Serious gaming is one intervention which can be used for influencing user behavior (Gugerell and Zuidema 2017). We investigated an experimental co-design process to collaboratively design a serious game called the 'EN-Survival Game'. The game was part of the Engineering and Physical Sciences Research Council's (EPSRC) Smarter Household project and was focused on researching into the application of games as a mean to reduce energy demand, meet UK government's carbon dioxide (CO_2) reduction targets and reduce domestic reliance on fossil fuels, offering protection from price risks and fuel poverty as well as providing more affordable and comfortable domestic environments (Shukla et al. 2019; Wood et al. 2019). Low-income households may be limited in the benefits they can reap from such systems because they already living within a tight budget, and suggestions for further energy-related cost savings may be detrimental to their health and well-being. This makes it important that the impact of actions taken to save energy is well communicated. In order to assist those household occupants we have created the 'EN-Survival Game' (Shukla et al. 2019). The purpose of the game was not only to reduce energy consumption, but rather to allow people to optimize their consumption by understanding the relationship between that and indoor environmental conditions, and to give some suggestions as to how energy might be conserved and how to improve their well-being. During the past decade, serious games have grown considerably more popular in their application as educational tools. Commonly cited purposes of these games are (1) to be educational;

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classically employing pedagogies around abstraction, problem-based learning or social learning; and (2) to be fun and engaging, through concepts such as "flow" or self-efficacy theory (Bellotti et al. 2013; Bourgonjon et al. 2010). It has been reported that in comparison to conventional methods, serious games can draw more engagement and user attention to a topic. In our view, there are five elements of a serious game: (1) story, (2) gamification, (3) individual feedback, (4) simulation and (5) the goal to learn (elearningindustry 2017). De Jans et al. (2017) investigated the design of serious games to raise awareness. They reported that serious games are promising tool to raise awareness for two main reasons—motivation and enhancement of player's interest on a selected topic. We have previously (De Jans et al. 2017) highlighted the usefulness of informant design when developing serious games. Influencing the end-user knowledge is one of the main focus of serious games and core of the more pedagogically centered game based learning (Kato et al. 2008; Lieberman 2001). These games can be played by single or multiple users or in group settings. The main aim is to assist the participants in decision making, learning or influencing their attitude/behavior. Khaled and Vasalou (2014) reported that serious games often have more impact or use if the simulations are close to the real life experience of the participants. This can be achieved by collaborative design with the participants where engagement activities with the end-users provide valuable knowledge for the design of serious game.

In the specific area of the environment and energy conservation, an array of similar principles applies to those behind public health issues. In both cases, a need exists to stimulate a change in the immediate behaviors of audiences, which may struggle to perceive the long-term benefits. Games may provide a useful platform for creating the levels of sustained engagement and motivation, and this hypothesis has been explored through a range of projects aimed an energy awareness for households: for example, the Energy Life project (Bjorkskog et al. 2010) focused on the use of pervasive devices for monitoring consumption, forming a game around usage. The Sustainable Public Open Spaces and Participation through Interaction and ICT (ASPIS) project is focusing on the improvement of urban planning and design practices to the benefit of urban sustainability, with emphasis on sustainable public open spaces. Other environmental concerns have been tackled through social media; for example the i-Seed serious game (Petridis et al. 2011) sought to create a game within the Facebook platform to promote positive attitudes toward

the environment (Hendrix et al. 2012). Other approaches have equally embraced mobile platforms and other emerging technologies to reach audiences with an environmental message (Gustafsson et al. 2010).

2 Literature Review

Given that a significant component of the energy consumption challenge is linked directly to end-user behavior, current research on game based learning is increasingly exploring the application of innovative technologies and behavioral messaging techniques (Lameras et al. 2017; Philippe et al. 2020). From a theoretical perspective, techniques are often underpinned by an understanding of challenges around self-efficacy and social cognition (Bandura 1986), in particular the limited ability of the individual to perceive a meaningful contribution to issues such as climate change through their individual actions, and the weak link between stated intention to act and measurable actions. Subsequent interventions have sought to address these challenges by targeting groups rather than individuals (Bedwell et al. 2014), providing extrinsic rewards (Wiersma 1992) or seeking to adjust social norms (Smeaton and Doherty 2013). Evidence shows promising impact when presenting consumption information to end-users (Borner et al. 2012), though success is neither universal nor guaranteed, with group-level intervention shown to have negative effect in a small-scale (n = 16) study (Foster et al. 2014). Other studies have sought to understand this negative effect, with suggestions that "freeriding," conflict or differing social norms, may be explanatory factors (Bedwell et al. 2014). More recent behavioral theories seeking to serve more directly as a design basis for interventions have sought to identify pragmatic considerations in effective behavioral intervention design, either by consolidating known factors though statistical approaches (Grob 1995) or by aligning the theory to the stages of change of a participant (Prochaska and Norcross 2001).

Many of the factors posited by current theory as mediating behavior change, including self-efficacy, social norms, immediacy, engagement and reward, are relevant to game-based interventions. Games are gaining interest as a means of behavioral intervention, due in part to the increased availability of hardware and rising digital literacy among end-users, and their ability to engage end-users, which may serve to aid in translating intention to act to measurable action. Games and play also provide means to abstract problems or behaviors, or communicate concepts in a novel

manner, making them relevant to situations where knowledge has been acquired but is not being translated to action due to issues around self-efficacy, social norms, or translating intent to action. The methodologies used to evaluate game-based intervention in the home energy space are diverse, with limited large-scale empirical data available; studies typically seek to provide design-level input through mixed-method or grounded theory approaches (Foster et al. 2012). Primary design-level evidence suggested by the literature base includes a likely limited impact of points, badges and leaderboards when introduced without an understanding of social context and how participants construct value around rewards (Wiersma 1992); providing asynchronous feedback, avoiding 'push' notifications (Simon et al. 2012); and that challenge may be a stronger motivator than real or virtual incentives (Kalz et al. 2015). In an evaluation of a workplace game for energy consumption, implementing a leaderboard (Tolias et al. 2015), users were observed to cheat, artificially altering their consumption data. On the one hand, this illustrates the risk of relying on technology to ascertain user behavior in a context where the user is motivated to 'game' the system, yet on the other that users were sufficiently engaged and motivated to cheat is a positive observation.

In general, the evidence base surrounding the design of games for behavioral intervention is difficult to consolidate into generalizable findings, as noted by existing meta-reviews (Connolly et al. 2012). In part, as suggested by Connolly et al. (2012), this is due to a paucity of large-scale empirical evaluations, such as randomized control trials. Yet even those that exist typically illustrate a particular game as 'working' for a particular challenge, and given the limited ability to understand causality present in such trials, this evidence is often more useful for the exploitation of a specific intervention than to inform future design. This is further compounded by the nature of the design of persuasive digital games as crossing the space between artistry, psychology and technology, and the associated challenges in reconciling differing perspectives on priorities, expertise and methodologies. Commonalities in methodology include advocating participatory, iterative design (Connolly et al. 2012), yet this is challenging to enact meaningfully in practice due to high cost and time overheads. Furthermore, the general case with behavioral intervention is that a 'one-size-fits-all' approach to a single intervention, which seeks to be taken up and used by the majority of a given demographic is unlikely to succeed (Prochaska and Prochaska 2011). Therefore, evaluation and consideration of user feedback or participatory design input needs to acknowledge the

likelihood that for a significant proportion of end-users, a single intervention is unlikely to be meaningful.

3 System Architecture for the EN-Survival Game

Drawing from the current literature on theory and design of game-based approaches, we adopted a rapid prototyping methodology for the development of the game, with the first iteration, evaluated in this article, being developed in a time span of three months. The prototype drew on several concepts related to the design of serious games, explored by other studies. Firstly, the game sought to provide a compelling narrative, shown to be a key engagement factor in digital games (Marsh et al. 2011). It also sought to use and scaffold analogy as a means to facilitate challenge and problem-solving, without compromising the overall narrative. Similar approaches to analogy within serious game design have shown such ability to allow users to engage with a problem, while understanding its real-world connection (Dunwell et al. 2014). A primary benefit of the use of analogy, rather than simulation, is to the designer in allowing more direct design for 'flow', a balance between challenge and user ability (Csikszentmihályi 1990), which is often not inherently present in a more direct simulation. More concretely in this case, the common household tasks of controlling humidity, room temperature and carbon dioxide levels in an energy-efficient manner were translated to the abstract situation of a survivor in an arctic shelter, where controlling these variables is essential for survival.

The game was developed and deployed to Android and Windows x86 using Unity 5.4.2. A 3D environment, with player control via touch allowing them to move their character by tapping the ground and interact with objects by tapping them directly, as shown in Fig. 1. Once interacted with, camera transition allows the player to directly manipulate a range of environmental controls: a hob, refrigerator, cooker, microwave, thermostat, windows and the overall layout of the environment. Each of these links to an underlying simulation of temperature, humidity and CO_2 levels, informed by target learning outcomes: heating water on the hob rapidly raises humidity, using the conventional oven over the microwave results in a higher energy consumption rate and keeping the windows closed, while helping to preserve room temperature, also results in rising CO_2 and humidity levels. These all pose a risk to the player's health; visualized as shown in Fig. 2. Health is depleted by sub-optimal environmental conditions and replenished by cooking or purifying (boiling) water to drink,

Fig. 1 Gameplay environment. Health (top left) is influenced by temperature, humidity and CO_2 levels. Multi-layered objectives (top-right) relate to both the environmental control and puzzle-solving. Objects can be tapped on to initiate interaction

Fig. 2 Player health. The ideal comfort levels for temperature, humidity and CO_2 are derived from the literature and learning objectives. Eating and drinking (left) replenishes health, but requires the player to expend energy to cook frozen food or purify water

placing a demand on the player to consume energy as efficiently as possible. The failure condition is met with the option to continue immediately with health replenished and a lower final score, or to repeat the game from the start. The goal here is to motivate both casual players seeking to complete the narrative and more engaged gamers seeking to achieve the highest score, measured in total kWh consumed at the end of a play-through, plus any restart penalties.

Another affordance for flow was the incorporation of non-serious puzzles within the environment, derived from common gaming generics: hacking a computer, solving a chess puzzle, accessing a locker code, searching for fuel and finding a lost survivor. In incorporating these, further effort was made to synergize simulation and gameplay. This was done in a non-linear fashion, based on the observed importance of player choice and freedom in game design (Adams 2013). The player is tasked with simultaneously operating control panels to modify environmental parameters (Fig. 3), to keep the environment safe for puzzle-solving under an 'escape room' paradigm.

Fig. 3 Example mini-game puzzle. In this game, the user can rearrange the furniture in the shelter. Actions such as unblocking the radiator and separating heat sources from the refrigerator have benefits to energy consumption

The simulation at the core of the shelter gameplay was designed based on target learning outcomes, informed rather than driven directly by real-world cause and consequence. Total energy use, and energy remaining, is shown to the player on a generator control panel in the shelter, seeking to create a sense of pressure for efficient energy use as levels tick down. An overall play-through of the game was designed to be accomplished in 45 minutes to an hour, with the opportunity to repeat the game for a higher score incorporated but, under pragmatic expectation of user engagement, not designed to be required for learning outcomes to be achieved.

4 Results for the EN-Survival Game

Participants were asked to fill in a survey about their experience of the game. This was completed by 13 of our 17 trial participants. Some participants filled in an additional section which asked for the views of anyone else in the household who had played the game (19 in total). In addition to our 17, 19 trial participants were asked about their views on and experience of the game in the follow-up interview (this was an added bonus because the game was played by other people living in the household).

The first part of the game survey consisted of statements based on the QUIS methodology (Questionnaire for User Interface Satisfaction) (Chin et al. 1988) in order to assess initial reactions, ease of getting started and time taken to learn the game. Responses to these questions tended to be negative, with the eight out of nine statements having a mean response of 4 or below (on a scale of 1 to 9, 9 being the most positive option). Additional exploration into these views was carried out in the interviews.

4.1 Usability

Players were asked in the survey about the furthest point they reached in the game (Fig. 4, $n = 17$). The majority of players (65%) made it to the second stage, where they were solving puzzles inside the shelter. No statistically significant relationship could be seen between the age of the participant and progress in the game, or progress and gender.

It is worth noting that by the point of the follow-up interview, 4–8 weeks later, everyone who had tried that game had at least made it into the shelter (Stage 2 of the game).

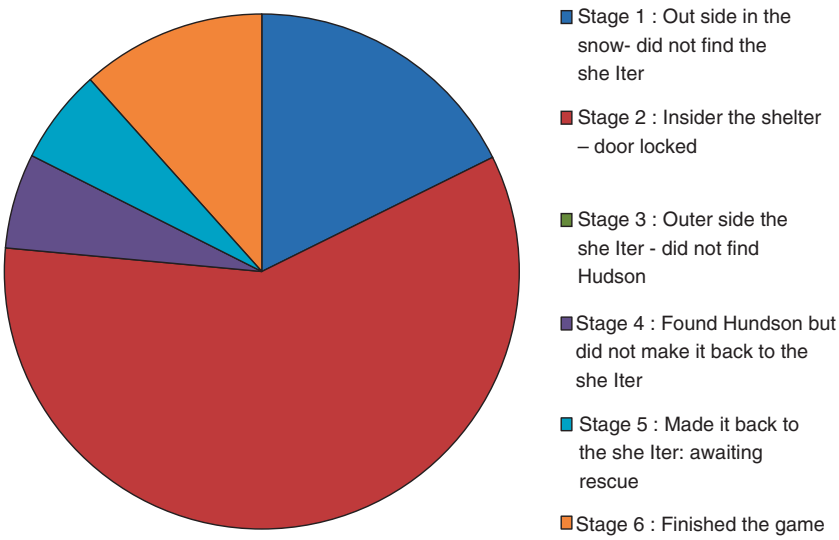

Fig. 4 Progress players made in the game (information captured via survey)

Game play support was provided by means of a walkthrough video and a user guide. The majority of feedback from players related to navigation and controls, with several players noting that their struggle to move around the game environment made the experience frustrating, for example, "I knew what to do, but it's actually doing it. I didn't know how to do it and that's what was the frustrating part" (Darren). This kind of comment was typical of the players, along with limited time available before the character 'dies', and a feeling that "I was juggling so many balls in the air" (Daphne).

11 out of 17 trial participants mentioned that they do not regularly play games or described themselves as 'not a gamer'. This may have contributed to players' difficulty in managing the multiple demands of the game.

4.2 Learning from the Game

Less than positive feedback relating to usability and navigation is not uncommon for a research prototype game, and it was noticeable that feedback on learning was much more positive. Notably, this reported learning from the game took place after most of the players had been using the

Energy Dashboard app for several months, and so the game could be seen to provide additional learning potential on top of the app.

A positive result was that most respondents agreed or strongly agreed with the statements around learning:

I feel more knowledgeable about CO_2 after playing the game (58% agree or strongly agree).
I feel more knowledgeable about humidity after playing the game (58% agree or strongly agree).

Around 50% of players also agreed or strongly agreed with the statement 'Playing the game has made me more aware of things I can do to save energy or make my indoor environment healthier/more comfortable'. Positive learnings were noted around the arrangement of furniture and appliances (for circulation of heat and not compromising ability of refrigerators to cool food), and the impact of opening windows on the indoor environment.

However, the implication of usability difficulties is that those who made limited progression in the game would not have as great a chance to learn as those who reached the final stages of the game or completed it.

In some cases, the learning reported by participants from the Energy Dashboard app, the Energy Game, or simply taking part in the trial, carried forward to affect their everyday behaviors in terms of energy use or indoor environmental conditions. The most reported behavioral change at the second interview was to laundry activities (washing or drying clothes), mentioned by 57% of trial participants. In most cases this was either reducing the number of washing loads carried out in a week or using the tumble dryer less. These behavioral changes were attributed by the participants to reading the hints and tips on the Energy Dashboard, seeing peaks in electricity usage on the app when doing laundry, or general trial participation. For example, Kay said:

> I do actually think about what is in the machine. I went to put it on Saturday night, and I said to myself no, that can wait until another night, which I did. So yes, I do think I'll put it on tonight but when I see how much actually is in there, I think it can go on another day. So that has made me think as well.

The other key change made by participants was around ventilation of the property. Around 43% of trial participants mentioned a change in

'airing' or window-opening behaviors, for example that described by Becky: "[B]efore I probably wouldn't have even cared, I wouldn't have even thought about it. Especially like I said about cooking and opening the windows, or just opening the windows when I had washing and stuff in here. I just wouldn't have been bothered probably before."

In a few cases this change was specifically attributed to learning from the game. Kate noted that "that comes down to the game more than the app … I suppose I did know that if you open the window it reduces the humidity, but the CO_2 thing I didn't realize existed really, or had an effect on an environment." Another participant reported that after playing the game they started opening a window in the lounge. This was a property that suffered from mold issues and where ventilation had not previously been regularly carried out, so this was a positive impact. The release of the game was the final activity of the trial, and therefore, it is likely that some participants had already learned about how to maintain healthy indoor environmental conditions and manage energy efficiently from the app and other earlier trial activities. However, it is still a positive outcome that some participants made changes to their routines following playing the game. Around 58% of survey respondents agreed that they were able to connect the game activities to their real-life energy use and/or managing the indoor environment in their home, demonstrating that despite the extreme environment in which the game was set, most players could still make a connection between it and their everyday lives.

Some participants reported difficulties in actually applying what they had learned from the app or the game. In several cases, this was due to long-term health conditions, or disagreements with other family members:

Daphne: "[Q]uite often I would come down, I'd say, 'Have you seen this? It's going in the red, and what do we do?' I said, 'Open the window.' He said, 'It's too damned cold to open the window.' So, sometimes, it's been a battle. Not from the project, but trying to do things to see how it would affect the pointer." This is to be expected in multi-occupant properties, where changes in behaviors that affect all residents must be negotiated.

The game shows clear potential for making it clearer to the trial participants how to apply what they learned through the Energy Dashboard app. The Hints and Tips function of the app made behavioral changes (like those made to laundry habits) clear, but the app did not make it clear how

to make the indoor environment healthier. This was the key role of the game: demonstrating how to use ventilation to manage carbon dioxide and relative humidity levels. Learning findings from this small trial of the game and the app were positive. Usability issues are likely to have hindered some people's learning from the game, as most participants did not reach the later stages.

Due to the game being tested after the app had already been provided, it is possible that changes to behavior had already been enacted by the time the game was trialed. Going forward, it could be useful to test both the app and the game in a large-scale randomized controlled trial. However, it is positive that 58% of participants felt more knowledgeable about carbon dioxide and humidity after playing the game. This demonstrates the potential role of a serious game about energy to embed learning and impart further information about aspects that had been less well understood previously in the trial (in this case, indoor environmental conditions and actions that can be taken in the home environment to rectify unhealthy situations). However, the reality of everyday living in multi-occupant homes is that changes cannot always be made when these impact upon the comfort of others. To tackle this, more research is needed into how to get whole households involved and invested in these kinds of trials.

5 Conclusions and Future Work

Serious games offer a range of benefits such as making users feel responsible for success according to their actions, match high-quality content and high engagement, turn mistakes into learning elements avoiding the message that an error is something that cannot be recovered, allow problem based learning, situated learning and make users feel more comfortable with the exercise. SGs offer the ability to participants to assume an active role in a situated and experiential learning process that potentially can alter their behavior. It is also widely accepted that educational games can increase the attractiveness of learning, giving a powerful tool in the effort against de-motivation and dropouts, two issues largely affecting academic performance and behavior. Moreover, serious games may help to connect specific contents and skills in a friendly, error-free environment, where the student or the user is able to play, probe, make mistakes and learn. In the case of Smarter Household serious game, the evidence that we have collected demonstrated that the residents made the connections

between the game and the real life. However, in order to verify that statement we need to evaluate the game using a larger sample.

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Open Strategizing and Gamified Organizing: A Bulletin Board View

Mikko Vesa and Mikaela Krohn

1 Introduction

As sustainability has become a strategic issue for businesses, organizations have come to face the fact that sustainability requires change and the commitment of different stakeholder groups (De Matos & Clegg, 2013). However, being a complex issue that changes the way in which questions regarding ethical, cultural, political and legal issues (to name but a few) are perceived by the organization (Stead & Stead, 2014), organizational sustainability efforts may be confronted with difficult change resistance and conflicting perspectives (Michel, Todnem By, & Burnes, 2013). Thus, corporate sustainability efforts require strategic practices that reinforce the change and stakeholder commitment (Thakhathi, le Roux & Davis, 2019). One way of doing this has been to turn to open technological platforms, "public arenas of citizenship" (Whelan, Moon & Grant, 2013) that allow

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for multiple voices and opinions to be raised (Castelló, Morsing & Schultz, 2013). These platforms respond to the expectation of openness that prevails in the post-bureaucratic ethos of our society (Tkacz, 2012), where legitimacy for organizational sustainability efforts is gained by engaging with the stakeholders in a non-hierarchical manner in an effort to co-construct the sustainability agendas (Castelló, Etter & Årup Nielsen, 2016). We argue that corporate sustainability efforts on open platforms can benefit from understanding gamified organizing as an open strategy practice.

In this chapter, we build, even if in a simplified and adapted form, on the philosophy of social practices developed by Raimo Tuomela (2002, 2007). Central to Tuomela's notion of social practice is the idea of collective commitment which has three dominant forms: a we-mode, a pro-group mode and an I-mode. At the heart of these is the insight that groups of people collaborating to create an organization will have different expectations of reciprocity. Organizations in order to persist as social practice will eventually develop one dominant type of collective commitment. This, in turn, will influence how the organization can be managed through strategic practices. Engaging with different stakeholders on open platforms is a type of strategy work known as open strategizing (Whittington, Cailluet, & Yakis-Douglas, 2011). Open strategizing builds on the dimensions of transparency and inclusion, where transparency refers to the availability and visibility of strategic information to new, larger groups of stakeholders and inclusion refers to allowing more stakeholders to take part in strategic discussions (Hautz, Seidl, and Whittington, 2017). However, as corporate sustainability efforts on open platforms face polyphony (Castelló, Morsing & Schultz, 2013) the question of control becomes salient (Castelló, Etter & Årup Nielsen, 2016). In these types of circumstances, gamification has become a powerful tool for tackling organizing and control.

Gamification has been defined as *the use of game design elements in non-game contexts* (Deterding et al., 2011) or as *a process of enhancing a service with affordances for gameful experiences in order to support user's overall value creation* (Huotari & Hamari, 2012). We start from them, but go somewhat beyond these definitions, noting that gamification can more broadly be understood as a recontextualization of practices between the social spheres of work and gameplay (Vesa et al., 2017). Thus, this chapter examines practices of gamified participation rather than the more studied question of practices of gamification design (for the latter, see, e.g.

Deterding, 2015). We hold that not all gamification is design or designed, rather gamification is also an emergent phenomenon in and across social practice in our ludic times. There is a strong and pervasive force at work in society now in the twenty-first century driving a wider ludic turn (Deterding, 2014), and what fascinates us is this liquification of the boundary that formerly boxed play and games into a separate sphere of social life.

It is this very same force that is driving the emergence of post-bureaucratic organizing. Post-bureaucratic organizing rejects the top-down, rule-based ethos of bureaucratic organizing and creates a "space where spontaneity, initiative, involvement, enthusiasm and pragmatic decision-making converge" (Iedema, 2003, p. 3). While the Weberian bureaucracy achieved great efficiency by clearly defining accountability and boundaries, and by building on rationality and depersonalization in a hierarchical structure (Kalberg, 1980), post-bureaucracy builds on trust networks, interpersonal dynamics and spontaneous group association as the primary logic for organizing (Iedema, 2003). Increased use of information technology is typically an enabler for post-bureaucratic organizing (Meijer, 2008) and a driver for the increased openness expectation in the society (Whittington, Cailluet, & Yakis-Douglas, 2011), which also informs transparency and inclusion in corporate sustainability efforts (Castelló, Etter & Årup Nielsen, 2016).

We draw these diverse elements together by adapting the notion of the bulletin board view of organization from the theory of social practice (Tuomela, 2005). The bulletin board itself is a metaphor for a transparent, propositional medium open for all groups within an organization; not unlike the discussion boards, chats and VOIP solutions used by MMO in-game organizations. It is post-bureaucratic because it does not assume coercive arrangements such as work contracts for defining accountability. It is open strategizing, because it renders the process of what to do next and how to become transparent and participative for all. However, it also gamifies strategizing by rendering all action proposals into mini-games to be played in order to maintain an organization's ethos; which is the source of cohesion and collaboration that allows the organization to act as a conduit for sustained social practice. It is the foundation, on which co-construction of sustainability agendas can build and navigate amongst conflicting stakeholder perspectives. In this chapter, we examine massive multiplayer online game raid guilds in World of Warcraft to show how collective commitment can be managed as an open strategizing practice.

This chapter contributes to research on organizational gamification (see, e.g. Vesa & Harviainen, 2019). First, under forms of gamified organizing (such as MMO raid guilds) we show how strategy formation and implementation are both constrained and enabled by the organizational ethos and the different organizational sub-group collective commitments. Effectively, these define the basic structure of intentions and reciprocity to which all strategizing must adhere, and deviations from these would result in substantial organizational disruptions. Yet each form of collective commitment does so differently. Secondly, this chapter contributes to our understanding of practices of gamified participation. We propose that the notion of the bulletin board (e.g. a discussion forum or chat channel) can be seen as a transparent and collaborative practice of open strategizing, highly relevant also as a conduit for corporate sustainability efforts. In this view, strategizing operates through a bulletin board onto which strategic action proposals as mini-games are posted, evaluated, and then collectively implemented by an organization's constituent sub-groups. Tuomela's notion of the bulletin board view of organizations (2007: 88-92) are in this chapter construed as consisting of organizational ethos, collective commitment and the practice of the bulletin board. Finally, this chapter contributes to the studies of open strategizing in post-bureaucratic organizations.

2 Collective Commitment, Organizational Ethos and Intentionality

The theory of sociality (Tuomela, 2002) stipulates that the foundation for groups' decisions to work together rests on how they relate to the organizational ethos. The organizational ethos broadly defines the content aspects of an organization's identity such as central goals, beliefs and standards (Tuomela 2007:16); for example, if it is a competitive or a casual raid guild, it looks at how loot is allocated, and which kinds of membership rules it runs. The theory identifies three distinct forms of committing to this ethos: the we-mode, the pro-group mode and the I-mode. In the we-mode, the group and its individual members are collectively committed to accomplishing the organization's ethos and assume that the same is true for all the other groups that make up the organization. In a pro-group mode, the group and its members are individually committed to the organization's ethos, but do not require or assume this to be true for

others that also belong to the organization. Finally, in a pure I-mode a group and its members are opportunistically interested in working towards specific goals that opportunistically happen to align with the organization's ethos, without any specific commitment to the ethos in question or intention to act reciprocally. Following this reasoning, the different forms of collective commitment of groups to the organizational ethos has consequences for both strategy formation and implementation.

Collective action and collaboration emerge as a result of voluntary commitment to the next step in the organizations chain of actions, but this commitment is (potentially) re-evaluated after each step. Group commitment can change as a result of changes in either the organization's ethos or the external environment. This leads to an understanding of strategizing practice as ongoing processes that form out of the dynamics of group commitment. Hence, strategy formation is not simply a matter of managers assigning goals ex officio; rather, it is the result of management mediating between complex group dynamics. Organizations change over time as groups with weaker I-mode commitment to the organizational ethos cease to see participation in the organization as meaningful, while at the same time introducing the possibility of including entirely new groups to the organization. Collective commitment thus both constrains and enables managerial agency with regard to the design and implementation of strategy. Each action, that is, the next mini-game, needs to be presented on the organizational bulletin board and create sufficient collective commitment to be implementable, with extra consideration being required to maintain the organization across several mini-games. The core concepts of the theory of sociality as applied in this chapter are presented in Table 1.

3 Data and Methods

This study is based on a virtual ethnographic study (Boellstorff et al., 2012) of the genre- defining massive multiplayer computer game World of Warcraft (see, e.g. Nardi, 2010; Bainbridge, 2010 for more on World of Warcraft). During 39 months, a total of 1230 hours of participant observation research was conducted across five different World of Warcraft raid guilds. The mixture of guilds includes both what are known as "casual" raid guilds who focus on friendly, relaxed playing as well as "hard-core" raid guilds that prioritize competitive progress. In these guilds, the first author held various positions from trialist to a guild officer. This allowed us to gather participant observation data from different points of view as

Table 1 Application and definitions from the theory of sociality

Concept domain	*Organizational ethos*		
Organization	Defines the content of the organizations sphere of interest in the shape of central goals, beliefs and standards. It can be either explicit or implicit; but all constituent groups must be aware of it for collective commitment to be possible.		
	Different types of collective commitment		
Groups (as in organizational sub-groups)	*We-Mode* Joint action with other groups with full expectation of reciprocity. Results in intentions to act through a condition of collectivism. Motto: One for all, all for one.	*Pro-group- mode* Joint action with other groups with no expectation of reciprocity. Results in intentions to act though a condition of conscientiousness. Motto: Divide and rule.	*I-mode* Opportunistic action with other groups, no expectation of reciprocity. Results in intentions to act through a condition of competition. Motto: Each man to his own.
	If dominant, results in strategy formation and implementation that is		
Strategizing practice	stable and efficient with regard to fulfilling ethos-driven action, but static and hard to change organizational ethos. Management unable to propose action that would change the ethos.	semi-stable but efficient implementation of action but groups commitment mainly to the ethos and not to the other groups in the organization. Organizational ethos can be changed by playing groups against each other.	unstable but highly dynamic; uneven capacity to implement action. Opportunistic groups exiting the organization once group needs are fulfilled. Ethos constantly changing to reflect current conditions.

well as to personally experience the different roles assigned to organizational members (Evered & Louis, 1981). While in accordance with the principles of ethnography participant observation was the primary data source (Van Maanen, 1979), secondary data was collected in many forms: (1) internal archival material such as internet discussion forum back-ups, (2) video-taped semi-structured interviews with key informants, (3) qualitative online questionnaires and (4) public media texts from sources such fan sites, game industry magazines and official Blizzard Entertainment press releases.

The initial analytical process was guided by ethnographic foreshadowing (Hammersley & Atkinson, 2007:21-24). Early analysis produced technically detailed, bird's-eye categorizations of organizational activity. As the iteration of fieldwork and data progressed, initial comparative sampling developed into theoretical sampling combining field data, emergent analytical themes and current themes of organization theory (Corbin & Strauss, 2008). Findings were throughout iterated with field informants in order to ensure their first-order validity (Van Maanen, 1979), but the final analysis was developed independently by the first author.

4 Analysis: Forms of Collective Commitment

Empirically, different forms of collective commitment become visible in the individual intentions of players acting as parts of groups, resulting in joint action to achieve organizational goals. It is both assumed in the theory of sociality but also empirically evident that on the level of groups there is sufficient homogeneity for sharing one form of collective commitment. This homogeneity is based on the way a common group-level understanding facilitates a sufficiently shared interpretation of the organizational ethos.

Code Excerpt 1: We-Mode Collective Commitment

> "I personally consider the guild as a family where you do what you can to help other members in the guild, as for instance, helping them farm resources they cannot get on their own. The big carrot here is the raids, where you go with your friendly guild, you take down the meanest bosses, the worst nightmares together and yeah... you don't give up. You analyze what you did wrong, or could do better and then you improve. So, the purpose of good, stable raid organizations is solidarity, cooperation and communication."

This excerpt shows how the individual intents of this player contribute to collective commitment in the We-mode. The organizational ethos, taking down the meanest of bosses and not giving up, is made actionable, and the resulting action is accomplished with the collective intent of satisfying the needs of all the constituent member groups of the organization. This means acting under conditions of full reciprocity both inside one's own

in- group as well as towards other groups within the organization. Such a strong collective stance results in strategizing practices that are often strong and static, defined by an internal ethos of jointly working to accomplishing organizational goals. The organization is, in effect, defined by strong collectivism with personal goals subsumed by reciprocal group goals where every member has agency in the organizational life of other members; directly in the case of members of one's own group and indirectly where such agency is the result of intra-group co-operation.

We-mode commitment stemming from collective intent is but one possible case. When examining the intentions behind pro-group commitment, we find individual intentionality directed towards reciprocity with one's own in-group, but disinterest and occasionally even opportunism with regard to the rest of the organization. Hence, within the in-group there is strong commitment to act as one group. Yet, this does not extend to other groups within the organization. In the pro-group mode, there is co-operation between groups but this co-operation is utilitarian based on a recognition that for the in-group to achieve its goals other groups should also be involved. In such situations, groups appear to resist meddling in their internal affairs, which is natural because inside the in-group different rules apply compared to the out-groups.

Yet, raid guilds operating in a pro-group mode appear to be professional and efficient, which might stem from the utilitarian and technocratic relationships between different groups that make up the organization. The goal-setting activity of each group is ultimately a matter left to each group on their own. This form of collective commitment is based on intentions that are conscientious to their nature. Of essence, here is how in-group members maintain high performance with regard to other in-group members, but assuming that no such reciprocity necessarily exists with and between other constituent groups. Commitment to the organizational ethos is based on groups' commitment to fulfil the ethos based on their own assessment on action proposals, but not on a sense of reciprocity. Collective commitment in the pro-group mode does not require that the long-term interpretation of the organizational ethos to be similar across all organizational groups. The following excerpt displays how such conscientious individual intentions become operational. The player mainly sees himself as one of the rogue group and his duty is mainly in being a conscientious member of the rogue group through technical excellence.

Code Excerpt 2: Pro-group Commitment

> "I play a rogue that is purely dps-oriented class. As a result, I try to keep myself up to date on the game mechanics that are relevant for my role and try to play in a way that allows me to do optimal damage during raids. To help this, I employ spreadsheets that allow me to input my theoretical dps. I am also trying to program a python script that would allow me to simulate rogue damage dealing in a numerical fashion. I do this mostly out of concern for how accurate my current knowledge of rogue mechanics is."

However, while conscientiousness often directs an individual to act in-group centrically, like the rogue class in the above excerpt, it is interesting to observe that such intentionality is surprisingly often expressed in terms of competitiveness or task excellence. In these situations, activity at the level of the organization is built on no assumption of reciprocity, but rather on an organization-wide acceptance that interpretation of the organizational ethos is at the level of the group. This, however, should not be interpreted as an inability to organize or with such groups being asocial. Rather, the pro-group organization is assumed to exist to satisfy the relatively opportunistic needs of its constituent groups acting jointly for individual reasons but with a clear recognition of the imperative need to collaborate.

Code Excerpt 3: I-Mode Commitment

> "The primary purpose of raid organizations is to give more people the chance of working together to defeat large targets, and in that way be rewarded in two ways; one as your organization gets better at fighting together and the other to get the best items that you can in-game."

Finally, in organizations characterized by I-mode collective commitment, the organizational ethos is something that a given player has personal relationship to. That is to say, members are not committed to their group or to their organization, but they follow the organization's ethos purely out of personal, even selfish purposes. This has implications for how such an organization can collaborate, but the I-mode collective commitment is still a form of collective commitment. It simply assumes away permanence from the organization by accepting that the organization functions as an "each man for his own"- collaborative effort. In World of Warcraft terms, it is as if the raid guild was a pick-up group with some form of temporal endurance.

5 Strategizing Under Different Forms of Collective Commitment

The implications for organizational strategizing of different forms of collective commitment that emerged from the five raid guilds studied can be grouped into three distinct models, drawn alternatively on: we-mode, pro-group mode or I-mode collective commitment (see Fig. 1). These are ideal types of strategizing distilled for theoretical purposes. In empirical settings, it is sufficient to think of one form of collective commitment as being dominant in an organization for understanding its impact on strategizing.

These models view organizational strategizing as simultaneously consisting both within-group collaboration and across-group collaboration. In Fig. 1, these are respectively represented as the smaller inner circles which depict within-group strategizing, and the larger outer circles which depict across-group strategizing. Though the model recognizes organizations as built from the actions of individuals, this aggregation is not simply a summation. Rather, individual intentions give rise to different forms of collective commitment with unique group and organizational qualities that form group and organization level emergent properties. The model

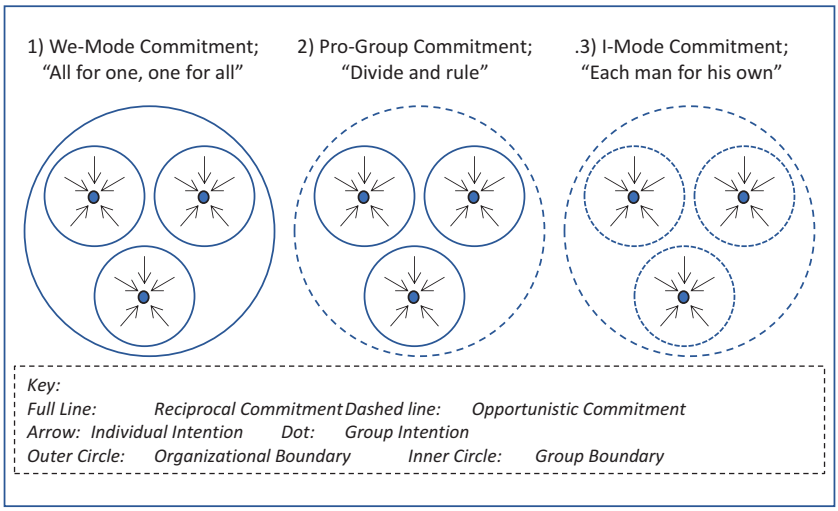

Fig. 1 Strategizing under different forms of collective commitment

recognizes this group and organization level collective commitment as the key driver(s) of strategizing. By intending to work together with others, we enter a complex social collaboration which entails uncertainty. This acting as a group has its own unique characteristics, in particular with regard to the level of reciprocity and opportunism that we as groups, while acting together, exhibit towards other groups and members of our own group.

In the model that we presented, it is assumed that the core operational unit of organizations is the group. This is an intermediate-level construct inside an organization, such as a working team or a group defined by similar tasks, skills or competencies. For instance, in a raid guild, such identities can be class (e.g. a warrior) or an organizational function (e.g. a loot master). The reason for lifting up the group as a central concept of strategizing the analysis indicates different forms of behaviour in how players relate to their own in-groups and the organization at large with the organization-at-large seen as consisting of other groups, to which the player does not belong. This is to say, we relate primarily to our own in-groups and our relationship with the organization is always mediated by our in-group membership.

Regardless of the types of collective commitment, action proposals are always evaluated within the in-group(s). Strategizing builds on how groups intentionally relate to reciprocity and opportunism. These intentions are two-way constructs; hence, they contain both an assumption of how a given group behaves towards other groups, and how this group expects other groups to behave towards it. These intentions are separate with regard to two social formations: firstly, the core group to which a member belongs and secondly the overall organization. Under we-mode commitment, the overall intention in all social relations is reciprocity, both within the in-group and with out-groups. Under pro-group commitment, reciprocity is applied to other members of one's own in-group while it is assumed that opportunism defines the intra-group relationships as well as the overall ethos of the organization. Under I-mode commitment, all social relations regardless of group type are assumed to be guided by opportunism. We will next empirically highlight the different elements of Fig. 1.

All of these individual intentions and forms of collective commitments have implications for strategizing. The more an organization is based on acting through we-mode collective commitment, the more persistence it will have. The reciprocity criterion creates a stronger sense of shared

identity and ethos where personal and group level goals are deferred or subsumed into wider organizational goals. This essentially entails that each member and group will eventually have their needs fulfilled through the collaboration. However, under conditions of we-mode commitment, the organization is also liable to become rather static as all forms of strategic change must be collectively accepted by the entire organization and be in accord with the organizational ethos. Such organizations offer relatively limited managerial agency especially with regard to change, because management is effectively inhibited by the strong sense of reciprocity collectively expected within the group. In contrast, by focusing members' attention more on their own respective in-group conscientious intentionality renders the pro-group collective commitment type of organization more open for managerial decision making. The way the organizational ethos is communicated into action is less subject to organization-wide reciprocity, and the constituent sub-groups of the organization are less interested in how the action treats other groups. This opens the door for management to make action propositions that they know would favour an outcome that is liable to appeal to some groups more than others, allowing for a "divide-and-rule" kind of interpreting act of the organizational ethos. When examining the I-mode, the organization ceases to be defined by any aggregate level interpretation of the organizational ethos. Rather, it is an opportunistic coalition of individuals searching to satisfy their needs with others who accept this opportunism and who themselves act in the same manner. While this in theory allows for more managerial agency, organizations acting under I-mode commitment require extensive managerial attention to the ongoing daily operations as the lack of any permanent boundaries results in large volatility of both organizational structure and operative practice.

6 Discussion: Open Strategizing and the Bulletin Board View of Organizations

Conceptualizing organizations through the forms of collective commitment proposed in the previous sections implies a distinct perspective on organizations. It is essentially an organization where group-based intentions blend together into an irreducible collective commitment. This collective commitment both enable and constrain the scope for strategy practices. Such strategic practices are lucrative for corporate sustainability

efforts, for example, for engaging the stakeholders into co-construction of sustainability agendas (Castelló, Etter & Årup Nielsen, 2016). It should be noted here that management and even strategic leadership in this view should not be seen as limited to the formal managers in organizations, such as the raid guild's officers. Rather, it is implied in a broad sense, including anyone within the organization with the power to enter action proposals onto the organizational bulletin board. The same is true for leadership in strategic sustainability practices in organizations (Thakhathi, le Roux & Davis, 2019).

In the bulletin board view of organizations, organizations are seen as dynamic flows of action proposals under different stages of completion. Such action proposals are ways of making the organizational ethos actionable. In this sense, the organizational ethos is the main cultural artefact of the organization: if the organization is "anything" it is its ethos, which in turn is a sedimentation of historical practices, narratives, identities and events. However, the organizational ethos stands in a reflexive relationship to strategizing. While action proposals must draw on the organizational ethos, over time the action proposals, through their role of being the everyday action guidelines of the organization, will reflect back on their constitutive cultural artefact. The actual strategizing practices of raid guilds can come in many shapes. Typically, in World of Warcraft raid guilds, it is done by groups of officers that hold different administrative positions in their respective raid organizations, but it can also arise from "shop-floor" management, for example, class and function representatives. Attributes like experience, seniority and in-game playing skill, can be mobilized as sources for power in putting forward action proposals. The view of managerial agency here recognizes that it is unevenly distributed within the organization, but also that formal position is but one source of authority among others. The organizing structure of the bulletin board view of an organization is illustrated in Fig. 2.

The nature of the action proposals themselves is public. In essence, this explains the metaphorical name of this view of organization; think of organizations as big, public bulletin boards where action proposals are posted for all those who hold a stake in accomplishing the proposed action to read. Hence, the relationship formed with the organization comes through a relationship formed with the proposed action. How the action is evaluated depends on the form of collective commitment(s) within the organization. In we-mode commitment, the evaluation is based on its overall utility for the whole organization and its ethos based on criteria of reciprocity. Under

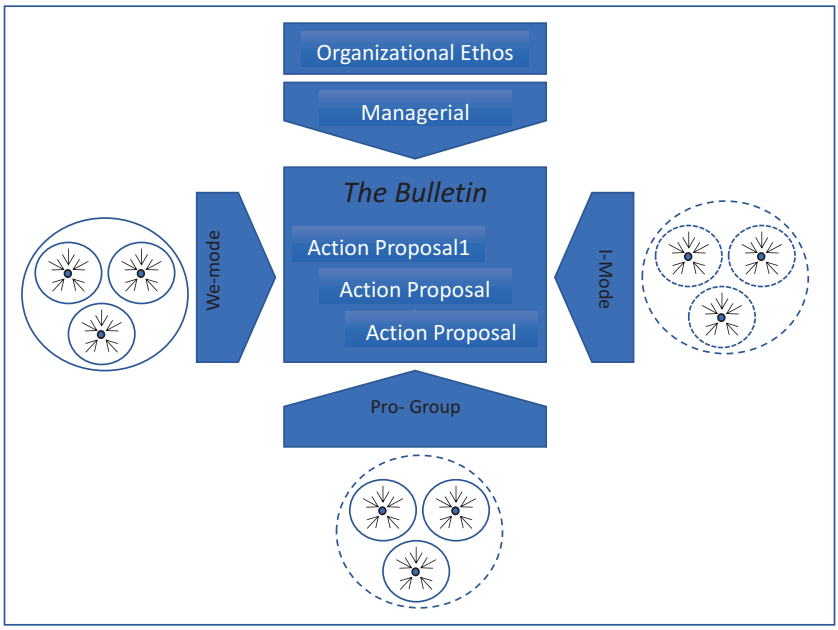

Fig. 2 The bulletin board view of organizations

pro-group commitment, each constituent member group evaluates the action proposal with regard to their own interpretation of the organizational ethos and the group's own utility. Based on this interpretation, reciprocity is extended to other members of the group, but not to other groups within the organization. Finally, under I-mode commitment, every action proposal is evaluated individually. The organizational ethos is seen as an umbrella from which the action is drawn, and every member relates to such action proposal based on their opportunistic interpretation of how the said proposal accords with their own intention. This is, however, still a form of collective commitment in the sense that the organization is collectively committed to pursuing its ethos under the conditions of opportunism. It is also possible for multiple forms of collective commitment to exist for a while within a given organization. In particular, the formation of we-mode commitment requires time and affinity as well as the gradual generation of collective trust that gives credence to reciprocity. Similarly, new members and groups will often initially have an I-mode commitment to an organization before undergoing deeper socialization.

7 The Bulletin Board View and the World of Post-bureaucratic Organizing

The ideal of post-bureaucratic organizing favours the participation and empowerment of employees (or equivalent members of the organization) in organizational decision-making but struggles largely with issues of control and managerial practices (Kärreman & Alvesson, 2004). Studies on post-bureaucratic organizing and open strategizing have found that the processes of organizational participation are often directed by tools that allow managers to decide, on what topics and to what extent the participation is enabled (Dobusch, Dobusch, & Müller-Seitz, 2019). While these tools can be criticized for constraining a truly open participation, they serve a purpose by channelling collectively made decisions within the (strategy) processes of the organization (Lusiani & Langley, 2013), and have thus served stakeholder engagement with corporate sustainability efforts. Therefore, the bulletin board view and the three models of collective commitment, on the one hand, offer a way to understand how such tools are affected by different social dimensions in post-bureaucratic organizing. On the other hand, the bulletin board view can be used to understand what defines organizational boundaries in the more fluid post-bureaucratic organizing. As proposed by Marvelias: "[It is] less important whether or not individuals and activities are properly inside or outside the orbit of the formal organization. What matters is instead individuals' abilities to activate the energy, the cultural glue and competence inherent in communities, and to align these "resources" with the goals and visions of the organization" (2003: 549-550; see also Sydow & Helfen, 2020).

Since, the ideal of post-bureaucratic organizing has been argued to be precisely that—an ideal that does not fully exist in reality, it can be questioned whether the bulletin board view of organizing is applicable outside the realm of MMO games. We argue that the three models of collective commitment can be seen in the context of contemporary work. For example, the we-mode commitment characterizes social control in knowledge intensive work organizations, where deviation from the group's and organization's norm may result in shaming or exclusion from the collective (Alvesson & Kärreman, 2004). Secondly, the pro-group mode characterizes the market logic used in contracting services within larger organizations, for example in New Public Management (Iedema, 2003). Thirdly, we argue that platforms that provide gig-based jobs for the users, draw on the I-mode commitment but use it as a managerial logic to create

competition between user. Thus, there a coercive power is maintained within the platform and the freedom to choose becomes a self-enforced control mechanism (Maravelias, 2003).

One specific condition pertains to when a bulletin board view of organization can truly come into effect. It requires a strong condition of voluntary membership. Essentially, unless members are free to choose their commitment to a particular action, it cannot be held that their interpretation of action proposals is based on collective commitment; rather it is based on different forms of coercive power exercised typically by management, for example, in the form of binding work contracts. In reverse, the main condition inhibiting managerial agency in this setting is the explicit lack of coercive power. Hence, managerial agency is exercised through propositional power which draws on the organizational ethos and the organization's collective commitment to seeing it accomplished. It is power based on the organizing action which is based on the ethos, rather than power based on disciplining the ethos into force.

8 Conclusions

Gamification is a social practice of organizing in post-bureaucratic organizing. It is not only something purposefully designed, rather, in a gameful world, it is something that also emerges in the daily practice of organizing. In such post-bureaucratic organizing, the fundamental social force is that of group-level collective commitment. Studying organizations within MMO Games allows us to see this emerging behaviour more clearly; as such, they can be used as prototypes or laboratories of what we think is a wider gamified turn in organizing. We can already witness this turn in organizing, for example, crowdsourcing. Understanding the different forms and implications of collective commitment will also facilitate the development of strategizing, in particular open strategizing for sustainability efforts within and across organizations.

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PART III

Environmental Lens

Gamified Emissions Through the Wisdom of Crowds

Ronald Dyer

1 Introduction

In this chapter, we discuss gamification as a potential artifact for increasing carbon emission awareness and participation through the wisdom of crowds. While there is much buzz around climate change and its effect, there remains much divide over how to treat it as well as on improving requisite behaviors at both organizational and individual levels to sustain a reduction in our global footprints. The issue of climate change is not new, spanning across ecological, social and economic systems. To many it is a far-reaching issue for both the present environment and the prosperity of future generations. Scientists predict 10–15 years in which to seriously address changes in lifestyle and policies to avoid further danger (Rajanen & Rajanen, 2019). Moreover, despite the adverse effects of climate change becoming clear, with detailed scientific understanding of the impact of anthropogenic changes and growing awareness of the need for widespread

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adoption of novel solution the knowledge gap remains (Flood, Cradock-Henry, Blackett, & Edwards, 2018).

Games represent an opportunity to enhance learning, practice and behavioral change through the utilization of technologies such as serious games, simulation/Artificial Intelligence (AI), augmented reality (AR), virtual reality (VR) and gamification. Games for good or with a purpose are becoming more widely used to support education awareness and service delivery across several sectors. They are also becoming widely utilized in climate change research with a significant uptake (Reckien & Eisenack, 2013). The objectives of these games are characterized as follows: (1) teaching knowledge and providing familiarity with issues associated with climate change and (2) making players aware of the challenges associated with global warming and encourage players to develop solutions (Reckien & Eisenack, 2013). Furthermore, they act as a safe space for learning and innovation to actively engage with alternative futures, build capacity, find solutions to difficult issues and socialize adaptation with various publics. Johnson, Rice, and Geels (2011) identified some common characteristics within the game ecosystem for climate adaptation, awareness and improvement (Flood et al., 2018) as follows:

1. Capturing complexity regarding decisions, risk and management
2. Challenging disbelief through understanding values and norms toward behavioral change
3. Facilitation and communication emphasizing co-learning, empowerment and personal responsibility
4. Reflexive learning to allow for challenging decision-making practices
5. Negotiation and conflict resolution for integration of different knowledge domains
6. Autonomous learning harnessing social learning and update metal models

These characteristics form the premise for not only increased awareness and education but also the co-creation of solutions that embeds local knowledge more accurately reflecting the realities that participants face. They also build a strong sense of ownership of the issues encountered. It is within this lens that the author explores the potential role of gamification as a tool to support climate change education specifically focused on the power of crowds. However, prior to any discussion on gamification's role an understanding of the realities of organizational and human impact on the climate ecosystem needs discussion.

2 Epistemic Realities of Climate Change

To understand the realities of climate change today we need to understand the significant impact climate change is having on our daily lives. From increased/decreased rainfall, forest fires, heatwaves and flooding to subtle shifts of rising water levels in cities like Miami, Venice, Jakarta and Houston (Talia Lakritz, 2019) all contribute to impact. There is an imminent danger lurking in the background of the ecological damage being done to the planet because of the significant advances of industrialization. Moreover, the current impact represents a high degree of disenfranchisement as it relates to the disproportionate impact in developed versus developing world countries. According to Akhtar, Simonovic, Wibe, and MacGee (2019) consensus on climate change remains ongoing with extremely adverse impacts expected and countries requiring models that can assist in analysis of the extent of impact of climate change so as to develop adaptation strategies. Hamilton, Wake, Hartter, Safford, and Puchlopek (2016) indicated that by late 2015 human activity had already raised atmospheric carbon dioxide CO_2 concentrations past 400 parts per million, levels unseen for millions of years. Furthermore, barring significant reduction in fossil utilization, deforestation and other approaches expect levels to double within the first half of the twenty-first century.

The adverse effects of greenhouse gases causing flooding, droughts, wildfires and increased insect pest are becoming a normal trend as the world grapples with the phenomena of climate change. With the USA and China as the largest contributors, respectively, they play a key role not only in reduction of their own emissions but also from a policy perspective within the global environment. One of the challenges is the issue of evidence with scientific proof still apparently experiencing difficulties getting through/past the intense debates on either side of the CO_2 dilemma. The debates are fragmented into post-political framing (Hamilton et al., 2016) accused of not addressing the economic and political forces, heavily technical or behavioral in their solutions or overtly political and thus more likely to downplay the biophysics of modern industrial society. Either way the divide perpetuates a focus more on right/wrong than addressing the ever-increasing evidence that something is awry with the planet and requiring urgent addressing to stymie its already excessive impact. Worthy of mention regarding the divide are some characteristics of the division based on such factors as political leaning, for example, liberals/moderates tend to agree that anthropogenic climate change is real, while

conservatives often reject this idea. There are also issues of gender and education that create further subdivides regarding self-assessed understanding. Figure 1 illustrates global perception on climate change seriousness by country. Either way there is much work to accomplish to ensure an urgent call to action given the stakes of continued global environmental degradation.

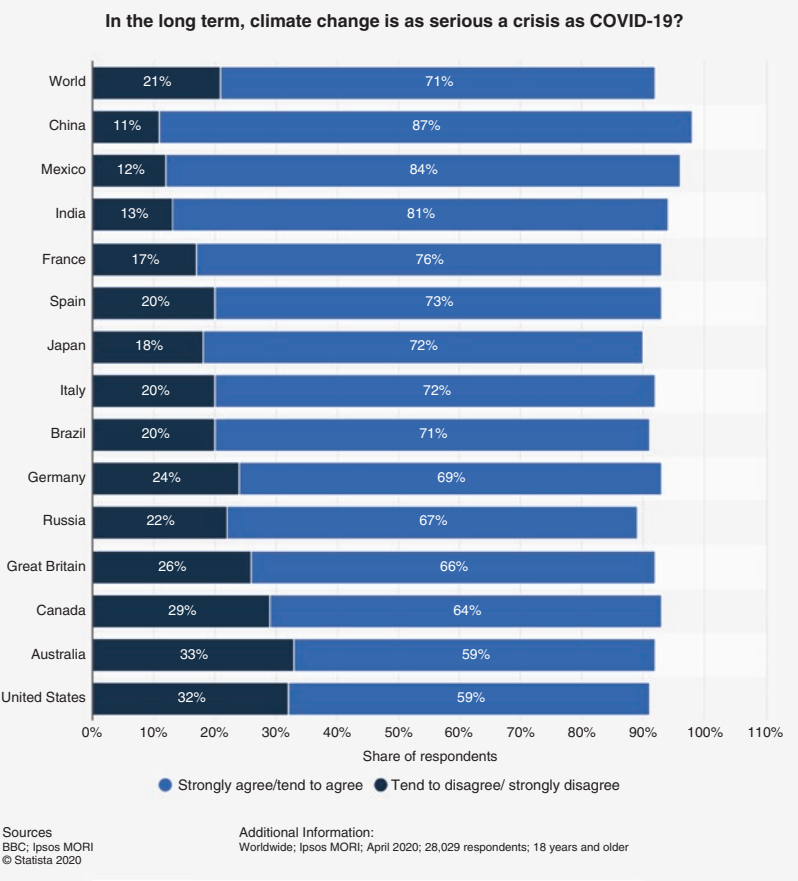

Fig. 1 Views on climate change as a serious crisis among adults worldwide by country 2020

2.1 CO_2 Landscape

However, to understand the bigger picture regarding CO_2 impact we need a macro view through the lens of economic growth. Estimates predict that the overall associated cost of climate change due to carbon emissions represents the equivalent of a 5% reduction in Gross Domestic Product (GDP) annually and 20% down the road if immediate action is not taken (Stern, 2006). Mitigation of carbon emissions requires a reduction in energy demand, a fierce challenge in itself given the macroeconomic cost associated with such mitigation. Consequent to the linkage between emission reduction and economic attempts to reduce them are the potentially negative effect on economic growth since (1) energy is a key input in productive capacity and (2) the existence of substitutes has not yet burgeoned to the point that they can adequately replace current sources. There is also the challenge for both economies and their respective industries of the wholesale cost of migrating to these alternatives sources, given their reliability and other socio-economic factors, especially in less developed economies. This conflict has resulted in two major schools of empirical thought (Acheampong, 2018). One based on examination of the environment-economic growth nexus, which tests validity of the environment via Kuznets curve, that is, a hypothesis that claims that there exists an inverted U-shaped relationship between environmental degradation and income. The second focused on the investigation of relationships between energy consumption and economic growth with such studies pioneered by Kraft and Kraft (1978) conducted in bivariate models but resulting in inconsistent estimates. However, recent models utilizing multivariate and advanced time series estimation approaches have improved but not without these findings having some degree of conflict (Acheampong, 2018). Examination of relationships between economic growth, energy consumption and carbon emissions augurs well for an integrated approach to finding a possible sweet spot to improve policy and assist in both awareness and behaviors. However, this does not change some of the current statistics on emissions such as in 2018 2% of greenhouse gas (GHG) increases were due primarily to a respective 2% increase in global fossil. Additionally, CO_2 emissions from fossil-fuel combustion/industrial non-combustion processes such as cement product and emissions from methane and nitrous oxide increased by 1.8% and 0.8%, respectively (Olivier & Peters, 2020). Fossil CO_2 are the largest source of global GHGs representing 72% of all emissions (Olivier & Peters, 2020).

Given our reliance on current energy sources and their derivatives to provide us with everything from food to residential energy supplies and everything else in between, there is an urgent cause for concern regarding not only the sources of these emissions but also modern society's consumption patterns driving the utilization of fossils through unprecedented consumer demand increases. The established effects of such demand are becoming more visibly evident as is the case with 2018 recording one of the warmest years (2014–2018) since record keeping began in 1880. This was manifested in 2018 with temperatures globally that were much warmer on average being recorded across Europe, the Middle East, New Zealand and parts of Asia (Olivier & Peters, 2020). Meanwhile, as temperatures rise and climate change accelerates because of four of the largest GHG countries contributing 62% of all emissions, the situation remains dire (Table 1).

What is evident from the above table is the obvious relationship between some of the largest countries, their population size and continued reliance on fossils as a major contributor to their economic development. This is further escalated by rapidly increasing global consumption of oil and natural gas production by 1.2% and 5.3% in 2018, led by China (+5%), the USA (+2.1%) and the Russian Federation (+5.1%) all accounting for net increases in production (oil) and similarly the USA (+10.5%), China (17.7%) and the Russian Federation (+5.4%) with similar increases for natural gas. These figures represent fossil only not accounting for other sources of emissions that further increase the total contribution to GHGs. Clarity regarding the prevailing landscape of CO_2 is further reinforced given their close relation to both highly industrialized countries and, by extension, their degree(s) of consumerism, driving emissions even further as demand increases. Moreover, while CO_2 emissions from combustion fossil fuels account for 89% (Olivier & Peters, 2020), there is still 11% of emissions made up from other sources that are also contributing to the ever-increasing emission concerns such as:

Table 1 Emissions by country 2018

Country	*% of emissions*
China	26
USA	13
European Union	8
India	7
Russian Federation	5
Japan	3

- *Cement production (4.1%)*
- *Non-energy use of fossil fuels (4.0%)*
- *Limestone and Dolomite (1.1%)*
- *Solid fuel transformation (1.0%) and*
- *Gas flaring (1.0)*

Of note related to the abovementioned emissions is they originated from many different sources and there is much uncertain at a country level regarding measurement versus those of core CO_2 emission (30%) given existing traditional CO_2 emissions measure availability of about (±5%) for OECD countries and (±10%) for others (Olivier & Peters, 2020). The lack of diversity of emission factors within these sources and insufficient statistical data to tracking make the degree of accuracy somewhat challenging. Nonetheless, the fact that there are other contributing emitters to the core group heralds even greater concern for the adverse impact that GHGs are having on our planet, thus changing the landscape of our environment and bringing with it harsher climate effects.

2.2 Human Interaction and Biodiversity Impact

The role that major industrial countries play in the carbon emissions dilemma and provision of some key empirical facts, regarding their contribution to these increases, represent only a partial picture. As indicated, the impact has and continues to have extreme effects, manifesting in visible ways. However, while industrialization remains a key contributor, the impact of human behavior as part of the bigger context is equally prevalent. Biodiversity and its human impact require specific attention given its behavioral and environmental linkages. Humans exhibit specific behavioral cues just as factories regarding climate change/carbon emission increases warranting equal attention in our discourse. In fact, one could argue that human's continuous need for conspicuous consumption is further fueling adverse climate change effects given the rise of fast fashion and array of plastic-based packaged consumables and a penchant for mobility by land, sea and air. Hence, different approach to mitigate these behaviors, thus ensuring some degree of reduction in impact to the global environment, is required. The potential exploration of tools such as gamification to support efforts in mitigation and increased awareness/calls to action receives further discussion later in this chapter, addressed via the proposed

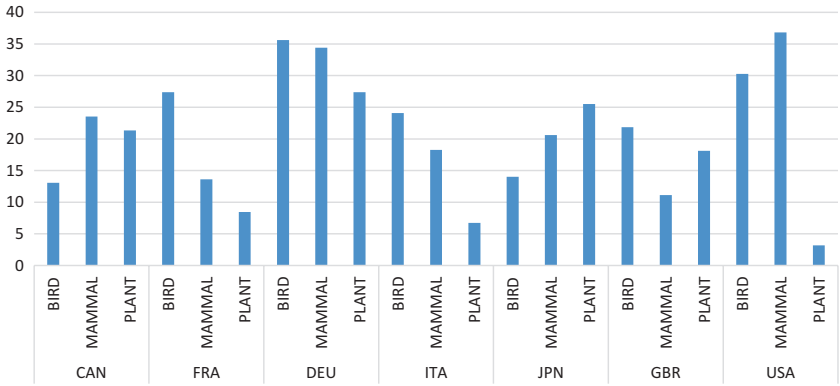

Fig. 2 Percentage of threatened species by G7 countries as of 2015 (OECD 2020)

framework of crowdsourcing-gamified methodologies. For now, there is first a need to identify the effects brought about by human activity that are adding to the already existing industrial damage and threatening to accelerate the loss of biodiversity already occurring. Moreover, there is also a need to examine some of the innovative approaches utilized to improve biodiversity awareness within society specifically through game-based methods. Figure 2 demonstrates the impact of changes in biodiversity by G7 countries as of 2015 illustrating the number of threatened mammal, plants and birds species expressed as percentage of total known species. The threatened categories refer to critically endangered, endangered and vulnerable species, that is, those plants, animals and birds that are in danger of extinction or likely soon to be.

The effects of loss of natural and semi-natural vegetated land illustrated in Fig. 3 also presented a proxy for pressures on biodiversity and ecosystems by G7 countries. This includes tree cover, grassland, wetland, scrubland and sparse vegetation converted to any other land cover type since 1992, thus once again illustrating the impact of human interaction with the biosphere and resultant loss of valuable land resources protecting our environment.

The maintenance/restoration of healthy ecosystems plays a key role in mitigating climate change effects specifically through conservation and sustainable land use/management with potentially positive socio-economic benefits. These primarily behaviorally driven events driven by

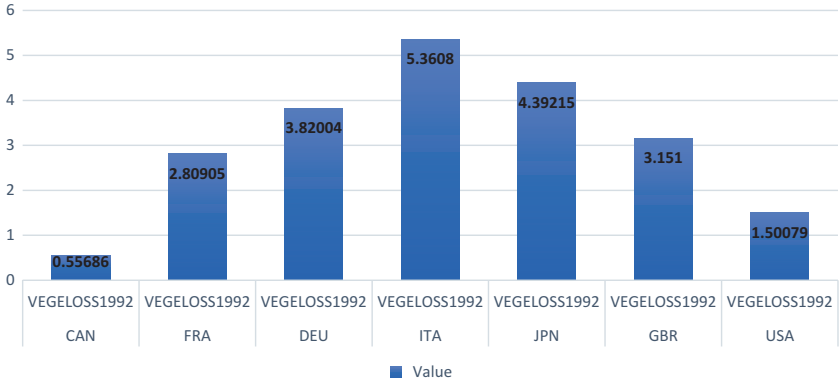

Fig. 3 Percentage of vegetation lost by G7 countries since 1992 (OECD 2020)

human interaction with the environment and consequently better platforms for education are required to support improved mechanisms for impact reduction. For instance, under climate change, there are several occurrences of species migrating to new territories because of changes to the physical environment, and as a result due to the emergence of these vagrant species, there is an increasing need for improved planning scenarios (Scheffers & Pecl, 2019). The need for improved monitoring and management with an aim to flagging species redistribution requires careful review at an early stage, which can potentially yield greater benefits from action through citizen scientist support. Furthermore, appropriate systems for environmental monitoring not only require the perspective of environmental specialist but also public intervention through novel approaches to improve awareness and effective data capture processes. Mehring, Bernard, Hummel, Liehr, and Lux (2017) to see the potential impact of gamified solutions to support the environment. Leveraging the power of play to both inform and support environmental changes can yield potential benefits such as mapping migratory patterns of behavior of species, flora or continued degradation of land use, all using the power of crowds to assist. The approach presents opportunities for reducing the economic cost on respective agencies through collaboration with consistent monitoring as well as provision of reliable data in a timely manner. As both an educational awareness and data-gathering tool, gamification can act as an early warning system through relevant data capture processes. In

essence a *gamified analytics platform* serving a specific environmental surveillance purpose, that is, an environmentally gamified analytics app.

One example of the use of gamification supporting biodiversity was in the use of a game-based approach in bioacoustics sensing through creation of a game with the purpose of helping classify animal sounds in a given area (Loureiro, Prandi, Nunes, & Nisi, 2019). The basic premise being to involve players as citizen scientist regarding categorization and analysis of these sounds in a fun, knowledgeable and efficient manner. Players were able to immerse themselves in nature remotely/locally and classify sounds near their place of origin using specific game mechanics (gamification) elements. The developers classified the solution as a "game with a purpose" (GWAP) specifically to monitor biodiversity of a certain species in specific locales. The utilization of bioacoustics sensors for data compilation obtained, provided the opportunity for analysis and classification of species through the game interface. The developers indicated that one of the main goals of the game was to provide players with an enjoyable and didactic experience, engaging them further in the project (Loureiro et al., 2019) supported by a storyline and various game mechanics. Table 2 provides further game examples.

The above examples of game-based approaches for public engagement and knowledge awareness, regarding core biodiversity challenges affecting global society, represent a clear opportunity to increase climate change mitigation approaches. The value of these games is that they serve as a platform for education and engagement supporting the work of researchers and other public policymakers. The challenge, however, is that the dissemination of a complex issue such as climate change is not easy despite increased news coverage and other media communication. Climate literacy is vital for promoting both good policy decisions, changing individual behaviors and consumption patterns (Rajanen & Rajanen, 2019). Therefore, a need for more impactful communication medium(s) is required to engage, educate and contribute to the development of mitigation strategies especially given current generation X and millennial populations who are best positioned consciously and technologically to engage with such approaches. Gamification represents one such opportunity given its interactive, participatory, engaging and behavioral motivation principles to support a policy of behavioral changes.

Table 2 Climate change games

Game	*Description*	*Link/source*
Gamers4Nature	The Gamers4Nature project aims to design and operationalize a set of strategies that prepare and encourage an active participation of the youngest audience in game creation, while promoting knowledge about environmental preservation and biodiversity conservation	Toolkit (Beça et al., 2020)
My Green Planet	Simulation game created to raise awareness and change the energy model to mitigate the effects of climate change. To do so, the player has to transform a city into a sustainable place	http://www.wwfspainsites.com/mygreenenergyplanet/ (Peralta, Lobo, & Pérez, 2017)
Misión posible, salvar el planeta/Mission possible, save the planet	Players become ecological superheroes who complete several mini-games and tests in order to fight against the uncontrollable emission of climate change-inducing greenhouse gases into the atmosphere	http://www.cruzroja.es/juego_cambio_climatico/ (Peralta et al., 2017)
Bioharminious	The player is responsible for the fate of two interconnected planets. The Manufactured Planet, a place of clockwork machinery and choking smog, is on the verge of collapse, and its sister planet, the lush and diverse Natural Planet, will die along with it unless something is done. Through a process of "bioharmony," scientists from the Manufactured Planet are able to integrate the flora and fauna of the Natural Planet into their machines to improve the environment of their home world	http://www.gamesforchange.org/game/bioharmonious/

3 Understanding Gamification (Role and Purpose)

Initially gamification was defined as the use of game elements in non-gaming context to improve user experiences and engagement (Deterding, O'Hara, Sicart, Dixon, & Nacke, 2011). The appeal rests with its ability to engage and motivate the creation of positive emotions, cognition and behaviors. Plangger, Kietzmann, Pitt, Robson, and McCarthy (2015) provided one definition of gamification as the application of lessons from the gaming domain to change behaviors in non-game situations. The experience can focus on business processes or outcomes involving participants or players to co-develop products or improve employee satisfaction. Similarly, Huotari and Hamari (2017) proposed a definition of gamification as a process of enhancing a service with affordance for gameful experiences in order to support users' overall value creation. While debate still exists on a clear definition of gamification, its inherent promise of provision of enhanced motivation and positive effects on learning at comparatively low cost remains a key selling point. Martens and Mueller (2016) indicated that gamification has its roots in the psychology of playing, in game design and in game thinking with a combination of the following:

- *A clear definition of learning objectives aimed to be reached*
- *Reduction of the learning material to a level that is appropriate for the target group and*
- *Re-design the learning content in a way that it is interesting for the target group, including closeness to everyday experiences, allowing for own mental knowledge and growing levels of complexity*

However, when compared to full-scale games it remains an underestimated concept with current applications limited to relatively small-scale levels. It derives value from its larger counterparts, that is, edutainment, game-based learning, serious games and game thinking with motivation being an accepted part of its offerings. Its roots stem from a term likely coined by Nick Pelling in 2002 in the context of attracting clients in industry. While there is a large degree of similarity between gamification and game design, differences exists in technique where game design, technique and mechanics represent different aspects of games. Game elements are the main constituents of games structured as follows (Martens & Mueller, 2016):

- *Interaction Elements: all game elements a user can interact with, for example, dice, character and so on.*
- *Rating Elements: providing feedback to user, for example, levels, badges and scoring systems*

These elements are part of the game and represent a certain role, an achievement, behavior or similar. The premise of gamification is its proposition of being able to change stakeholder attitudes by tapping into motivational drivers of human behavior in two ways, reinforcement and emotions. Diving deeper into the components of gamification, we need to examine the mechanics, dynamics and emotions (MDE/A) or esthetics (Oceja & Fernández, 2016) to first understand how gamification works and gain insight into its potential contribution to climate change behavioral change.

3.1 Mechanics, Dynamics and Emotions/Esthetics of Gamification

Understanding the operations of gamification requires deeper knowledge of its elements. Within gamification rests three core components (mechanics, dynamics and emotions or esthetics). Mechanics defined as the various actions, behaviors and control mechanisms afforded to the play within a game context. Dynamics, as the work to create esthetic experiences and the run-time behavior of the mechanics action on player input and each other over time, and emotions/esthetics are essentially, what make the game fun, described as the desirable emotions evoked by the player (Oceja & Fernández, 2016). In terms of interactions among these elements the key take home is that they are all components of the gamification process allowing for sub-elements such as achievement, avatars, badges, leaderboards and so on to accomplish the desired effect. Mechanics are the actions that drive actions forward and generate player engagement, for example, how things work—like a button click. Dynamics represent the big picture, with the user needing to consider and manage but never directly enter into the game. These systems further inform goals and themes that take responsibility for missions or quests and what the game is all about, respectively. With regard to the esthetics in the design of gamified processes, they contribute significantly to emotional responses and are driven by informing player behavior such as sensation (pleasure), fantasy (make-believe), challenge (obstacles faced) and fellowship (socialization).

In sum, the MDE/A framework outlines the interdependencies between relationships of gamification principles and how these principles can be applied together to create and extend the player experience (Plangger et al., 2015), illustrating how small changes in one principle can impact the others and by extension affect the user experience.

A classic example of these elements working together is the highly ranked TV show American Idol. The show utilizes gamification to increase engagement demonstrating customers (viewer) engagement via a voting system and how live television can successfully hold the attention of crowds through a televised experience. In the context of a gamified emissions approach, the value would be similar, albeit less entertainment-driven than a commercial offering, but effective through the utilization of lessons from the gaming domain to create experiences that motivate, educate and engage individuals in a non-game setting. Climate change policy makers require adoption of a gamification strategy informed through embedding of gamification elements as a core component to improve educational awareness and behavioral change. To allow this, a page from the gamification strategy playbook is requisite taking into consideration the components outlined in Table 3. Given both the dryness of climate change content representation and education, the integration of fun, challenge and active participation augurs well for better interaction.

4 Toward a Gamified Carbon Reduction

The above list while not exhaustive contains essential elements of the gamification process that can be successfully embedded in an education agenda for improved collaboration regarding climate change. These strategic components take into consideration dimensions such as cognitive and emotional elements that can better embed information dissemination by policy experts and scientists in a user-friendly manner, while making it more attractive to the target audience(s). However, for this novel approach to climate change mitigation to have an effect requires a significant mobilization of people to join the fight. Motivation leading to behavioral changes is either extrinsic or intrinsic, and gaining the interest of a wider body of stakeholder/participants requires both robust information (which already exists for climate change) and novel design thinking approaches to capture the imagination, interest and engagement of the public. Ouariachi, Li, and Elving (2020) proposed a set of game attributes that could maximize the cognitive, emotional and behavioral engagement of players based on three core dimensions:

Table 3 Gamification strategy elements for improved education and behavioral change

Achievability	Promotion of possible actions easily accomplished with regard to climate change educational awareness by individuals. For example, presentation of the message around awareness through problem-solving approaches versus traditional narratives that encourage linkages to real-world issues in bite size forms
Challenge	Integrating task, which requires effort to perform: Nnot just a problem as identified above but also informs curiosity, exploration and allowing the participant(s) to advance from one contribution level to the next
Concrete	Simple messages, avoiding complex language and statistical data that are uninterpretable by the average individual. Integrate the information into the game mechanics
Credibility	Trustworthy information: Iindividuals will better trust the actions of people whom they can relate too. Seeing actions taken by people like themselves and the results potentially yield better participation and benefits
Empowerment	Providing participants with a sense of control and agency, allowing individuals to make their own decisions based on the info provided via the mechanics/data and explore consequences
Feedback	Allowing a shared platform for feedback not only in terms of what people did, felt but the consequences and benefits of their contribution via a common platform
Fun	Perhaps the most important category: ensuring that a degree of entertainment exists if players can take on different roles or levels as they advance play
Meaning	Leveraging the power of emotions/esthetic elements to ensure that people feel the impact in order to increase attention, interest and willingness to participate
Reward	Giving rewards to participants for their contribution is a compelling activity for increasing positive behavior. Providing a series of incentives at various levels of the engagement process can maintain participant interest

1. *Cognitive involvement: what people think and know and how many mental efforts they are willing to make.*
2. *Emotional involvement: what and how strongly people feel about climate change.*
3. *Behavioral involvement: what and how much people do to address climate change.*

The framework suggests that a gamification platform containing these attributes potentially enhance better engage with climate change issues. The author adds one more element to this approach, that is, an effective

crowdsourcing strategy component to ensure the widest level of participation. Crowdsourcing represents a valuable online, distributed problem-solving approach that transforms problems and task into solutions by harnessing the potential of large groups of crowdsources via the web rather than through traditional approaches (Morschheuser, Hamari, Koivisto, & Maedche, 2017). There has been a significant increase in the utilization of crowdsourcing-based start-up business models with many companies investing significantly in their utilization. It is a useful method to coordinate work task through the lens of collective intelligence, and it relies on the crowd to perform large quantities of homogeneous task, solutions to a problem, assessment or create new artifacts. A major challenge with people motivation is enabling positive formation of the work activities to ensure that they spark sustainable interest. While climate change is of interest to most individuals, holding attention beyond the next catastrophic event can be a challenge as people quickly return to their daily routines. Incentive in the design of the climate change narrative via the gamification process utilizing human-computer interaction is critical. To develop a good climate change narrative curated from the vast amount of data available requires first that gamification's process design increases motivation of participants to the activity, thus creating influencing behaviors through motivational affordance (Morschheuser et al., 2017). Second, there is the need for a psychological framing through the gamification process to ensure participants experience cognitive causality (cause and effects) of the consequences of inaction as well as a sense of purpose that they can make a difference. This component is essential for sustainability of participation. Third, the gamification process needs to demonstrate to the participants evidenced behavioral change, that is, provide collective proof of accomplishment by whom, where and when. Leaderboards and badges can effectively illustrate this via the gamified platform as well as provide useful information to support adoption by others. Morschheuser et al. (2017) provided a useful conceptual framework for a gamified crowdsourcing system, Fig. 4, that the author believes merits adoption.

Their framework proposes inclusion of gamified affordance, psychological outcomes and behaviors building on the existing work on crowdsourcing (Geiger & Schader, 2014), Pedersen et al. (2013) and Zuchowski, Posegga, Schlagwein, and Fischbach (2016) providing a structure to investigate the phenomena holistically with a focus on incentive orchestration. The findings, based on a comprehensive literature review, indicated that gamified crowdsourcing approaches easily support tasks such as

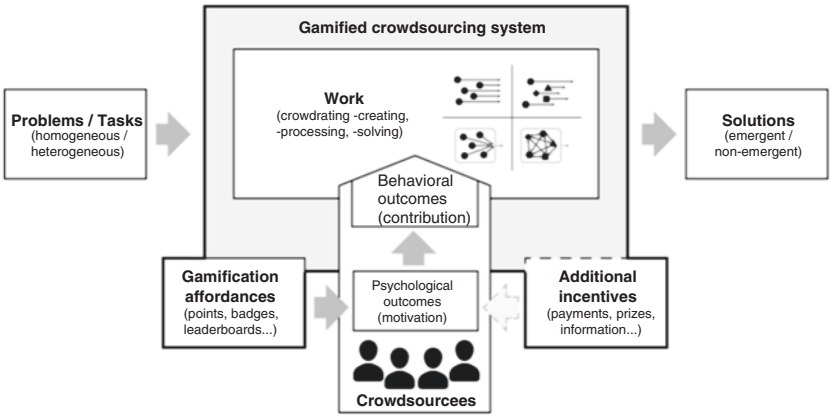

Fig. 4 Conceptual framework of gamified crowdsourcing system (Morschheuser et al., 2017)

crowdrating or crowdprocessing especially when integrated with simple point and leaderboard-based game design. Moreover, there was also evidence to support through review that crowdsolving and creating made more use of affordance given task heterogeneousness with varying complexity and requiring a broad spectrum of skills. This allowed for engaging broad target groups in the short/long term (Morschheuser et al., 2017). The author recommends the above framework as an excellent baseline to support climate change education and awareness given the power of gamification's points, leaderboard and design integration flexibility abilities to assist in the creation of competitive engagement, reward cooperation and collaborative behavior through the utilization of gamification affordance (i.e. motivation). However, from a toolkit perspective we extend the conceptual work of Morschheuser et al. (2017) through integration of three additional components to increase efficacy (Fig. 5).

The first component is moving beyond the established leaderboard indicating how well individual(s) are doing in relation to each and toward one, which leverages the power of crowd data input regarding their contributions to aid in mapping positive/negative effects of the climate change initiatives locally or globally. This approach not only provides both traditional leaderboard data but also goes deeper utilizing statistical information on environmental impact. It allows both the scientific and policy communities to collect valuable data that would not be readily available. The caveat being that recording of such data (in simple but useable forms)

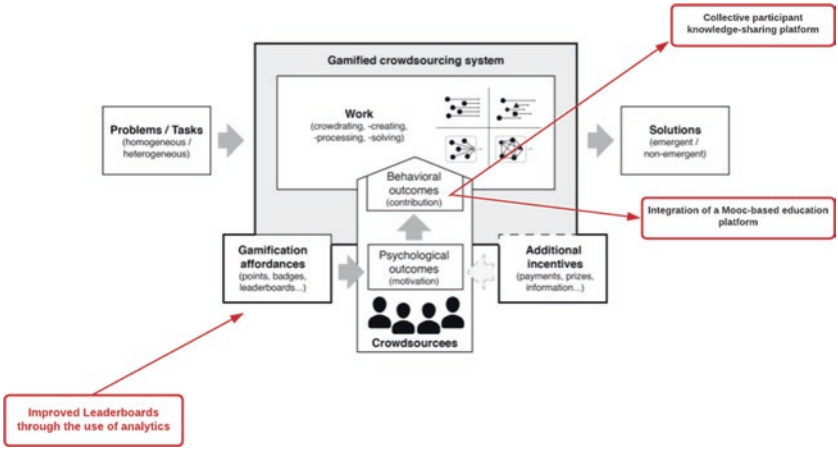

Fig. 5 Revised conceptual framework (Dyer 2020)

would require training and monitoring. This game analytics approach can be utilized to provide useful real-time data, support prediction and recommendations for improved community action and inform clusters of best practice to empower other communities to replicate appropriate patterns of behavioral changes (Alonso-Fernández, Calvo-Morata, Freire, Martínez-Ortiz, & Fernández-Manjón, 2019). Thus, the crowdsourced leaderboards become a learning analytics tool to support behavioral improvement, monitor progress action and collect and analyze general trends and patterns in very much the same way that such methods are utilized with students (Klock, Ogawa, Gasparini, & Pimenta, 2018). This brings me to the second element of the MOOCs integration. Massive Open Online Courses (MOOCs) have seen a significant rise in utilization over the past decade. While completion rates remain a challenge for most (Antonaci, Klemke, Stracke, & Specht, 2017) the impact of their efficacy from a micro-learning perspective is valuable. Integration of MOOCs into the behavioral outcomes component of a gamified climate change platform supports large-scale education/re-education regarding applicable content associated with the phenomena, allowing individuals to improve (formally/informally) their citizen science knowledge. This is achieved either via formal certification on such issues as conservation and so on to support their community efforts or informally through structured education awareness micro-learning to become less ignorant as Mehring et al. (2017) indicated around issues regarding climate change. Thus, the

MOOCs become a central tenet of the goal achievement process of education building, leveraging both the power of gamification and the MOOCs as part of the user engagement process to support "gaining focus" on key topics at an individual level (Antonaci et al., 2017). Finally, the third component added is knowledge sharing building on component two (MOOCs) to establish a community platform for sharing knowledge both as best practice but more importantly based on relatability. Reliability being the collective experiences of action/knowledge culminated from the use of a gamified crowdsourced platform becoming a repository for all users created by them and for them. While recognizing that "joe public" is neither policy analyst nor scientist, experience through action captured and disseminated through the gamified platform provides an excellent template for others to replicate. The caveat being that these "climate-champions" will need support and training by said policy analyst and scientist as it relates to quality assurance for effective practice at the community level. It also acts in creating agents of change at a grassroots level through gained knowledge expertise. The overall process speaks to not just gamification of emission and other component awareness through a gamified approach but to deep integration of crowds as a source of motivation and inspiration through leadership by example versus the high-level perspectives of experts, which do not necessarily translate as easily.

5 Final Thoughts

This chapter aims to provide some insights into a gamified emissions process, examining the impact of climate change from both an industrial and biodiversity perspective informed by a gamification-centric approach to improving education and awareness of the core issues. The nexus of the approach centers on gamified crowdsourced approaches to inform a toolkit for better education and more so participation. Crowdsourcing as part of the gamification toolkit takes it beyond just fun/motivation and engagement to one informed by an organizational learning approach. Incorporating both social and cognitive processes via collective capability (Devece, Palacios, & Ribeiro-Navarrete, 2019) through the use of game-based approaches better informs acquisition, sharing and utilization of climate change knowledge improvement. That is, the goal of utilizing this gamified approach is creation of transformative leadership at the grassroots level where the process broadens and elevates the interest of the stakeholders through purpose and mission. It stirs them to look beyond their own self-interest for the

good of society. The author believes that such an approach integrated into the climate change phenomena provides the requisite filtering, absorption and dissemination of knowledge through a gamified process. This is further supported by the wisdom of crowds for greater impact and sustainability. Furthermore, while the above approach is yet to be empirically tested, its conceptual nature augurs well for the incorporation of game-based thinking into the improvement of climate change education. It also addressed the requirement for future ecosystem design informed by crowds, data and motivational factors for increased adoption.

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Gamification and Virtual Reality for Communicating Ecoliteracy and Climate Science: Carbon Transport in the Essequibo River at Iwokrama Guyana

David Cole, Ryan Pereira, and James Spray

1 Introduction

Moving into the twenty-first century it is becoming clear that we are facing a defining moment for humanity. Understanding the interrelationships and dynamics of nature's life support systems, and the destructive effects of our globalised industrial economies, brings a stark warning of

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runaway climate change, failing states, the rise of the far right, mass migration, food and water insecurity and pandemics. Yet in the midst of these challenges, we seem to be witnessing profound confusion and a lack of leadership from many politicians, who seem either unwilling or unable to rise to the challenges ahead. Why is that? Are we witnessing the inevitable collapse of all that is unsustainable?

What is clear is that the challenges of the twenty-first century are systemic. The relationships between climate, the economy, energy, food, our mindsets and many other factors are interdependent, interrelated, complex, and cover local to global scales.

In order to mitigate the impact of climate change, we will need to navigate and manage this complexity in an inclusive manner. We will need to promote environmental and climate science, ecoliteracy and systems thinking widely. Systems thinking gives us the conceptual tools and language to embrace complexity by understanding relationships, patterns and context (Capra & Luisi, 2014), and ecoliteracy may be defined as "an understanding of the principles of the organization of ecosystems and the application of those principles for creating sustainable human communities and societies" (McBride, 2013).

The use of virtual reality (VR) at the Iwokrama International Centre for Rainforest Conservation and Management (IIC), Guyana, began when the Carbon-Water Dynamics Team at the Lyell Centre, UK, were looking to find ways of disseminating their climate science work to both scientific and non-scientific stakeholders alike, recognising that traditional models of presenting research to invoke wider transformational change have limited impact (Sterman, 2016). This was further complicated by the disparity in social mobility both within Guyana, and between Guyana and the UK. In using an immersive virtual reality (IVR) simulation of their expedition and research approach, it is becoming clear that gamified IVR experiences may have the potential to not only communicate climate science, but educate a variety of audiences in a transformative way that also nurtures both systems thinking and ecoliteracy skills. This may be particularly effective when the VR experience is combined with real-world physical role-playing games, which was the approach taken here.

In our game experience, we aim to improve understanding and skill sets in the following important concepts of systems thinking and ecoliteracy:

- Understanding of nature's carbon cycles
- Multiple perspectives

- Context, narrative and purpose
- Temporal feedback
- Complex web of relationships and social connectivity
- Multidisciplinarity
- Boundary judgements and fairness

We will return to these concepts, in the context of the game experience, in the Discussion section.

2 Carbon Transport Science

2.1 The Global Carbon Cycle

Carbon is a hugely important part of our world—it is the basis of all living organisms, as organic matter it provides fuel and food, and as carbon dioxide (CO_2) it forms a key component of our atmosphere and influences climate change. Earth's carbon is unevenly distributed between terrestrial, oceanic and atmospheric reservoirs, in what is termed the global carbon cycle (Cole et al., 2007; Falkowski et al., 2000). The global carbon cycle consists of terrestrial and oceanic "biologically active" zones, which are connected through gas exchange with the atmosphere (Siegenthaler & Sarmiento, 1993). Significant fluxes of carbon in the cycle include respiration and photosynthesis, weathering and sedimentation, and transportation by rivers; these processes occur on timescales from seconds to millennia. The terrestrial biosphere has a fundamental role in the climate system, providing both positive and negative feedbacks to climate change, and the advent of the industrial age has changed the way carbon is transported between the major carbon stores by disturbing natural fluxes and creating new pathways and potential feedback mechanisms (Ciais et al., 2013) (Fig. 1).

In addition to CO_2, another key component of the carbon cycle is organic carbon, which comprises carbon contained in either living or dead matter. It is typically originally formed by plants through the photosynthesis of CO_2. Once formed, organic carbon can be transported through the carbon cycle by river systems. Recently, however, the idea that rivers passively transport carbon has been challenged—annual global estimates show that up to 5.1 Pg of carbon enter rivers from the land (Drake et al. 2018; Tranvik et al., 2009) but only 0.9 Pg reaches the oceans (Cole et al., 2007). This suggests that rivers actually actively process, store and

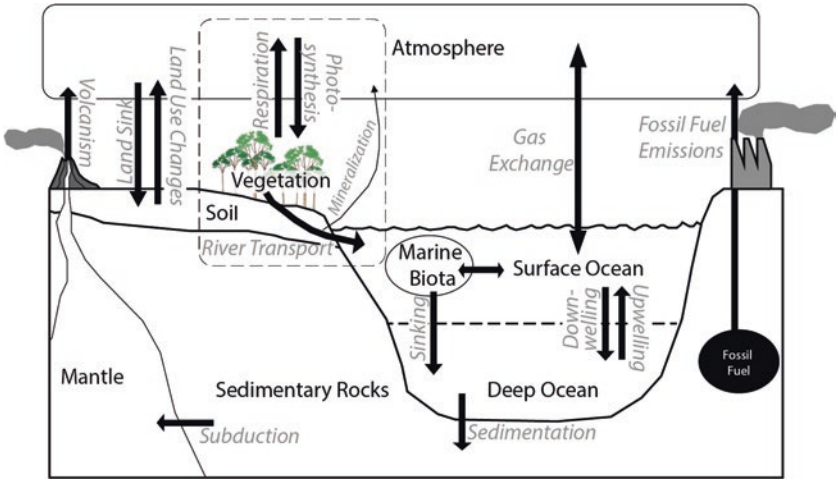

Fig. 1 Simplified diagram of the global carbon cycle, showing major reservoirs and fluxes. Dashed box highlights the components of the cycle that directly relate to rainforests and tropical rivers

recycle carbon, with processes such as respiration by bacteria releasing CO_2 back into the atmosphere.

2.2 The Importance of Rainforests and Tropical Rivers

Tropical forests are a key area of the global carbon cycle. They account for nearly 40% of terrestrial net primary production (Townsend, Cleveland, Houlton, Alden, & White, 2011) and contain approximately 17–25% of the carbon in the terrestrial biosphere (Bonan, 2008), despite covering only ~10% of the land surface (Lewis, 2006). Soil carbon, including root material, averages about 20% of the total carbon stored in tropical forests (Asner, 2009; Cairns, Brown, Helmer, & Baumgardner, 1997). The intense hydrological conditions of tropical forests ensure that this carbon enters networks of small streams, which then converge into huge tropical rivers, such as the Amazon or Essequibo; intense rainfall events are particularly effective in this regard (Pereira et al., 2014). Tropical rivers are estimated to export 0.53 Pg of carbon per year (Huang, Fu, Pan, & Chen, 2012), and if Amazonian CO_2 evasion rates are representative of the remaining tropics then an estimated ~0.9 Pg of carbon per year is

outgassed to the atmosphere by tropical rivers (Richey et al., 2002). Being able to calculate the amount of organic carbon being transported by tropical rivers, therefore, is key to us in understanding the global carbon cycle.

2.3 How Do We Measure Carbon?

The large variability of carbon structures in the natural environment is daunting. The ability to detect responses to climate and land use change in rainforest systems is therefore very challenging (Townsend et al., 2011; Wohl et al., 2012). Many current methods used to measure how much organic carbon is in river water are based on how the carbon in the water changes the colour of the water; broadly, this correlates with dissolved organic carbon concentration (e.g. Weishaar et al. 2003; Carter et al. 2012). One advantage of these methods is that we can measure water colour remotely (e.g. from satellites; Griffin, Frey, Rogan, & Holmes, 2011), and the computer models that we use to determine how the carbon cycle operates and responds to anthropogenic climate change rely on these measurements. However, recent discoveries have revealed that some carbon in river water is optically invisible and therefore is not measured by these techniques when large variations in composition of this river carbon occur over time (Pereira et al., 2014). We may, therefore, be underestimating the amount of carbon being transported by (and reacting in) rivers from tropical rainforests.

2.4 Closing the Gap: How Do We Quantify River Carbon Leaving the Rainforest?

Determining the importance of this invisible organic carbon requires travelling to the rainforest in person to sample river waters directly. The best time to do this is during the rainy season, where the intense rainfall events responsible for mobilising organic carbon are more prevalent, and the best place to do this is small headwater streams, which receive the majority of the mobilised carbon. In the field, both the colour of river water samples and the total amount of organic carbon they contain can be measured directly. In theory these two measurements should relate to one another, but if they disagree this might indicate that there is invisible organic carbon in the sample, which would be missed by the colour-based technique but detected in the total amount of organic carbon. Samples that show a disparity could be shipped to a laboratory for further advanced analysis,

which reveals the different kinds of compounds present in organic carbon, and can quantify the amount of invisible organic carbon (Huber, Balz, Abert, & Pronk, 2011). By timing sample-taking with periods of intense rainfall, it should be possible to determine how much invisible organic carbon is released into rivers when they occur.

3 Iwokrama

3.1 The Iwokrama Rainforest

As described earlier, rainforests are an incredibly important part of the global carbon cycle, and they are also vital for biodiversity, our climate, tourism, industry, and the discovery and development of new medicines and other products. They are also home to rich and diverse indigenous peoples and their cultures. However, rainforests are threatened by deforestation, driven by practices such as unsustainable logging, the clearing of land for agriculture and mining. To ensure the survival of rainforests, it is vital to study how they can best be treated to manage these competing interests and challenges while also enabling them to be studied in detail.

One such example is the Iwokrama rainforest, located in Guyana, South America (Fig. 2). The Iwokrama reserve, managed by the IIC, comprises 3710 km^2 of rainforest in central Guyana bounded by the Essequibo River to the East and the Siparuni River—a tributary of the Essequibo catchment—to the west and north, and lies just north of the Rupununi savannah grasslands in the south. Iwokrama is situated near the northern extent of the inter-tropical convergence zone (ITCZ), where there is a transition in the climate regime from north (coastal) to south (savannah) of two wet seasons (primary: May–July and secondary: December–January) and two dry seasons (primary: September–November and secondary: February–April) to one wet season (May–August) and one long dry season (September–March; Bovolo, Pereira, Parkin, Kilsby, & Wagner, 2012).

The rainforest is crisscrossed with a myriad of small headwater streams and tributaries that feed into the Essequibo River, which drains the tenth largest river catchment in South America (Dai & Trenberth, 2002). One of these tributaries is the Burro Burro catchment, which covers an area of approximately 3200 km^2. The main channel of the Burro Burro River dissects the Iwokrama forest south to north from the southern boundary of the forest–savannah transition, forming an approximate 65 km riverine transect. The underlying geology consists of acid-intermediate volcanics

Fig. 2 The Iwokrama rainforest, with the Essequibo River in the middle ground

intermixed with granitoids and dolomites, which is predominantly overlain by highly leached, white and brown quartz sands (Hawkes & Wall, 1993).

The Iwokrama forest also plays host to a rich array of flora and fauna, and their conservation and management forms a key part of Iwokrama's mission while also forming the basis for many ecotourism activities and providing sustenance and livelihoods for Iwokrama's indigenous communities.

The diverse fauna of Iwokrama is a huge draw for ecotourism; the wide range of habitats within the forest is home to approximately 180 species of mammals (including over 88 species of bats—one of the highest diversities in the world), 150 species of reptiles and amphibians, 420 species of fish and more than 500 species of birds. In particular, tourists often visit to witness the "Giants of El Dorado", large and endangered species including the Harpy Eagle, Jaguar, Giant River Otter, Arapaima, Giant River Turtle, Anaconda and Black Caiman (Engstrom, Lim, & Reid, 2017).

Though the Iwokrama forest represents only 2% of Guyana's forests, its flora comprises more than 15% (1250) of the country's 8000 species of plants. Several different types of forest can be found within the reserve, dictated by variations in soil type and the propensity for flooding. These include Wallaba Forest, which is found over drained, white sands; and Mora Forest, which is found in areas that are flooded during the wet season (Thomas, 2019). Preserving and sustainably using these forests not only is important to the climate (Bovolo et al., 2012) but also ensures that they can continue to provide key uses to indigenous people and the Guyanese in general. The Greenheart tree (*Chlorocardium rodiei*), for example, is prized as a timber product due to its hardiness and is found only within Guyana. The Crabwood tree (*Carapa guianensis*, *Carapa akuri*), meanwhile, produces oil that is used locally for a wide range of applications, such as an insect repellent and cosmetic product (Forte, Ousman, & Radzik, 2002), whereas the Kapadulla vine (*Tetracera asperula*) is used as an aphrodisiac (Thomas, 2019).

3.2 Iwokrama International Centre for Rainforest Conservation and Management

The Iwokrama International Centre for Rain Forest Conservation and Development (IIC) was created in the "run-up" to the Earth Summit in 1992. It is a key environmental programme dedicated by the Government of the Cooperative Republic of Guyana to the Commonwealth in 1989. Since its legal establishment, through an Act of Parliament in 1996, Iwokrama has sought to advance best practices in the sustainable management of the world's remaining rain forests.

The successful conservation of rain forests requires that local people and national governments see financial benefits from sustainable use. Otherwise, tropical rain forest degradation will continue unabated. Iwokrama's mission is:

> *To promote the conservation and the sustainable and equitable use of tropical rain forests in a manner that will lead to lasting ecological, economic and social benefits to the people of Guyana and to the world in general, by undertaking research, training and the development and dissemination of technologies.*

Iwokrama's core values are as follows:

- A people-centred approach to conservation and wise use
- Developing low-volume, high-value markets for all forest products and services
- Encouraging local, national and international partnerships for development
- Active learning by doing

The set of activities necessary for Iwokrama to demonstrate that successful forest management is attained by developing conservation models through the wise use of multiple forest resources is a complex one. It requires the development of technologies and governance models that will build capacity and produce innovative businesses and models for collaborative management.

The second level consists of the four essential programmes required to achieve effective conservation: Business Development, Research and Science, Capacity Building, and Management and Monitoring. To provide the science basis for decision making in managing the Iwokrama forest, the Iwokrama Science Committee (ISC) was formed to assist with:

- Measurement and valuation of Iwokrama's ecosystem services and the benefits they deliver to human well-being and the resilience of the forest.
- Practical ways to improve community benefits.
- Interactions between climate change and the Iwokrama forest and the influence of the Iwokrama forest on the global climate.
- Development, testing and installation of new models of sustainability, crossing traditional disciplinary boundaries.

3.3 Iwokrama and the Search for Invisible River Carbon

IIC has on-site laboratory facilities within the rainforest and employs a team of indigenous rangers who, along with their extensive local knowledge, are experts in conducting and supervising fieldwork within the challenging environment of the rainforest. Combined with its mission to promote rainforest research, therefore, the IIC provides the perfect opportunity to search for invisible organic carbon, within the Iwokrama rainforest and the headwaters of the Essequibo. Furthermore, the environment fostered by IIC encourages science communication and outreach and helps to involve local and indigenous actors with research and provide

them with training. This aspect cannot be understated, as research in areas such as rainforests can often be conducted in ways that add little to the skills or value of those in the area of study. To this end, from 2019 a field campaign was conducted in the Iwokrama rainforest, in conjunction with the IIC. Samples were collected from small headwater streams from April–June, at the beginning of the rainy season in Guyana, to try and capture carbon mobilised by intense rainfall events as described earlier. The experience of collecting these samples, processing them in the rainforest lab at IIC and then conducting further analysis at the lab in the Lyell Centre, UK, formed the basis of the VR experience outlined in this chapter.

4 Game Structure

4.1 Modalities

For the full game experience, we blend a number of gamification modalities. We use physical group climate workshops and climate summit role playing with a VR game world for the scientific expedition. The physical group activities also work well online on the Teams or Zoom platforms.

Figure 3 shows the structuring of the game environment as consisting of a pre-expedition, climate scenario planning stage, the scientific expedition phase and a post-expedition climate summit phase. The expedition phase consists of five 3D modelled environments: at Iwokrama the base camp, field laboratory, sampling site and botanic gardens, and at the Edinburgh main Lyell Centre laboratory. Each modelled location also links to corresponding 360° video footage of the linked location. The pre-expedition phase consists of a climate workshop using the en-ROADS climate simulation developed by Climate Interactive (Climate Interactive, 2020). One of the authors (David Cole) is trained as a climate ambassador for Climate Interactive. The post-expedition phase comprises a physical climate summit role playing game simulation also making use of en-ROADS.

4.2 The Octalysis Framework

The Octalysis Framework (Chou, 2019) maps core motivational drives that, if addressed systemically in a gamified experience, are more likely to succeed in creating immersive, engaging and transformative experiences; that is experiences that challenge a player's assumptions, preconceptions,

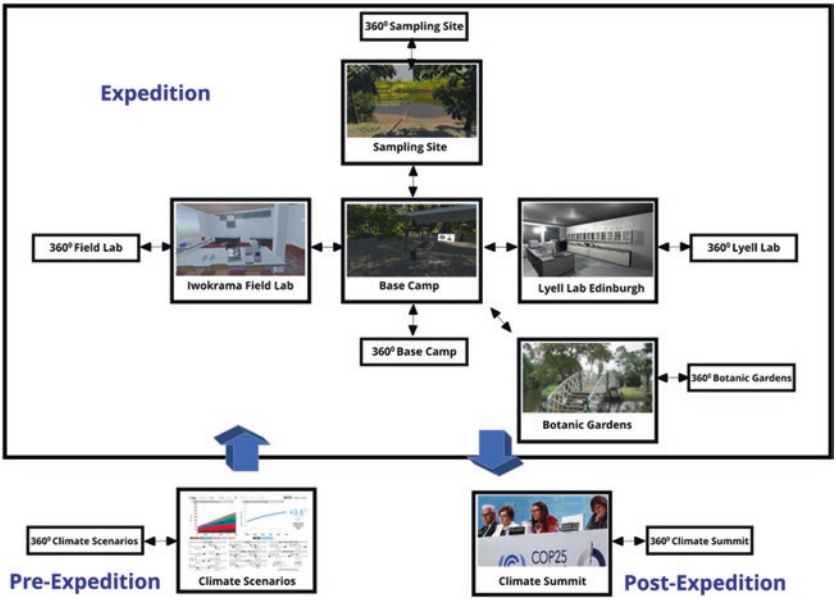

Fig. 3 The game environment structure

beliefs and values, affecting how they understand themselves, others and the world. This approach was used to help design the Iwokrama experience.

Table 1 describes the core drives and Table 2 summarises the game techniques used for the game experience. These techniques are referred to, when relevant, throughout the discussion of the game. Please note that the game technique reference numbers given relate to the Octalysis framework, so do not appear numbered sequentially in the text.

4.3 The Player Journey: Narrative Overview

We frame the narrative Fig. 4 (***game technique #10 Narrative***) of the game in alignment with the idea of high purpose. The world is experiencing severe disruptive social, ecological and political crises, of which climate change is one aspect. These dilemmas are systemic and need urgent systemic interventions (***game technique #84 FOMO Punch and #86 Evanescent Opportunities***).

Table 1 Octalysis Framework core drives

Core Drive	*Description*
Core Drive 1 Epic meaning and calling	This core drive uses game techniques that motivate players by inviting engagement in a cause that is both noble and "bigger than themselves". This aligns well with evolutionary purpose, as discussed earlier, as developmental levels emerge that can navigate and find accommodations from complexity. For many, this may align to evolutionary purpose as described in Teal organisations (Laloux, 2014).
Core Drive 2 Development and accomplishment	This drive engenders motivation when players can develop valued skills and accomplish meaningful tasks. This is relevant to all of the scientific methods and skills reproduced by the game.
Core Drive 3 Empowerment and feedback	Aligns with our innate desire and ability to create and to affect the environment in meaningful ways.
Core Drive 5 Social influence and relatedness	Human beings are social animals and gain meaning through our social interactions. Co-creation.
Core Drive 7 Unpredictability and curiosity	Adds an element of chance and unpredictability supporting users to explore and be engaged with the environment.
Core Drive 8 Loss and avoidance	This technique motivates through the fear of losing something or having undesirable events occurring.

The player is positioned at a unique and important place in human history, with an ability to contribute to a safe climate future (***game technique #27 Humanity Hero***). The player is invited to take on the role of an engaged citizen scientist.

Then the players attend a group workshop in which they co-learn about possible climate scenarios using the en-ROADS climate simulator. The workshop allows players to test the effect of climate policies on future warming. The players make suggestions, which are tested in the simulator showing the effect on future emissions. The model uses the system dynamics school of systems thinking, which models dynamic non-linear feedback processes in climate and energy systems (Fig. 5).

The aim is to create a set of policies that will reduce emissions and future warming to the safest levels possible supported by the best climate science. This is a physical workshop but also works well online in Zoom or Teams. After achieving a successful scenario, players are given a minute's silence after which they are asked to articulate "what it would feel like to

Table 2 Octalysis Framework game techniques employed in this study

Core Drive #	*Game technique*	*Description*
#1	#10 Narrative	This technique presents a narrative to the player that gives context about why they should play the game.
	#27 Humanity Hero	Invites the player to take the central role of hero within the narrative, which fosters a high degree of motivation.
#2	#2 Achievement Symbols	This technique enables players to achieve status symbols, for which they have pride.
	#17 High Five	This technique provides feedback as "flourishes" when a player achieves a level of skill.
	#92 The Rockstar Effect	The technique makes the player feel like they are central to the needs of others.
	#4 Progress Bars	The technique presents representations of progress in the game to the player.
#3	#31 Milestone Unlock	Small well-defined tasks, outside of the main story path, that add to a sense of achievement.
#5	#55 Water Cooler	Fostering social interaction throughout the game.
	#64 Trophy Shelves	Enables players to share achievements that they are proud of and gain recognition from them.
	#57 Brag Buttons	Provides opportunities for players.
	#22 Group Quests	The technique supports the players' ability to learn, co-operate and co-create.
#7	#48 Mini Quests	Small well-defined tasks, outside of the main story path, that add to a sense of achievement.
	#39 Random rewards	Providing random opportunities to make certain actions rewarding for players.
	#87 Obvious wonder	Adds mechanisms to show seemingly familiar things in a new light.
#8	#86 Evanescent Opportunities	Motivates based on the presentation of a possibility that has only a small "window of opportunity".
	#84 Fear of missing out (FOMO) punch	Motivates based on the fear of missing out on some important opportunity.

be part of that climate future". The responses are often inspiring (***core drive 1 epic meaning and calling***).

The successful scenario is shared on social media, and the players record the URL in their game log (***game technique #64 Trophy Shelves, game technique #57 Brag Buttons***). Next, with some systemic appreciation of the complexity, the player joins a scientific expedition to the Iwokrama rainforest in Guyana, to walk and work in the footsteps of climate

Fig. 4 The game narrative arranged in relation to the Kolbe learning cycle

scientists studying carbon transport in Amazonian rivers. Players set up a base camp, collect equipment, go to the sampling site to collect water samples, and complete pre-analysis tasks at the base camp and field laboratory. There are opportunities to do some personal fieldwork to study local fauna and flora (***game technique #48 Mini Quests***). Players are able to visit the botanical gardens to brush up on plant identification skills by keeping a field log up to date. While in the rainforest, players are able to experience some of the dramatic rainstorms that commonly occur there (***game technique #87 Obvious Wonder***).

After the expedition, players virtually travel to the Lyell Centre labs in Edinburgh to learn how to use state-of-the-art chromatography instrumentation to undertake river water analyses. Players may gain scientist status (***game technique #2 Achievement Symbols***). On completion, players are tasked to write a report on the findings of the scientific study and then present findings with groups of other players at a United Nations (UN) climate summit (***game technique #92 The Rock Star Effect***). With

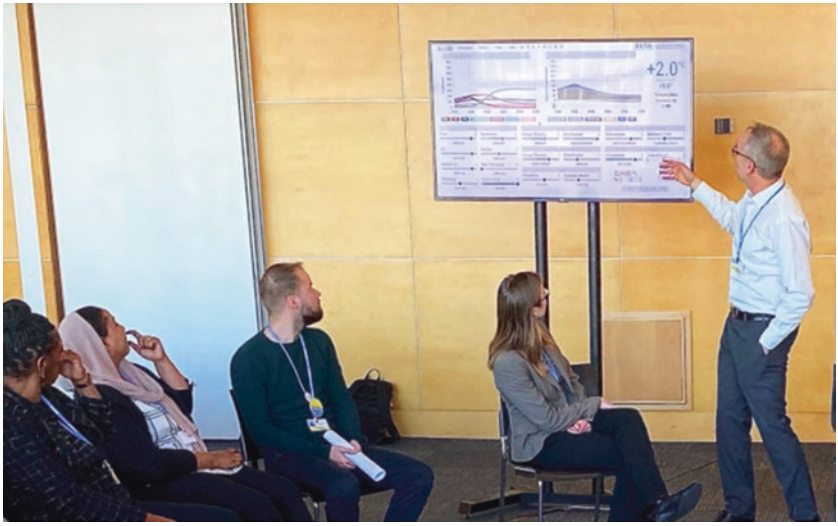

Fig. 5 An en-ROADS climate workshop

stakeholder groups (***game technique #22 Group Quests***) such as the government, industry, non-governmental organisations (NGOs), activists, and agriculture and land users, players attempt, through discussion and negotiation, to jointly create policy. Policies are tested out between rounds of engagement in the en-ROADS climate simulation.

Now, having gained insight and expertise, players are invited (optionally) to undertake the en-ROADS climate ambassador training scheme to become a Climate Interactive "Climate Ambassador", thereby supporting and facilitating future rounds of the learning cycle, and in which participants can come to ambassadors for queries and help (***game technique #92 The Rockstar Effect***).

Finally, players are invited by a call to action to engage in personal and organisation actions in the real world and are provided resources to support this (***Core Drive 3 Empowerment and Feedback***).

4.4 Implementation of Virtual Iwokrama Expedition

The player enters the VR expedition game at the base camp location, collects sampling equipment and travels to the sampling site. The player carries out sampling activities described by the story board seen in Fig. 6.

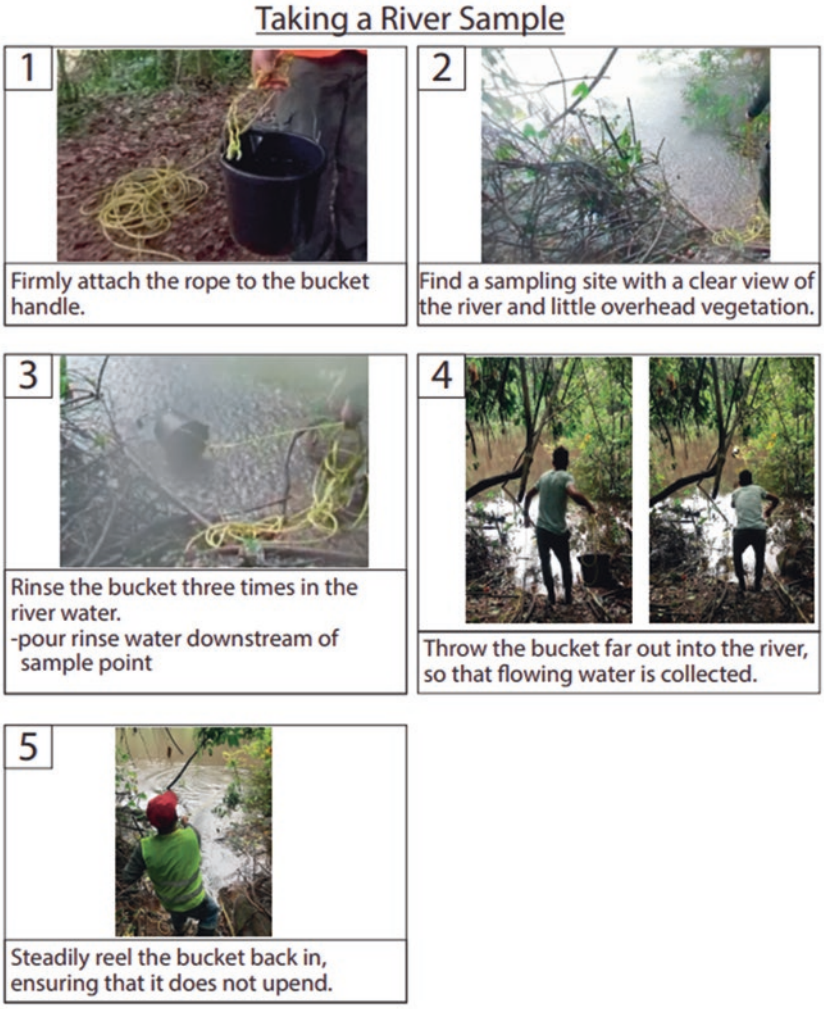

Fig. 6 Sample site story board

The player can navigate to a 360° video of the sample site to see exactly what the location looks and feels like (***Game technique #48 Obvious Wonder***). The player can take a photo of the location for their virtual logbook.

In VR, the player can manipulate objects, using hand controllers, to perform tasks. Figure 7 shows the player readying the bucket to throw into the river to collect a sample. The modelling of the dynamics of the rope and fluid dynamics enable the very effective sense of realism in casting the bucket out and rinsing the bucket.

On completion of each set of operations the player is congratulated with a flourish (***game technique #17 High Five***), and the players' skill profile is updated in their log. The player then returns to the base camp in order to carry out field filtration (Figs. 8 and 9).

During the fieldwork players have the opportunity to take a break to carry out mini quests to add experience to their field logs. These take the form of fauna and flora identification in the botanical garden location (***game technique #48 Mini Quests***). Also, some wildlife species may randomly be spotted, giving an opportunity to take photographs to be put into the field log (***game technique #48 Random Rewards***). Rainstorms are dramatic in the rainforest, and so the weather in the game changes to bring in occasional rainstorms (***game technique #48 Obvious Wonder***).

Fig. 7 Sample site location modelled (Left) and 360° video (right)

Fig. 8 Field filtration story board

Fig. 9 Base camp location modelled (left) and 360° video (right)

After completing activities at this location, the player then navigates to the field lab at the Iwokrama field centre to carry out the initial analysis (Figs. 10 and 11).

Finally, the player travels to the virtual Lyell Centre Laboratories to run detailed sample analysis using state-of-the-art liquid chromatography instrumentation (Figs. 12 and 13).

4.5 Post-expedition en-ROADS Role-Playing Game

In order to consolidate the experience of carrying out science in the Amazon rainforest, players finally create a scientific report and present it at the en-ROADS climate summit game. This is a physical game based on role playing members of industry, government, and NGOs, focused on energy, land use and climate policy. The facilitator guides the game by taking the role of the UN Secretary General or the Executive Secretary of the UN Framework Convention on climate change (UNFCCC). The experience is framed by the en-ROADS climate simulation (Fig. 14).

Players are encouraged to share experiences and insights on social media setup for the game and in discussion groups on the ConnectUs (see technology and platforms) platform (***game technique #55 Water Cooler***).

4.6 A Call to Action

Throughout the game, next stages are not unlocked until the player has carried each set of activities. Players cannot attend the climate summit until they have produced a report from the expedition (***game technique #31 Milestone Unlock***).

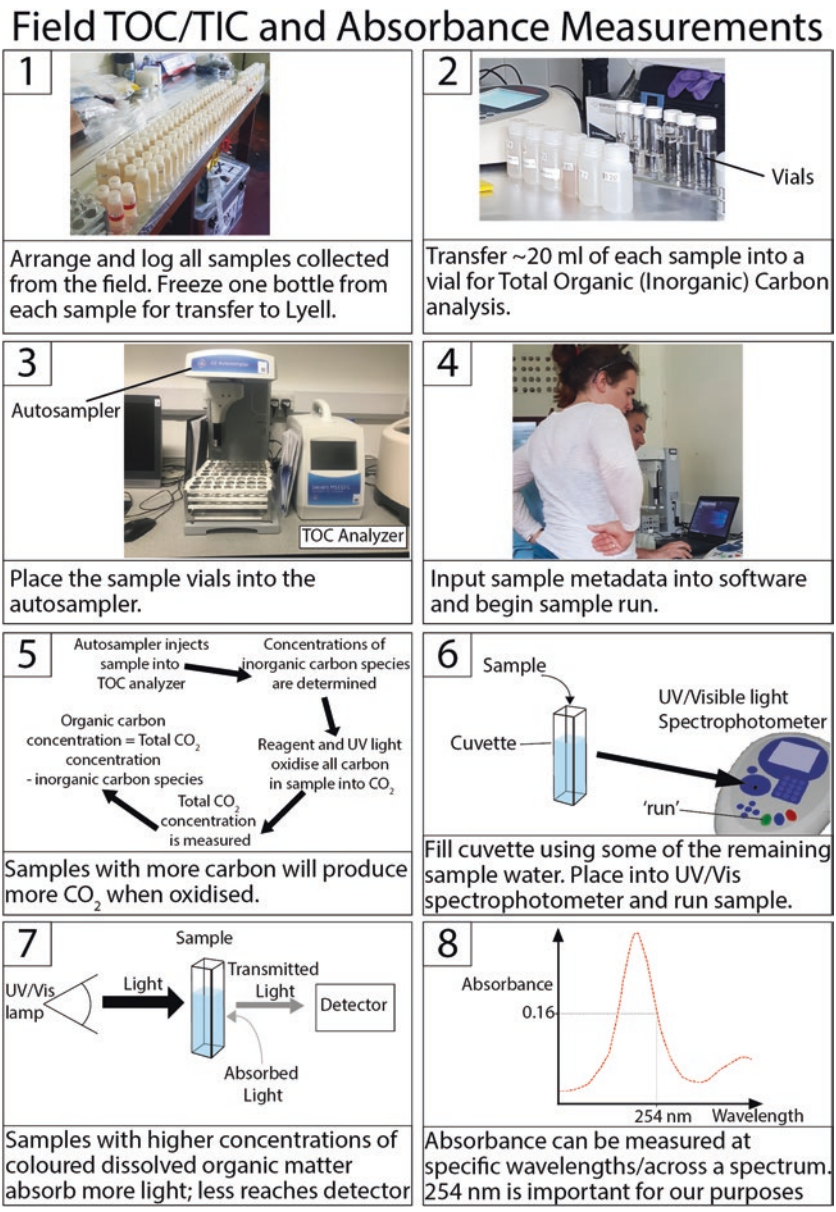

Fig. 10 Field laboratory analysis story board

Fig. 11 Field lab modelled

After the climate summit, players hold a group session to discuss how they as individuals and groups can take climate action. Resources and suggestions are provided. Past players can become "climate champions" and act as mentors (***game technique #61 Mentorship***) to those less experienced in later rounds of the game (***game technique #92 The Rockstar Effect***).

5 Discussion

5.1 Virtual Reality, Multiple Perspectives, Empathy and Role Play

"A systems approach begins when first you see the world through the eyes of another" (Churchman, 1968, p. 231). One of the central tenets of systems thinking is understanding that social reality is co-created by human beings who may hold different often contradictory perspectives for a situation of interest, arising from differing assumptions, understanding and mental models. When understanding complexity, it is beneficial to consider as many perspectives as possible. One of the promising aspects of IVR experiences is that it allows players to be viscerally "present" as another in a role-playing game. In the Iwokrama game, we invite players to step into a number of perspectives, both in the VR experience and in

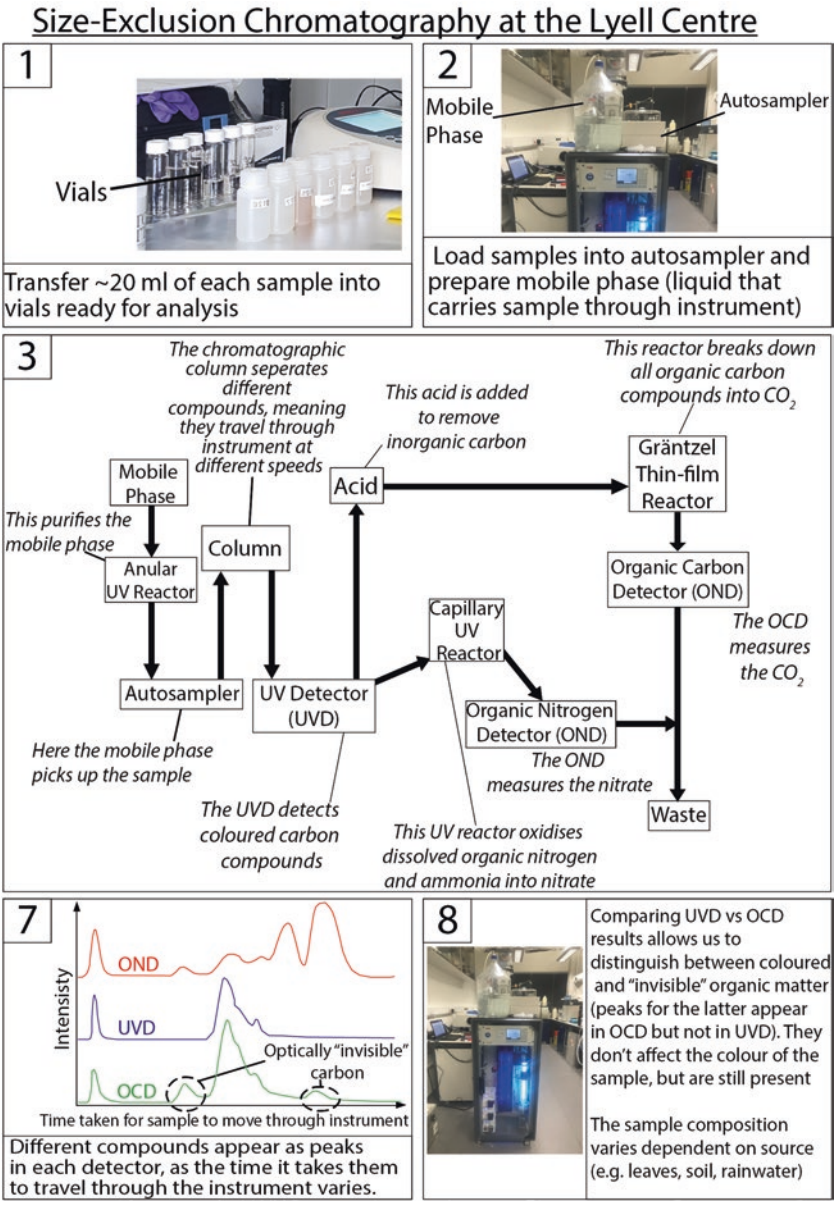

Fig. 12 Main analysis story board

Fig. 13 Lyell lab model (Edinburgh) and analysis equipment (right)

Fig. 14 The en-ROADS climate summit game (with permission from Climate Interactive)

the physical game; climate scientists, UN Secretary General (as facilitator) and stakeholders in business, government, civil society, renewable energy, industry and commerce, world governments and activists.

There are claims that VR headsets are "empathy machines". If empathy is the ability to sense other people's emotions and imagine what it is like to be the other person, then VR will only invoke empathy if the designed

experience is designed to do so. As we bring in more perspectives to the game, we will strengthen empathic experiences for example bringing in the experiences of indigenous communities with regards to forestry and land use.

5.2 Context, Narrative and Purpose

Human beings have an innate drive to obtain meaning. All systems have purpose, and considering people as systems raises the notion of individual and group purposes. "The single best way to add meaning to our lives is to connect our daily actions to something bigger than ourselves—and the bigger the better" (McGonigal, 2012 Location 1738). It is perhaps paradoxical that happiness may arise out of wholehearted commitment to face and engage the difficult challenges of the realities of the twenty-first century. This is foremost in the narrative for our game, as the call to "save the world" is not so much in an alternate reality but is very much related to our current dilemmas.

McGonigal defines the term "super empowered hopeful individuals" (SEHIs) to describe someone who feels not just optimistic about the future but also *personally capable* of changing the world for the better (McGonigal, 2012). We hope that our players will become SEHIs by grounding them with rigorous climate science, then enabling them to see that scientific understanding is crucial for informed policy decisions and multi-stakeholder climate negotiations. This is particularly important in an emerging "No truth" world. Also, the overall experience is both positive and hopeful; we have everything we need to avoid the worst of climate change effects if we act wholeheartedly, systemically and with some urgency. Players are encouraged to act and become mentors and/or climate ambassadors for the next round of players.

5.3 Temporal Considerations

One of the things people find difficult to understand about systems are feedback effects that only emerge over extended time periods. The en-ROADS climate simulation vividly demonstrates possible future consequences of action or inaction taken in the present to affect the future as far as 2100.

McGonigal notes that many gameplayers have nurtured three skills that are in essence systemic skills, which are "taking a long view, ecosystems

thinking, and pilot experimentation", all of which we hope are strengthened in the game experience.

5.4 Relationships and Social Connectivity

Research has shown that happiness depends on the quality of our social connections with others (Haller, 2006). We have built that into the experience. Achieving positive outcomes at key stages of the experience is shared to social media, the game platform supports discussion between players and players are invited to become climate ambassadors that will mentor new players, widening presence on social networks.

6 Evaluation and Future Work

Across a diverse set of participants, Climate Interactives climate simulation has been associated with statistically significant gains in three areas: (1) knowledge of climate change causes, dynamics and impacts; (2) affective engagement including greater feelings of urgency and hope; and (3) a desire to learn more and intent to take action in the real world (Rooney-Varga, 2018). Our initial evaluation agrees with these findings. We will carry out a full analysis for the combined experience of physical role playing and the VR game.

During the next expedition, we wish to bring in experiences from a wider set of perspectives, indigenous peoples and also Guyanese people living in the coastal regions, many of whom have never been inland into the forest. The development of the game experience therefore will be iterative as multiple perspectives are included.

7 Technology and Platforms

7.1 Unity 3D

The computer game components of the learning experience were created using Unity, which is a platform for creating and operating interactive real-time 3D content. Unity supports the creation of multiple platform games and experiences as well as cross-platform VR games and experiences.

7.2 Blender

Blender is a free and open source 3D creation suite. Where suitable third-party 3D models were not available, particularly for analysis instrumentation, models were hand created in Blender.

7.3 ConnectUs and the Microsoft Azure Cloud Platform

ConnectUs is an online learning platform developed in the Edinburgh Business School to deliver the school's flagship MBA by distance learning, educating 22,400 students with 10,000 active students and 22,000 Alumni in 158 countries. The platform is designed to maximise interaction and a sense of community, supporting both paper-based exams and formal E-Assessment Exams (over 5000 to date) and 5200 online tutorials (Fig. 15).

The platform supports gamification allowing embedded WebGL game content to be included in courses and supports the persistence of game states and messages to and from game content. ConnectUs runs on the Microsoft Azure cloud platform, providing robust scaling and wide geographical availability, and will also enable the use of Microsoft's evolving AI and machine learning capabilities in the near future. The platform enables addition of (***game technique #55 Water Cooler***) by providing discussion forums where players can share experiences.

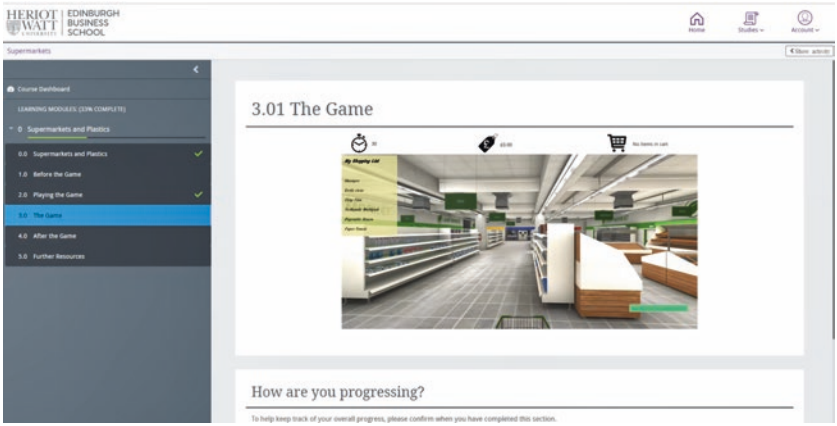

Fig. 15 The ConnectUs platform running an embedded WebGL game

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Gamification Service Framework and Transformative Services: Applications for Environmental, Social and Organizational Changes

Sol Klapztein and Carla Cipolla

1 Introduction

The purpose of this chapter is to demonstrate how gamification can act in the improvement of transformative services. Specifically, we will present the Gamification Service Framework (GSF) (Klapztein & Cipolla, 2016) as a gamification approach to services aiming at environmental, social and organizational changes. Next, we will visualize the application of the GSF in three related cases with critical design problems, reconfigured through the proposition of design recommendations aiming at increasing users' engagement and improving their experiences. We see the GSF, as a tool

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specifically designed to improve service experiences, as something able to make a positive impact in social transformative areas like sustainability, behavior change or innovation, among others.

The Gamification Service Framework is an artifact that uses resources from service design and game design areas to gamify services. To this end, it operates by modifying and restructuring services and their experiences in a similar way to game activities (Klapztein & Cipolla, 2016). The service design has the function of acting analytically and operationally, by mediating the analysis of the characteristics and needs of the services, and also acting in its redesign. The game design has the function to propose concepts from Game Studies and adapt them to the service's specific characteristics and objectives. Gamification, which refers to the use of game design elements in non-game contexts (Deterding et al., 2011), in a broader understanding, is game design applied to the human world. In our particular view, without the design mediating the gamification processes, there is a risk to gamify services disconnected from their real characteristics, qualities and potential.

Aiming at the introduction of the GSF as a tool potentially capable of fostering engagement in transformative services, we selected three services with social transformative potentialities. These can be defined as services meant for supporting the emergence of a more collaborative, sustainable and creative society and economy (Sangiorgi, 2011), operating within its specific communities for different transformative ends. The cases aim at:

1. Environmental ends, with Recicla-CT (Recycle-CT), a recycling program that implemented actions and policies for garbage collection and recycling at a university campus, to contribute with solutions aiming at making users more environmentally conscious and their habits more sustainable;
2. Relational and socially progressive ends, with CaronaUniversitária (Universitary Ride), a service aiming to strengthen social bonds and interpersonal relations on a university community by implementing a ride-sharing service;
3. Human-centered and participative culture ends with Sistema de Notificação de Incidentes (Incident Notification System), a service that seeks to empower users and employees on a university hospital, aiming to encourage a culture of participatory inspection of the health services and to foster zeal for the public.

This chapter covers the application summary of the GSF in these three services. We first present each of them in their initial state and after the application of the GSF and highlight the most relevant points of their gamification processes. We then list the design recommendations aiming at the improvement of users' experiences, pointing out the expected benefits in each case. In the Recicla-CT, the application of the GSF generated design recommendations aiming at increasing the overall participation of users, the quantity of garbage collected and recycled and the awareness about sustainability issues. In the CaronaUniversitária, the application resulted in design recommendations aimed at increasing the number of rides, decreasing the demand for alternative transport and favoring new social interactions in university. Lastly, in the Sistema de Notificação de Incidentes, the GSF has been applied focusing on the improvement of notification processes, making them more participatory, responsive and transparent, at the same time proposing a more agile system for resolving these incidents.

Finally, we discuss in a more general view the possible particularities and consequences of the gamification of services as a catalyst for social transformation processes, trying to predict possible new application scenarios and discussing improvements for the GSF tool.

2 Gamification Service Framework and Transformative Services

2.1 Contextualization

There is a growing interest in service design acting in support of social and organizational transformation issues (Sangiorgi, 2011). Consequently, services have been discussed as a means to support the emergence of a more collaborative, sustainable and creative society. This transformation can be from inside out, working within organizations to inspire changes in services and society, or vice versa, working with society to imagine new systems and service models (Freire & Sangiorgi, 2010). In this sense, users must be understood as collaborative agents for social transformative ends. Similarly, the increase in user participation can result in more appropriate services and a growth in self-confidence and social capital (Popay, 2006). In this context, it is essential to foster services with resources that promote the creation of a culture of participation and engagement. Gamification

can fit in this context providing solutions for these necessities, working in developing design solutions to promote more engaging and participatory experiences. With better service experiences we believe we can potentialize these social changes through a viable path for gradual transformation towards a better society.

Since gamification emerged fairly recently as a field, the effects of gamification on services are still debated. However, in recent years, there has been more clarity regarding the impact of gamification on service provision, and researchers seem to have reached a consensus based on the predominantly positive empirical studies (Hamari, Koivisto, & Sarsa, 2014; Koivisto & Hamari, 2019). The available studies largely confirm, to the best of our knowledge, positive effects of gamification in a wide range of areas and approaches.

For Hamari and Koivisto (2013, 2014), Rapp (2015), Robson et al. (2015), Hammedi et al. (2017) and Hammedi et al. (2017), the gamification effectiveness potential seems to be linked to the way it is effectively applied. When it is utilized superficially,[1] the results tend to be more likely to be negative or to have a short-term impact. When applied in a deeper and integrated way, assessing service potential and needs, the results tend to be more positive and its effects have a greater outreach and impact. Our particular understanding is that without the use of design resources that seek an in-depth understanding of the service, gamification can only act superficially, with its effects being less effective and more cosmetic.

In the services domain, according to Shostack (1984), it is difficult to guarantee the quality of a service in the absence of a detailed design process. Gamification, in turn, is enacted with game design resources in the real world, aiming to make its processes and experiences more similar to those found in games. These resources, successfully utilized for decades by the games industry, have the potential to make experiences more engaging, participatory, meaningful and enjoyable (Hamari et al., 2014).

In the service field in particular, Huotari and Hamari (2012, 2017) offer a more in-depth understanding of gamification as a service improvement process through the use of concepts from games. For them, the convergence of the service and gamification can help to structure how gamification can be part of services or help in the development of gamified services. The Gamification Service Framework, in its turn, creates a

[1] For example, with the use of ready-made solutions and concepts and/or without a detailed investigation about the service characteristics, objectives and potentialities.

convergence between these two areas, combining service design and gamification capabilities aiming at the improvement of users' experiences in services.

2.2 GSF Summary

The Gamification Service Framework (Klapztein & Cipolla, 2016) is a tool developed through an approach with the Action Design Research methodology (Sein, Henfridsson, Purao, Rossi, & Lindgren, 2011). It proposes to gamify services through a system that seeks to understand and restructure them in a similar way to game activities, using service design and game design resources in a joint and integrated way. Service design acts in the most specific roles of analysis, mediation and regulation of processes, while gamification acts in a more projective and transformative role, proposing improvements in service experience based on game design concepts.

The collection of game design concepts used in the GSF was researched, classified and systematized in a framework that groups them according to seven components analogous to the formative components of game activities (Klapztein, 2012). They are Voluntariness, Rules, Control, Objective, Feedback, Perception and Social Interaction (Table 1).

The GSF application methodology can be simplified in a four-phase process based on the Action Design Research methodology.

1. Problematization, where the need for the gamification of a service is delimited for some reason or objective;
2. Building, including three sub-stages: (1) data collection; (2) mapping with a Business Model Canvas (Osterwalder, 2004), Personas (Miettinen & Koivisto, 2009) and a Service Journey (Miettinen & Koivisto, 2009; Mager, 2009) and (3) the assessment of the critical points, objectives and the pros and cons of the service;
3. Intervention, which also includes three sub-stages, whereby the first two use a brainstorming process. First, we assess how and if a particular component of the game activities can fit into a particular resource or stage of the journey and, in sequence, which game design concept of that particular component can be used in a coherent and meaningful way. Second, the previously selected game design concept is adapted to the particularities, characteristics and objectives of the service. The first two stages usually occur repeat-

Table 1 Gamification Service Framework components

Voluntariness [Vol] has to do with aspects related to the preconditions for participation in-game activities. Without voluntary participation, there is no game, but something as an ordinary activity. The concepts related to this component can be influenced by factors related to the games themselves, as well as by personal, social and cultural ones. The more attractive a game activity appears to be, the greater the propensity of users to experience it;
Rules [Rul] have to do with the logical, technical and material aspects of game activities and how they can influence these experiences. They deal with formal and logical structures and how they will be presented and experienced;
Control [Con] is a hybrid component, which depends on technical aspects (rules) and shapes the gaming experience itself. It deals with aspects related to the feeling of control over activities, shaping the way users interact with the service/system;
Objective [Obj] deals with concepts linked to the goals proposed by the game and how these elements motivate users. The establishment of objectives/goals/challenges directly influences the pleasure obtained in such activities. Concepts related to the objective component have to do, for example, with the implementation of short- and long-term goals;
Feedback [Fee] has to do with responses provided by the game system based on the users' actions. Its concepts are responsible for keeping players informed about their performance and progress. Through game responses, the feedback component shapes experiences, directs actions, rewards users for their successes and punishes them for their failures;
Social Interaction [Soc] deals with social aspects inserted in the game activities, such as communication, self-expression, status, teamwork, companionship and competition. For certain user profiles, these factors can be highly influential and motivating;
Perception [Per] has to do with aspects related to sensations, emotions and feelings enjoyed by users when experimenting with game activities. Pleasure is ultimately what makes people play. If activities are not recognized as potentially pleasurable, rewarding and meaningful, their overall experience tends to fade.

edly in each step of the service journey. Third, the gamified service journey is set up with all its new features, where the coherence of the set of these resources must be calibrated.

4. Evaluation, where the new features are evaluated and tested. The process can then be repeated for another development cycle or progressed to prototyping and implementation, which is outside the scope of this methodology. In academic settings, the implementation process can also be subject to evaluation.

It is also important to emphasize that the GSF does not deal with the development and implementation of gamification resources in services, but rather with the development of design recommendations that shall guide and regulate this process.

3 Gamification Service Framework Application Cases

In this section, we report on the three applications of the GSF applied to different types of transformative services. The first two cases are from academic projects that have not been fully implemented yet. The last one is part of a project that has been under development but had to be suspended due to COVID-19 pandemic. We will therefore not present results of the application of the GSF here, but rather illustrate its implementation process, the design recommendations generated and its perspectives for social transformation. We illustrate the potentiality of the GSF as a catalyst tool for different types of social transformations.

3.1 Recicla-CT

Recicla-CT is an experimental recyclable waste collection program operating since 2007 on the campus of the Technology Center of the Federal University of Rio de Janeiro (UFRJ) in Brazil. The program collects, classifies and weighs the material, delivering it for free to partner organizations for recycling. Its main objective is to promote environmental actions and policies for selective garbage collection and recycling in the university environment. The materials collected range from the most commonly recycled types, that is, paper, plastic, glass and metal, to those that require more complex recycling processes, such as styrofoam, vegetable oil, batteries and lamps. The service also works by collecting obsolete electronic equipment.

From the user point of view the program operates in two ways. First, recyclable waste collectors are distributed across campus, with garbage being collected periodically. Second, a scheduling service is provided to collect large volumes of waste from the requesting departments.

In a preliminary analysis, we assessed that the service central aspects to be considered in the gamification process would be the increase of users adhesion and general use, the increase of the rate of waste collected on campus, the increase of the recycling rate of these materials, the promotion of sustainability-related issues and the cleanliness improvement of the campus.

3.1.1 GSF Application

With the mentioned aspects as a guide, we applied the GSF to Recicla-CT through our four-phase process.[2]

Phase 1: Problematization

A preliminary stage where proposed services were evaluated regarding the research requirements. They are services with social innovation potentialities, transformative services and services with sustainability-related objectives. The priority was given to services related to the university environment, usually more conducive to research development, but two municipal recyclable collection services were also initially prospected at the time.

Phase 2: Building

Stage divided into three sub-stages:

- Data collection, where the service was properly understood through the analysis of documents and media, interviews (mainly the service staff), immersion in the service experience and visitation to the facilities (executive office, processing center and other operational locations);
- Mapping, where the service experience was represented through the Business Model Canvas, the Personas tool (including students, visitors and university staff) and the Service Journey map, which can be divided into three different journeys:
  - Journey of users who uses the colored dumpsters to dispose their waste;
  - Journey of users who dispose large volumes of recyclable waste by transporting them to a large collection bin or scheduling their removal with the service personnel;
  - Journey of users who schedule the removal of obsolete, unused or damaged electronic equipment;
- Assessment, through the data from the previous sub-stages, of the most relevant characteristics, critical points and objectives to be addressed, specifically:

[2] For a full detailed and described implementation process, see Klapztein and Cipolla (2016).

- Lack of communication policies and strategies that promote Recicla-CT and encourage the participation of potential users, which ends up hampering their understanding of the service, the adhesion of new users and more effective participation;
- Few options for contacting service administrators, which limit communication channels with the general public;
- Lack of feedback on the service experience and in the dissemination of reports with program actions and objectives;
- Lack of an incentive/reward system for service usage;
- Lack of a goal system that helps users to remain engaged.

Phase 3: Intervention

Through the three sub-stages previously described we mapped the service journey with the following gamified recommendations (with the Game Components used in each case):

- Implementation of communication strategies and policies that disseminate and encourage the participation of potential new users, such as the reformulation of the service visual identity and its website [Vol];
- Communication strategies focused on encouraging participation [Vol] and promoting its benefits [Obj, Fee]. Dissemination of explanatory materials about the different types of service provided [Con, Per];
- Dissemination of messages of encouragement and thanks for the conscious use of waste dumpsters [Fee, Vol, Per];
- Availability of periodic reports on the website and social media [Fee], highlighting collective achievements, benefits, beneficiaries and goals to be achieved [Obj, Fee];
- Development of an online collection request system for large volumes and electronic waste [Rul, Con];
- Availability of certificates for donors of large volumes of recyclable materials [Fee], with information on the destination of the donated materials and incentives for continued participation [Obj, Fee];
- Provision of rewards to more engaged users, such as gifts with recycled materials from the service itself [Fee];
- Development of an online ranking system giving visibility to the departments with the highest donations number [Rul, Fee, Soc];
- Possibility to invite friends from social networks to join in [Soc];
- Missions system for more engaged users, such as task forces for cleaning and collecting materials, participation in events related to environmental issues and surprise missions [Obj, Per, Rul].

Phase 4: Evaluation
Evaluation of the gamification process, the proposed components and concepts and assessment of the chances of successful implementation.

3.1.2 Transformative Services' Perspective

From the social transformation perspective, the use of the GSF on the Recicla-CT had the general objective of potentializing, through the suggested improvements in the service experience, the adoption of more sustainable habits by the community involved. These improvements, if successfully put in practice, can lead to a cleaner campus, the increase in the amount of waste collected and recycled, user participation rate, number of active users and user awareness about sustainability-related issues (inside and outside the campus) and economic and social benefits for partner organizations. Partially achieving these objectives does not seem to have the potential to transform social habits, but if the objectives are addressed in a systemic way, the potential for such transformations gains momentum.

The ultimate goal of the Recicla-CT gamification project was to provide design resources that can enhance the service experience in multiple and complementary ways, making it potentially more attractive, easier to use, rewarding and engaging and, as a result, transformative.

3.2 CaronaUniversitária (CarUni)

CaronaUniversitária is a car ride scheduling service that operated between 2010 and 2012 at UFRJ. It was designed by two master students from the Production Engineering Program at COPPE/UFRJ. Its main purpose was to simplify car rides in the university area through an online scheduling system. It sought to meet two complementary demands: people who wanted mobility solutions with good value for money and drivers who wanted to offer rides to colleagues (to partially recover their costs or to socialize).

CarUni's three main values were safety (the service was open only to registered university members), comfort (avoiding overcrowded and inconvenient public transport systems) and socialization (enabling socialization and interpersonal relationships). CarUni also stated its commitment to sustainability-related objectives (reduction of the environmental impact through increased vehicle occupancy, and reduced traffic,

local pollution and fuel usage). In a metropolis with diverse social problems like Rio de Janeiro, a decentralized, bureaucratic, safe, low cost and low impact solution, if adopted by a representative user base, can foster a significant transformative potential for the community involved.

The service was offered and provided online. On the website, registered university members (civil servants, students and teachers) could request or offer rides. If there is a match of requests and offers between the users, they could contact each other directly and schedule the service.

Initially, we assessed that the central aspects to be considered in the gamification process are the increase in the retention of new users, the increase in service usage, the increase in the active user base, the increase in the number of rides carried out, the promotion of greater socialization and conviviality and the improvement of aspects related to transport and local traffic.

3.2.1 GSF Application

Below are the results of GSF applied to the CaronaUniversitária.

Phase 1: Problematization

Candidate projects were evaluated regarding the following requirements: services with social innovation potentialities, transformative services and services with sustainability-related objectives. As in the previous case, the focus was also on services related to the university environment.

Phase 2: Building

Stage divided into three sub-stages:

- Data collection, where the service was properly understood through the analysis of documents and media, interviews (with service creators) and immersion in the service experience;
- Mapping through the Business Model Canvas, the Personas tool (students/university staff and/or drivers and hitchhikers) and mainly the Service Journey mapping, divided into two complementary journeys:
  - Journey of the users who access the service to look for rides;
  - Journey of the users who access the service to offer rides;

- Assessment of the most relevant service characteristics, critical points, positive/negative features and objectives to be addressed;
- Lack of communication policies and strategies to promote the service as something interesting, innovative and that really works:
  - A bureaucratic user registration system, with tedious steps making it difficult to start using the service;
  - Social interaction resources outdated, ineffective and limited;
  - Few options for socialization between users;
  - Lack of a reward system;
  - Lack of all kinds of feedback (users rating, ride classification, service personnel contact), mainly after the journey ends.

Phase 3: Intervention

Through the same sub-stages we remapped the service journey with these gamified recommendations:

- Implementation of enhanced promotion strategies: social communication focused on encouraging participation and extolling the benefits generated by the service usage; clear and engaging communication of the service features, characteristics and resources; reformulation of visual identity [Vol, Per];
- Quick and easy registration system [Rul, Con, Per], simplified interface and user system [Con, Rul];
- Development of a point and level system, with additional resources linked to a rewards system (e.g. carpool priority, parking discounts) for already engaged users [Rul, Fee, Obj];
- Implementation of new tools for social interaction (chat between users, profile view, an invitation on other social networks, etc.) [Soc, Rul];
- Missions system, where users can be challenged to perform tasks specifically shaped for their profile [Obj, Rul];
- Virtual (ranking, badges, avatars) and physical (discounts, t-shirts, stickers) rewards system [Fee, Rul];
- Development of a communication and feedback system between users and service staff, making it possible to classify users and report them in case of any security issue [Soc, Fee, Rul];
- Implementation of ride points in different places on the university campus [Rul, Per, Vol];

Phase 4: Evaluation
Evaluation of the GSF process and their results (the relevance of the proposed game design components and concepts and the possibilities of implementation and success). Decision to proceed to the test phase or to do new adjustments.

3.2.2 Transformative Services' Perspective

Similar to the Recicla-CT, from the social transformation perspective, through GSF, the CarUni gamification project focused on improving the community involved mainly through the adoption of social and relational habits. If successfully put in practice these improvements in the service experience could lead to some degree of reduction in local traffic; to the increase of occupancy rate per car and socialization between users, reduce CO_2 emissions and commuting time as opposed to public transport and save costs for some users.

The ultimate goal of the CaronaUniversitária gamification project was to enhance the service experience in multiple and complementary ways through the provision of strategic design resources capable of making it potentially more participatory, rewarding, attractive, easy and pleasant to use.

With only one or two of these objectives achieved, it is hard to picture a significant degree of transformation. It is crucial that the service brings significantly more perceived benefits than the previous one. Thereby, one time inside, the majority of users shall not even think about coming back to older habits. This is why it is so important that the service improvement acts structurally and systemically, addressing its different issues with integrated solutions.

The CarUni gamification has the objective to enhance the service experience making it more structurally similar to game experiences through the implementation of game design resources. We hope this process can result in a more potentially transformative service.

3.3 Sistema de Notificação de Incidentes (SNI)

The third case is the gamification project of the Sistema de Notificação de Incidentes, currently in operation at the Pedro Ernesto University Hospital in Rio de Janeiro. The SNI seeks to meet the need for knowledge, action and resolution of any adverse incident related to the health and safety of the hospital patients.[3] In theory, notifications can be carried out by users, family members and hospital professionals (teachers, health professionals, residents and academics). In practice, however, almost all are made by the nurses.

The service starts when a user becomes aware of a problem or irregularity in the variety of treatments and services offered by the hospital. Then, the user must go to a room equipped with a computer with internet access and a printer, print and fill out the notification form and deliver it to the department responsible. The main objective is to make the hospital management aware of the incident as quickly and accurately as possible so that they can take action.

When the notification is issued, the Patient Safety Center[4] is also notified. It then forms a working group specific for the type of incident. All the hospital employees are encouraged to participate in this process. If the person is not an employee, his participation is optional. The working group analyzes the case and carries out an action plan following tools and techniques such as the London Protocol, 5W2H, Brainstorming, Affinity Diagram, Cause-Effect Diagram, Failure Mode Analysis, among others.

The SNI is currently in the early stages of migration to a fully online system that, at the moment, is not yet operational. Although its implementation seems to bring clear advantages, we believe this can lead to a critical problem for most potential users. As this new online service will be part of the hospital's internal data system, it can only be accessed by accredited professionals, preventing other users from using it. With this potential issue in mind, our gamified service aims to work separately from the online SNI, communicating with the system through web service integration without accessing it from inside, working in a separate layer.

[3] Examples: Incorrect medication administration, mistreatment, harassment, incorrect treatment, accidents of all kinds, equipment malfunctions, errors in patient feeding, omission of help, poor cleanliness or hygiene and so on.

[4] The responsible sector for investigating the cases.

The initial proposal is that the new gamified system can be utilized through two interfaces: a website (for casual users, such as visitors and patients) and a smartphone application (for more frequent users, such as health professionals), with both systems mediating the exchange of data between the users and the hospital's online system, without the later having to be accessed for non-authorized personnel.

While in the other two services the theme revolved around socio-environmental issues, in the SNI the main objective is to improve the quality of hospital services by empowering its users. Therefore, the project aims to develop a tool that enhances the supervision of the hospital services, making the system more agile, transparent and efficient.

In a preliminary analysis, we identified the following aspects to be considered in the process: the increase in service usage, the retention of new users, the increase in the active user base, range of users and number of incidents reported, the possibility to track notifications, real-time feedback system, the increase in user engagement with the hospital and its services and more transparency and agility in incident resolution.

3.3.1 GSF Application

The GSF process applied to this case is presented below; however, it does not include the Business Model Canvas and the Personas tools, applied to other cases.

Phase 1: Problematization

This initial stage occurred differently from the previous. We heard about a potential candidate that fit our profile and we went to talk directly with its coordinator. In common with the previous cases, this service is also inserted in a university environment and has a transformative potential.

Phase 2: Building

- Data collection, with preliminary analysis through an examination of documents, exploratory meetings, interviews with the Patient Safety Center coordinator and visits to where the service operates;
- Mapping through previous data and the Service Journey mapping, divided into two complementary journeys:
  - Journey of the "casual" users, who do not visit the hospital frequently and would access the service preferably through a QR Code that leads to a website;
  - Journey of the "frequent" users, who are professionals that work in the hospital and would access the service through a smartphone application already installed.
- Assessment of the most relevant characteristics, critical points, positive/negative features and objectives to be addressed:
  - Lack of communication policies and strategies that promote the service as efficient, advantageous, participatory and easy to use;
  - Difficulty to access and use the service, because a system currently depends on hospital staff and equipment for access;
  - Technical and bureaucratic obstacles to filling and delivering the forms, which has to be done manually and in person in a specific department;
  - Lack of any type of feedback after the delivery of the notification, whereby sometimes the user (especially if he/she is not a hospital employee) does not receive any communication about the progress of the notification until the investigation process is in an advanced stage or even resolved;
  - Lack of a reward system for more engaged users.

Phase 3: Intervention

Same process as in previous cases, with the following recommendations:

- Implementation of enhanced promotion strategies: social communication focused on encouraging participation and promoting its benefits; effective communication of service main characteristics and resources; visual identity reformulation [Vol, Per];
- Access facilitation to the service with options for use via website and smartphone application, promoted throughout the hospital environment [Con, Rul, Per];
- Dissemination of posters with QR codes enabling direct access to the service's website [Rul, Vol, Con], emphasizing that all hospital users including visitors can access and use the service participatively and safely [Vol, Per];
- An online interface only, eliminating the need for paper forms and face-to-face delivery [Rul, Con];
- Partially automated inputting in the form [Fee, Con, Rul];
- An easy registration system, using data from the notification form to register users [Rul, Per];
- Gamification features specific to frequent users (smartphone app), such as point and level systems [Rul, Obj], personalized avatars [Per] and real-time notification system [Fee];
- Constant and frequent feedback of all stages after the initial notification [Rul]. For the website interface, feedback by email [Fee, Rul]; for the app interface, notifications via smartphone [Fee, Rul];
- Evaluation systems for quality of attendance process and problem resolution [Fee, Rul, Soc];
- Periodic feedback on the SNI (cases received, cases resolved, project goals) making users an integral part of the service and encouraging continued use [Fee, Per].

Phase 4: Evaluation

In this case, evaluation has not yet happened, since the project is still in progress.

3.3.2 Transformative Services' Perspective

The general objective of the SNI gamification through the GSF is to improve the quality of hospital services through a system that facilitates and encourages its use. With the constant use of this service users will indirectly contribute to improving its quality. If successfully put in practice, these improvements can lead to a less bureaucratic and more agile service, an increase in user participation, retention of new users and a range of participating users, a reduction in time to resolve the issues and a more trustful service.

While the other two cases aim to catalyze processes of social transformation through the promotion of more sustainable and social practices, the SNI aims to increase participation and awareness. The GSF approach seems to be a promising alternative due to its systemic characteristics and integrative methodology, where game design resources are used to understand the service, its audience and their needs, while gamification adds game design concepts that are attractive and engaging, aiming to promote the service to its target audience.

Again, the aim in this case is to approach the service gamification in a systemic way, making it potentially more engaging and so more potentially transformative. We believe that radical shifts toward real social transformation needs much more than incremental changes.

4 Conclusion

In this chapter, we presented three application cases of the Gamification Service Framework seeking social transformation objectives. The first one aimed at improving experiences to promote environmental causes. The second aimed at improving service experiences to promote social and relational causes. The last one focused on organizational issues in promoting more empowering and participatory service experiences. In all three cases, the focus was on the improvement of user experience journeys, making them more engaging. The analysis of cases through GSF provides a broad overview of the scope, characteristics and potential of the GSF and demonstrates particular functionalities of the tool.

All the cases are closely related to the university context. Recicla-CT is still in operation in UFRJ and has been expanded to other campuses. CarUni was developed at the same university, and although it was not formally supported by UFRJ, it was allowed to operate while remaining active. SNI, initiated by Pedro Ernesto's University Hospital, is still in operation and is planned to be reconfigured. In a country where research

occurs almost exclusively in the university environment, it is a natural choice, often necessary, to develop new methods with this type of support. It is also important to note that, in a country with severe deficiencies and inequalities such as Brazil, the social transformation theme appears to be particularly relevant and challenging.

Although the majority of design recommendations provided in this chapter could have been proposed individually using other approaches, applying gamifications through GSF provides a joint and systemic action between game design and service design in improving user experiences, which differentiates this methodology from others. GSF does not act by adding predefined gamification resources (such as points, badges and leaderboards) to services, but rather trying to understand service activities and processes through the game design perspective, planning flexibly, step by step of the journey experience, identifying the game activity components and game design concepts that can improve the service experience. It is a cyclical process of improving experiences that has to make sense within the particularities and objectives of the service. We believe that this conjunct and systemic action can make the gamification processes more precise, by facilitating the understanding of their real characteristics, needs and potentialities and, also effective, by presenting design recommendations aimed at meeting these demands.

We envision two possible approaches of extending research with the GSF. The first approach would deal with updating the application method by adding new/updated game design concepts or adding new service design tools to be used in the application methodology. The other approach would be the development of more specific methodologies for use in areas such as health, education, sustainability and so on. This could also allow for the expansion of the method to other areas, for example, gamification of work processes, methods and environments. As a service gamification tool, GSF seems to have a potential that still can be expanded.

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PART IV

Social Lens

Gamified Active Learning and Its Potential for Social Change

Sebastian Marin, Vivien Lee, and Richard N. Landers

1 Gamified Active Learning and Its Potential for Social Change

Social change refers to the transformation of culture, behavior, social institutions, and social structures within a society over time, and due to its importance, is one of the most critical targets for human intervention. Greenfield's (2009) theory of social change and human development describes how changing sociodemographic conditions, such as increasing levels of formal schooling and levels of technology, can drive social change, particularly regarding cultural values and learning environment, which in turn shifts people's developmental trajectories. Such changes in developmental pathways can be explained by various adaptations in a person's or their parents' values and abilities. These adaptations occur to help individuals navigate an increasingly complex environment. For example, transitioning from subsistence activities to commercial activities contributes to

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a more abstract cognitive style and greater visual representation skills in children (Greenfield, Keller, Fuligni, & Maynard, 2003). Furthermore, individuals with greater exposure to formal education, technological development, and urbanization tend to have better cognitive performance (Greenfield, 1998). Essentially, generations adapt to the challenges posed by the changing social environment during their lives.

Yet, societies do not undergo homogeneous social change. The kind of social change that occurs, and the rate at which it occurs, can vary drastically based on sociodemographic conditions within societies, necessitating local solutions. For example, intergenerational mobility varies at the regional level in the US (Chetty, Hendren, Kline, & Saez, 2014). Because a college degree somewhat reduces inequity in early life (see Torche, 2011), differential access to learning and educational opportunities among youth from higher and lower socioeconomic status (SES) is a pressing concern. The magnitude of such problem is illustrated by continued achievement gaps between White students and students of color (viz., Black, Latinx, and/or Hispanic American students). Since ethnicity is correlated with SES, marginalized individuals are also on average more vulnerable to inadequate learning resources and career opportunities and are more likely to have been denied opportunities seized by their counterparts (Barton & Coley, 2010; Carter & Welner, 2013; Chubb & Loveless, 2004).

Another concern is the growing need but lack of talent in Science, Technology, Engineering, Mathematics (STEM) disciplines across the world. The global shift to STEM education has elicited efforts from governments worldwide to invest at all educational levels (Freeman, Marginson, & Tytler, 2019). In order to maintain international competitiveness, countries like Germany, France, Ireland, the Netherlands, and Spain have adopted STEM promotion policies to improve public perception and knowledge of science, school-based mathematics and science instruction, general participation in STEM fields, and educational performance. Nevertheless, according to UNESCO, STEM participation rates in Anglosphere countries and some Western European countries have remained more or less the same from 2011 to 2018. Furthermore, there are differences between countries such as higher STEM graduation rates in France, Germany, Norway, and Sweden than in India, South Korea, and the US.

In relation to the general talent gap in STEM, persistent gender disparities in STEM are also an urgent matter in education and job contexts worldwide (García-Holgado, Verdugo-Castro, González, Sánchez-Gómez, &

García-Peñalvo, 2020). According to the UNESCO Institute for Statistics (2018, pp. 19–20), under 10% of students enrolling in information and communication technology, mathematics, statistics, engineering, manufacturing, and construction programs are female. Furthermore, fewer than 30% of the world's researchers are female. Even within STEM, female representation varies by field. In the US, for example, although women are overrepresented in STEM fields like medical, social, and life sciences, they are still underrepresented in other domains such as engineering, computer science, and the physical sciences (Chen & Ho, 2012). One of the leading explanations to these gender gaps is the influence of traditional gender role beliefs that women tend to be more family-oriented and endorse the idea of helping others and are "best suited" for professions encouraging those values (Dicke, Safavian, & Eccles, 2019). Other research has also shown that strong masculine images associated with math and science decrease the likelihood of female students majoring in STEM at university and pursuing STEM careers (Makarova, Aeschlimann, & Herzog, 2019).

To tackle these issues, we focus on two areas of research that can be used in tandem to facilitate social change: active learning and gamified education. First, active learning refers to learning that occurs when learners are active, as opposed to passive, participants in their own learning process. Common elements such as exploration, training frame, and emotional control are used in designing active learning interventions (see Bell & Kozlowski, 2008). These strategies engage learners and maintain their motivation during the learning process by giving them a sense of control over their own learning experience. Second, gamification can be defined as a design strategy where game mechanics (e.g. points, badges, leaderboards, narratives, levels) and/or game attributes (e.g. fantasy, immersion, progress) are used within non-game contexts to make users' experience within that context more gameful (Deterding, Sicart, Nacke, O'Hara, & Dixon, 2011; Landers, Auer, Collmus, & Armstrong, 2018). Typically, adding game elements to some activity or process is done to elicit a gameful experience, which in turn motivates users and enacts targeted behavioral change(s) in the user(s) (Landers et al., 2018). Similar in goals to active learning, gamification in learning contexts often targets boosting engagement and learner motivation, thereby yielding better learning outcomes (Sailer & Homner, 2020).

For the remainder of the chapter, we focus on and refer to the application of gamification to facilitate active learning, which we call *gamified active learning*. Although the gamification and active learning research

domains are typically studied with distinct disciplinary lenses, we believe approaching them with an interdisciplinary lens has the potential to reveal new insights. Specifically, we contend that gamification when used to encourage active learning has the potential to improve attendance, increase exam scores, and improve achievement of learning objectives. In this chapter, we describe gamified active learning, explain how gamification theory and active learning strategies can be used in tandem, and explain how gamified active learning can be used to foster positive social change.

2 Active Learning and the Learning Environment

Active learning is defined as students getting "involved with the information presented, really thinking about it (analyzing, synthesizing, evaluating) rather than just passively receiving it" (King, 1993, p. 2), in which instructors require learners "to engage in a behavioral activity during learning" (Mayer, 2009, p. 186). Learners engage in deeper levels of cognitive processing by attending to relevant information, constructing a coherent structure from that information, and tying it to prior knowledge (Mayer, 2009). This paradigm is often contrasted with historical approaches to teaching in which learners are passive receivers of information presented in a predetermined way as decided by an instructor. For the purposes of this chapter, we approach active learning as a family of instructional methods that involves students taking responsibility for their own learning processes through cognitive processing as well as behavioral strategies recommended by the instructor (Chi & Wylie, 2014).

Two broad categories of active learning are individualized and group-based learning. Examples of individualized active learning techniques are exploratory learning (Debowski, Wood, & Bandura, 2001; Mayer, 2004), learner control (Hardy, Day, & Arthur, 2019; Landers & Reddock, 2017), developmental simulations, and mastery learning and error management training (Kozlowski & Bell, 2006; Robledo et al., 2012). Group-based examples are collaborative and cooperative learning (Keyser, 2000). Most active learning strategies frame errors as learning opportunities (e.g., error management; Bell & Kozlowski, 2008) provide increased control of the learning environment (e.g., learner control) and let learners explore their environment individually.

Active learning methods challenge the learner to take responsibility for their own learning and increases learner motivation to do so. Evidence on the effectiveness of active learning strategies is spread across multiple

domains. In STEM education, active learning methods produce positive student outcomes such as lower failure rates and increased exam scores by a half standard deviation (Freeman et al., 2014). Small group collaborative learning has been shown to boost academic performance in statistics education (Kalaian & Kasim, 2014). However, active learning methods are not without limitations. They are mainly grounded in a constructivist learning philosophy, which assumes learners link new knowledge in unique ways within their own existing knowledge structures, which can help make new knowledge more accessible; high-quality instruction encourages and supports these links (Kraiger, 2008). Thus, instruction methods hailing from constructivism function best when there is a relatively small number of people that can receive individualized learning. In fact, Freeman et al. (2014) show evidence that active learning strategies are most effective in smaller class sizes (i.e., $n < 50$).

3 The Social Impacts of Active Learning

Engaging students through active participation is a common goal among practitioners of both gamified education and active learning. However, there is a clearer picture on the social impacts of active learning methods than of gamified education. First, active learning can boost academic performance among all students, especially minority students, potentially narrowing achievement gaps. Eddy and Hogan (2014) found that adopting course structures with higher levels of student involvement compared to traditional lectures improved course achievement among all students. However, the benefits were particularly evident among Black students, as the achievement gap was reduced by half when a moderate course structure was implemented. More recently, Theobald et al. (2020) found that high-intensity active learning narrowed the academic performance gaps between minority students and other students in STEM subjects.

Second, active learning plays a significant role in boosting student persistence, which is directly linked to on-time graduation rates (Braxton, Jones, Hirschy, & Hartley, 2008). Low on-time graduation rates imply students either graduate later than anticipated or decide to drop out. A report published by the US National Center for Education Statistics in 2019 showed that on-time graduation rates from four-year institutions for Hispanic and Black students were only 34% and 24%, respectively. Furthermore, among those who did not graduate from a four-year program within six years of their entry, over 35% of Black and 26% of Hispanic

students eventually dropped out. The economic consequences of low on-time graduation rates are dire; if students do not graduate on time, it costs both institutions and students thousands of dollars in expenses and lost wages (Complete College America, 2014). Active learning has been used to address low on-time graduation rates among college students. A longitudinal study conducted by Braxton et al. (2008) revealed that student perceptions of faculty use of active learning strategies (e.g., classroom discussions, debates, hands-on research project) were related to perceptions of institutional support and social integration. Consistent with prior research (Braxton, Milem, & Sullivan, 2000), Braxton et al. (2008) found that social integration was also associated with students' subsequent institutional commitment, which was related to student retention. Survey responses were weighted to ensure the same degree of representativeness on gender and race. Another study also showed that active learning techniques successfully increase graduation rates by 8% among Dutch medical students by inducing better academic performance (Schmidt, Cohen-Schotanus, & Arends, 2009). Taken together, these studies suggest that applying active learning techniques in college classrooms could increase the likelihood of on-time graduation by encouraging students' retention.

Moreover, active learning strategies contribute to increasing educational attainment in STEM, which can potentially shape STEM development. Over the last two decades, STEM education has remained a top priority for governments, educators, and businesses. For example, in 2012, the US President's Council of Advisors on Science and Technology called for a 33% increase in the number of STEM graduates in the US each year. Active learning techniques might be used as an alternative to traditional instructional strategies to improve academic outcomes and to arouse students' interest in STEM fields. Active learning has been shown to lead to increases in course examination scores and grades (Chen et al., 2018) as well as other positive effects on knowledge gains, skill acquisition, student perceptions, group task performance, and social interaction (Chen, Wang, Kirschner, & Tsai, 2018). In the case of STEM education, LaForce et al. (2017) found that problem-based learning, an active learning method, can improve students' STEM attitudes and increase interest in pursuing a STEM career. Similarly, research has also shown that active learning lowers course failure rates in STEM subjects (Freeman et al., 2014). Overall, it appears that active learning strategies can improve STEM education, and ultimately, job prospects.

4 Gamification and Active Learning

One goal of gamification is to bring game-like characteristics to non-game contexts to elicit similar psychological and/or behavioral mechanisms as observed in games (Deterding, 2015). That is, gamification is often applying to create gameful experiences for learners by implementing one or more gameful systems (see Landers et al., 2019). Typically, gameful designers build gameful experiences by targeting motivational states with one or more interrelated game elements (e.g., narratives, points, badges, leaderboards), which can lead to broader, targeted outcomes (e.g., learning, motivation). For example, in a recent meta-analysis, Sailer and Homner (2020) showed that the use of game elements was associated with cognitive (g = 0.49), motivational (g = 0.36), and behavioral (g = 0.25) learning outcomes in educational contexts. Gamified education can be designed to encourage more individualized education by targeting active learning strategies, such as the use of game fiction in web-based training (Armstrong & Landers, 2017) or simulation (Sitzmann, 2011). Further, adding game elements at the group level (e.g., classrooms) may provide enhanced learning outcomes when designed to encourage cooperation and collaboration among group members (Arnab et al., 2016; Jagušt, Botički, & So, 2018; Sailer & Homner, 2020). Thus, gamification can encourage active learning strategies within a variety of specific designs.

The potential effects of gamification in education can be explained by the theory of gamified learning (Landers, 2014). This theory describes how game elements can alter behaviors and attitudes that affect subsequent learning outcomes (i.e., mediation) and/or interact with instructional content as to change the effectiveness of that content (i.e., moderation). For example, Denny, McDonald, Empson, Kelly, and Petersen (2018) conducted a randomized controlled experiment where they tested how a point system and a badge system led to improved grades via student preparation behaviors (N = 701). Because prior research showed that self-testing activity as a preparation behavior was related to academic achievement (Hartwig & Dunlosky, 2012), Denny et al. hypothesized that a properly designed point and badge system could improve persistence in self-testing, thereby leading to improved grades. Results from their study indicated that self-testing activities fully mediated the relationship between their badge system and final exam scores. These results suggest that gameful systems can impact specific mechanisms that

lead to enhanced learning and overall academic achievement, supporting the theory of gamified learning.

We contend that game elements, when selected appropriately, can encourage the psychological mechanisms that make active learning effective and can be used to enhance the effectiveness of standalone active learning methods. This is the process by which *gamified active learning* is defined. There is some early evidence for the effectiveness of what we would categorize as gamified active learning in learning contexts. For example, gamification can enhance student participation and practice rates in mastery learning programs (de Pontes, Guerrero, & de Figueiredo, 2019), increase student collaboration and course motivation (De-Marcos, Garcia-Lopez, & Garcia-Cabot, 2016), and encourage engagement outside the learning environment (e.g., completing more out-of-class activities; Huang & Hew, 2018).

5 A Brief Case Study on Gamified Active Learning

To understand the potential of gamified active learning, we present a brief qualitative analysis of Fotaris, Mastoras, Leinfellner, and Rosunally's (2016) research to help illustrate the connection between active learning and gamification. Fotaris et al. (2016) adopted a quasi-experimental design in which two versions of the same course over two academic semesters were studied. University students were enrolled in similar entry-level Python programming classes. However, one section underwent a gamified version of the course, whereas the other section experienced the original version. The class receiving traditional instruction comprised three components. By taking this approach, Fotaris et al. (2016) extended standalone active learning strategies via gamification.

First, instead of attending theoretical lectures, students in the gamified class participated in micro-lectures on "Kahoot!".[1] Students answered questions on "Kahoot!" after every micro-lecture, and they were later shown the correct answers with a corresponding explanation. Students were then rewarded with points for their answers, which led to weekly leaderboard rankings and rewards. They not only integrated game elements into lecture sessions to increase student motivation to learn but

[1] Kahoot! is a web-based classroom response system that allows users to customize multiple-choice questions. Users answering questions would be awarded points based on the correctness of their responses.

also used mini-lectures as an active learning strategy. Mini-lectures are characterized by pauses; they consist of approximately 10 to 20 minutes of lecturing briefly covering a range of content followed by a 3- to 5-minute pause to encourage reflection (see Bonwell & Eison, 1991). Mini-lectures encourage students to follow course material given limited attention spans and to engage in meta-cognition (Nilson, 2014). Recently, instructors have been incorporating student-active breaks sandwiched between mini-lectures, such as in the case of Fotaris et al. (2016). Kahoot! functions as a formative assessment that lets students check their understanding of the material after each mini-lecture. However, Kahoot! coupled with a public leaderboard integrates student-active breaks across a semester. This design decision takes active learning a step further by making student-active breaks core motivational and learning components of the class, whereas typical (i.e., non-gamified) interactive lectures isolate student-active breaks within a single lecture session. Second, coding challenges on CodeAcademy were used in place of lab classes. Students were able to access different coding exercises on CodeAcademy both at school and at home. Points and badges were used as achievement-based rewards depending on the correctness of the student's code and activity on the platform. Fotaris et al. (2016) do not report how achievement-based rewards were related to active engagement or practice performance. Thus, we do not have a sense of gamified active learning in CodeAcademy, although such an approach could have been used; the detail level presented by Fotaris et al. simply makes this unclear. Third, the revision seminars were replaced by a collaborative problem-solving task, which is a common active learning strategy. However, this collaborative task was gamified to mimic the television quiz show "Who Wants to Be a Millionaire?". Students were divided into teams and answered multiple-choice questions regarding course material in increasing difficulty. A leaderboard was used to track progress and ranking of each team throughout the course. The winning team was rewarded the title of "Pythonista of the year" and chocolates. In essence, Fotaris et al. (2016) used game fiction to simulate a televised gameshow, where students were attendees and contenders.

The findings of Fotaris et al. (2016) show that incorporating game elements to further encourage active participation seem to trend toward increases students' attendance rate, the number of downloads of reference material, and final course grades. Student also reported on a five-point Likert-type questionnaire that the game elements were fun (M = 4.7, SD = 0.63), encouraged attendance motivation (M = 3.8, SD = 0.84),

motivated them to learn (M = 3.8, SD = 0.71), increased their self-confidence (M = 4.3, SD = 0.63), and improved their perceived understanding of course topics (M = 4.1, SD = 0.50). However, since the gamified class sections also included differing active learning activities as compared the non-gamified class, it is difficult to assess whether positive student outcomes (e.g., academic performance, motivation to learn) were due to the active learning strategies, the gameful design itself, or if as gamified active learning would suggest, the two interacted to produce greater effects than either would necessarily produce alone.

Nonetheless, Fotaris et al.'s study suggests that gamified active learning has the potential to enhance academic performance and motivation to learn in STEM courses, and the three gamified components, which incorporated scores, leaderboards, assessment elements, competition, and collaboration, integrated well with active learning methods. It was expected that incorporating interrelated game mechanics into course components activity could motivate students in such a way as to find course material enjoyable and interesting as gamification is often designed to invoke "users' intrinsic motivations commonly through design reminiscent from games" (Hamari & Koivisto, 2015, p. 420). Indeed, interest in STEM subjects via game mechanics could spark interest in broader STEM courses or fields if such mechanics offer indication of mastery, competence, or self-efficacy (e.g., feedback, challenge-based rewards).

6 Gamified Active Learning and Its Potential for Social Change

Encouraging newfound interest in a field or subject from fostering more specific interest in a subject topic could reduce underrepresentation of marginalized groups in certain STEM fields when gamified education is targeted at subjects where disparate gaps are seen as previously discussed. Ultimately, gamified active learning might affect social change by motivating students who happen to belong to a historically disadvantaged group to continue their education and grow interest in specific subjects. Developmental trajectories are shaped by an individual's environment, but they are also shaped by how an individual changes the environment around them to suit their goals. A common goal of gameful design is to target motivational mechanisms to create a gameful experience. In educational contexts, the target of creating a gameful experience is that learning

objectives or behavioral outcomes are achieved by experiencing a course with gameful systems. By experiencing gameful systems in class settings, students could be more motivated to learn and continue their education. This may raise graduation rates of disadvantaged minorities. Although there are a limited number of studies, two studies particularly highlight the potential effects of gamified active learning on social change.

First, consistent with general findings for active learning (e.g., Prince, 2004), Legaki, Xi, Hamari, Karpouzis, and Assimakopoulos (2020) found that, when paired with active learning, challenge-based (i.e., achievement-based) gamification can significantly improve learning outcomes among all STEM students (i.e., both male and female engineering students). Researchers blended gamification and active learning strategies to teach statistical programming. Using a web-based gamification application, they adopted a challenge-based gamification approach, where the focus is on having users overcome challenges, progress through the activity, earn rewards, and feel competent. More specifically, they incorporated points, levels, badges/achievements, and leaderboards as motivational affordances to encourage active learning in classroom context. For example, at one point, students were required to choose the best forecasting approach for time-series data. They were encouraged to assess their own knowledge base (a meta-cognitive activity) with the gamified goal of winning the most points.

Legaki et al.'s (2020) exploration of gender suggests that challenge-based gamified active learning may offer the opportunity to enact social change by ensuring female students' retention in STEM without compromising learning progress of male students. In their study, women showed similar performance and a higher degree of improvement compared to men in the course when gamified and active learning components were incorporated. This finding is particularly important because improving learning performance of female students can enhance self-efficacy, which is related to plans to persist in predominantly male STEM fields (Marra, Rodgers, Shen, & Bogue, 2009), thereby potentially reducing the gender gap in STEM. In addition, prior research in educational psychology also showed that achievement-based rewards during learning are related to intrinsic task motivation (Eisenberger, Pierce, & Cameron, 1999), which can transfer to other similar activities of a particular subject and improve learning (Cameron, Pierce, Banko, & Gear, 2005). This generalization effect from one specific task to broader categories (e.g., from programming in Python to software engineering) is often a major goal in

education. This is related to social change because sparking motivation and intrinsic interest in STEM fields from women via challenge-based gamification could alleviate underrepresentation.

Second, findings from Barrio, Muñoz-Organero, and Soriano (2015) suggest that the implementation of competition-based gamified active learning can have a greater positive impact on student motivation, attention, engagement as well as learning performance than the use of active learning strategies alone. They examined this question by isolating the effects of active learning and gamification using a randomized controlled experimental design, combining active learning and gamification in the form of real-time feedback and game dynamics. Students were assigned to either one of the two conditions—non-gamified active learning or gamified active learning. Traditional student response systems (SRSs), also known as "clickers", were used as the active learning component for this study. By incorporating leaderboard and scores into an SRS, a new system for gamified active learning was used to enhance learning experiences for students. In each lecture, students were prompted to answer a fixed number of multiple-choice questions on the system. Teachers would then provide students with real-time feedback. Group and individual ranking information was available by the end of each question for students to view based on the number of correct responses. These findings indicate that effects of active learning can be further enhanced when used in conjunction with gamification techniques.

The efficacy of active learning strategies, gamified learning, and/or both likely differs by the particular gamification or active learning strategy used, which complicates the interpretation of results regarding marginalized groups across these studies. For example, when examining the effects of gender, Barrio et al. (2015) found that competition-based gamified active learning was more effective for men than women on academic performance, yet Legaki et al. (2020) did not. On the surface, this might suggest contradictory results; however, upon closer inspection, quite different gameful design strategies were used across studies. Whereas Barrio et al. incorporated challenges, Legaki et al. incorporated competition. Ultimately, these differential strategies for gameful design may have influenced gender effects in both studies to an unknown degree. Gamification and active learning strategies should be more carefully experimentally controlled within and across studies to produce broader, generalizable conclusions.

7 Conclusion

In sum, gamified active learning techniques have the potential to address the gender divide in STEM by improving learning outcomes for female students, and potentially encourage student retention in STEM education among women, when gameful systems are chosen and developed appropriately. By designing and selecting a suitable gamified active learning strategy in STEM education, we may be able to better retain women in STEM, thereby reducing the gender pipeline problem while simultaneously adding to the STEM talent pool. Gamified active learning has significant potential to do more than active learning or gamification can do alone, but further research is needed. Most critically, there is little empirical research on which game mechanics cause psychological variables meaningful in active learning to improve learning outcomes. Studies are needed systematically exploring those factors, likely derived from educational psychology research on active learning, and how gamification can be used to facilitate them. Because prior research suggests that gamified active learning might show similar benefits as other active learning strategies, future gamified education research should extend both the antecedent and criterion space to educational outcomes that have broader social implications.

In addition, future gamified education research should isolate the effects of active learning strategies, gameful design techniques, and their combination, to better understand the effects of standalone active learning techniques versus gamified ones. With a better understanding of design techniques that can effectively facilitate gamified active learning, its potential to help historically underrepresented or at-risk students can be enhanced. Although there is some early research suggesting gamified active learning can reduce gender gaps in STEM, there is little research on effects for other social change contexts, such as reducing achievement gaps by race or ethnicity. This thus emerges as a key research priority for gamified education researchers across the globe. Additionally, investigation of moderating factors of gamified active learning strategies will be an important line of research to create practical design and implementation recommendations that will effectively enhance learning outcomes across a diverse set of students. Overall, with further research in these subdomains, we see great potential for gamified active learning to support social change within learning environments, especially for underrepresented or at-risk groups.

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How Socially Sustainable Is Social Media Gamification? A Look into Snapchat, Facebook, Twitter and Instagram

Dayana Hristova and Andreas Lieberoth

1 Introduction

The corporations behind social networking services (SNS) are the current principal stewards of communities and suppliers of mechanisms that allow for communication and exchange of ideas among friends and strangers alike. Companies like Facebook and Twitter inc. offer ways to connect and grow communities, while at the same time, the SNS sphere has become involved in disinformation and political polarization as well as questionable business practices said to displace non-digital activities important to

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human thriving and belonging. While even the term *social networking sites* suggests that companies aim at offering social value to their consumers, it is debatable to what extent they actually focus on social sustainability and how they work toward this goal. Hence, ongoing critical appraisals are needed to understand social sustainability implications of SNS designs, in terms of their core loops—main behaviors they enable like chatting, exchanging pictures and sharing content (Elias, Garfield, & Gutschera, 2012), versus added design elements intended to change behavior, among which gamification is a central exemplar.

The ubiquitous use of gamification in social media including elements like Point counters, Badges and Rewards (Hristova, Göbl, Jovicic, & Slunecko, 2021) has been framing interactions among users around the globe. In this paper, we thus analyze a series of prominent gamification elements implemented on four of the main platforms currently shaping the face of social media: Facebook (FB), Instagram (owned by Facebook) (IG), Snapchat (SC) and Twitter (TW). For this purpose, we (1) discuss a definition of social sustainability and (2) introduce gamification as a now ubiquitous part of the social media experience. We then (3) present and analyze the social sustainability impact of gamification on social media sites and apps.

2 Defining Social Sustainability

The term "sustainability" gained prominence in the 1960s within the context of environmental preservation and has been more recently supplemented by economic and social sustainability (McKenzie, 2004; Bostroem, 2012). Conceivably, because of the original natural sciences anchoring of sustainability, its "social pillar" (Murphy, 2012) has remained more elusive to definition and measurement (Boyer, Peterson, Arora, & Caldwell, 2016; McKenzie, 2004; Bostroem, 2012).

In this chapter, we adopt McKenzie's definition of social sustainability as "a life-enhancing condition within communities, and a process within communities that can achieve that condition" (ibid., p. 12). While "life-enhancing conditions" may be a fluid formulation, meaning a broad range of factors that make life better for people in the social arena in question, the definition has the conceptual advantages of capturing the *goal state*, thus accentuating the process-oriented (Boyer et al., 2016) and future-focused nature of the term (Mehan & Soflaei, 2017). Since social sustainability cannot be defined without a reference to the context, it is embedded

in Dempsey, Bramley, Power, and Brown (2011), the potential for "life-enhancing", or indeed detrimental conditions arising from the infrastructures of social media must be understood with reference to how they and their gamification elements are structuring individual experiences and joint sociality—both on the platforms themselves and in the broader context of users' day-to-day life.

3 Gamification of Social Media

Though gamified social media features like Likes, Streaks or Badges do not look like a "proper game" (Lieberoth, 2015), their use shares psychological and phenomenological properties with gaming (e.g. Deterding, Dixon, Khaled, & Nacke, 2011) and can, hence, be defined as gamification (Hristova et al., 2021). Previous research finds a wide variety of game-like elements in social media context (Pellikka, 2014; Hristova et al., 2021) acting as "microsuasion" elements (Fogg, 2003) persuading users to spend more time on an SNS (Lampe, 2014; Hristova et al., 2021) or otherwise adapt human behaviors to the needs of company business models (Zuboff, 2019).

Following the definition that social sustainability involves not merely maintenance but also growth of value within a community (McKenzie, 2004), SNS social spaces also continually evolve, for example, when providers change aspects of an app while preserving its "core loop" (Elias et al., 2012). As the gamified elements of an SNS, or more rarely the core loop itself, change, the conditions and prerequisites for the social sustainability of the space and its more or less "life-enhancing" qualities shift too.

In order to understand the social sustainability of SNS gamification, this chapter describes specific gamification elements found on the aforementioned platforms: Streaks (SC), Likes (FB, IG), Best Friends (SC), Top Fan Badge (FB), Blue "Verified" Badge (TW), Trophies (SC) and Charms (SC) and Fundraising (FB). In each section, we consider the design function of an element, its reception, and in what ways the element may be said to hinder or enhance social sustainability.

Our analysis especially calls attention to the following social and psychological mechanisms, which will be treated in depth in the discussion:

- **relatedness** as the need for connecting with others (Ryan & Deci, 2000) **and reciprocity** (Mauss, 1954) as symbolic social exchange;
- **status signaling** (Wang & Wallendorf, 2006);

Table 1 Social sustainability aspects of gamification elements

Soc. sustainability aspects	*Likes*	*Streaks*	*Best friends*	*Top fan*	*Blue badge*	*Trophies*	*Charms*	*Fundraising*
Relatedness and reciprocity	+	+	+	+			+	+
Status signaling	+	+	+	+	+	+	+	+
Community responsibility	+	+		+	+			+
Future focus		+			+			+

- **community responsibility** (McKenzie, 2004) as an umbrella term for practices such as supporting communities or carrying out shared projects;
- **future focus** (Mehan & Soflaei, 2017).

In Table 1, we plot these mechanisms against the analyzed gamification elements.

3.1 Likes and Scores

The ubiquitous Like button shaped in the form of a white hand giving "thumbs up" was first introduced by Facebook in 2009 (later extended by five and then six emoticons) and can now be found in various guises across innumerable social technologies. It is a "one-click feedback" element through which users may give or receive what Facebook scientists (Scissors, Burke, & Wengrovitz, 2016) themselves term "lightweight affirmation". As revealed by a Facebook spokesperson in 2017, choices of reactions are also used to adapt what the user will see in their feed (Bell, 2017). As such, they also hold informational value to the business of generating behavioral predictions (Zuboff, 2019). In gamification terms, Likes are one of many types of Points, which serve as social or personal signals, in addition to being a hard number representing the relative engagements generated by each post. Variations of this quantified scoring mechanic are found on a host of applications, including Reddit's *Karma points* (Pellikka, 2014), Instagram's *Likes, Followers* and *Following* scores (Hristova et al., 2021) and even YouTube's number of *Views* for a video.

Likes are wielded by users as an expression of interest and relatedness through signaling appreciation for the shared content (Ellison, Gray,

Lampe, & Fiore, 2014; Rosenthal-von der Pütten et al., 2019). One study by Facebook indicates that "people care more about who likes their posts than how many Likes they receive, desiring feedback most from close friends, romantic partners, and family members" (Scissors et al., 2016). In contrast, according to a survey by Burrow and Rainone (2016), quantification preoccupies some users to an extent that the amount of Likes is more important to them than the content shared. This is also seen in practices such as posting content at a certain strategic time to maximize likes and beat one's personal high scores (Hristova et al., 2021) or a preset goal. For example, one of Weinstein's (2017) adolescent informants shares "when I post a picture, sometimes I'm like, I hope this breaks 200 likes […] and I'm like dangit, I didn't hit my mark". This competitive approach to Likes has also been linked to "anxiety about social feedback or judgment" (ibid.). Adolescents are found to be particularly susceptive to peer feedback as signaled by friends' likes, whether they are exerting problematic or prosocial influence (Crone & Konijn, 2018). Quantification of user reactions holds the potential to enable "healthy" signaling of identity and belonging or could foster insecurities, envy or unattainable aspirations, such as the ones documented in terms of body image (Hogue & Mills, 2019; Crone & Konijn, 2018).

Competition per se need not be negative, though. For instance, communities may be formed around attempts to maximize Likes, as exemplified by barters, such as *follow-4-follow* and *like-4-like* initiatives when two users promise to exchange likes as an act of reciprocity. Hence, in addition to fostering a sense of relatedness and signaling social status, likes can be used as vehicles for reciprocity and generate a sense of shared engagement within formal groups or informal circles of friends.

Facebook's introduction of the *Care* reaction in April 2020, during the COVID-19 pandemic, is an example of a gamified design evolving beyond its inception as numeric points, to meet social needs. Facebook stated that now users could give their communities "extra support while many of us are apart. We hope this helps you, your family and your friends feel more connected" (Brandon, 2020). The statement hints at efforts to improve social sustainability through modifying existing features. In a similar vein, Instagram (owned by Facebook) has experimented with removing Likes in several countries including Australia (Meisenzahl, 2019). At the time of writing, the exact extent and outcomes of these experiments have, however, not been shared publicly. The official rationale behind this effort was to combat cyber bullying and reduce the sense of competition among

users (Rodriguez, 2019). However, according to the head of Instagram, Adam Mosseri, the platform tested the hypothesis that making the number of likes invisible would increase the amount of posts since users would feel less insecure about the amount of likes their posts get (ibid.).

To sum up, the impact of likes, as an element quantifying appreciation and enabling comparison, appears to be ambiguous, spanning benign or maladaptive practices. Social media provider Facebook Inc. reportedly introduced the *care* reaction and made likes invisible for others in an effort to alter the effect of Point-like gamification on social sustainability (i.e. cyberbullying and social comparison) outcomes.

3.2 Streaks

A Streak is maintained by repeating the same behavior at set intervals or iteratively succeeding at a series of challenges. On Snapchat, Streaks are a *relational* score that signifies *how many days* in a row *two* users have been sending each other *snaps*—pictures or videos that vanish after viewing (Hristova, Dumit, Lieberoth, & Slunecko, 2020). Snapchat Streaks thus quantify and provide a reward for the daily interaction of two users (Meshi, Turel, & Henley, 2020), even when content has disappeared (Hristova et al., 2021).

Adolescents report that Streaks are especially beneficial for keeping in touch with friends (both the ones they see daily and the ones who are away) and finding out about their routines and everyday life (Hristova et al., 2020). Keeping a Streak requires the reciprocal effort of both partners since missing even one day of content exchange resets the accumulated score and ends the Streak. The wish to avoid loss has given rise to strategies such as sharing one's password with a friend, so they can uphold active Streaks if a user momentarily does not have access to Snapchat (Déage, 2019). The future orientation of the intention to keep a Streak going, as well as the attention and time committed daily to the shared endeavor, can in turn create a sense of solidarity between Streak partners (Hristova et al., 2020; Pelaprat & Brown, 2012). However, the dyad is transcended by user practices such as *mass snaps*—impersonal pictures sent to multiple others to uphold Streaks (Hristova et al., 2020), who themselves may have Streaks among each other. The Streak count, although not public on the app, acts as a status signal signifying shared effort and social relation when shared with others within these networked communities of practice. Therefore, Streaks can be boon for social sustainability through

their future focus—encouraging longer periods of daily reciprocity between user-dyads embedded in communities of practice shaping Snapchat's social space.

However, psychological research has hinted that through their daily iterative reward structure, Streaks reinforce repeated and "potentially problematic use" of the platform (Meshi et al., 2020). Indeed, research among Viennese adolescents reveals that keeping a Streak alive may be perceived as stressful by users as they need to remember to snap daily with their Streak partners (Hristova et al., 2020; Salomon & Hristova, 2020). In turn, the goal of keeping the Streak often triggers a less personal interaction—for example, sending black pictures—rather than conversations motivated by content (Hristova et al., 2020). When gamification overrides conversations as a primary value of the interaction, users commonly report perceiving the impersonal snaps sent by their Streak partner as a sign of uncaring, and hence the exchange as meaningless, which may move them to abandon it.

To sum up, Snapchat Streaks positively impact social sustainability by fostering daily reciprocity, building up to social relatedness that is signaled through a quantified score; however, the time constraint on reciprocity may make users feel smothered by the shared responsibility. Further, if gamification appears more important than conversations, this may lead users to abandon the Streak. Finally, while individual Streaks are a nudge for the daily reciprocity of dyadic relationships, this gamification-enhanced connectedness expands beyond the individual score, to networked communities of practice and to the platform itself.

3.3 Best Friends

Like Streaks, Best Friends are markers of relationships between users. Snapchat's Best Friends feature made contacts, with whom one communicated most often, visible (Vaterlaus, Barnett, Roche, & Young, 2016) on the user's profile. The feature functioned as a signal of relatedness and reciprocity visible to one's contacts and as a leaderboard of social status (Hristova et al., 2021). As most social media utilize sorting algorithms to prioritize the posts, most likely to draw attention and engender engagement, this merely makes a metric already existing "under the hood" visible—a now classic easy tool in the gamification playbook (Reeves & Read, 2009).

In practice, the Snapchat Best Friends feature became controversial as it was deemed to induce envy and jealousy (Peterson, 2016; Vaterlaus et al., 2016). Research indicates that even Snapchat's core loop—exchanging ephemeral and thus secret messages—may already evoke negative emotions of jealousy among romantic partners (Utz, Nicole, & Cameran, 2015; Dunn & Ward, 2020). Hence, the gamified feature was amplifying an essential social sustainability problem with the platform's core offering of sending and receiving ephemeral messages.

As a response, Snapchat Best Friends was made visible only to the user (Lupo, 2017), as a panel of the eight people that one currently snaps with the most. Snapchat's support page emphasized that "No one else can see your Best Friends list. This feature is just for you" (Snapchat Support, 2019a). In addition, Friend emojis—icons signifying the intensity of reciprocal exchange between two users—are also private. Making this feature more private disabled one mechanism for monitoring others' social activity, thereby alleviating the potential for negative social comparison and jealousy. This hints at efforts on Snapchat's part to monitor the impact of their gamification in creating favorable or difficult conditions with regard to social sustainability.

"Top Fans" Badge and Blue "Verified" Badge

Facebook introduced the "Top Fan" Badge gradually from 2018, which awards the most active followers of a Facebook page (e.g. of a business, an artist or an NGO) a badge (Facebook Help Centre, 2020), thereby signaling status and relatedness. The feature aimed to make "fans' more active and thus helps in producing 'organic' viral content" (Maly, 2020), while granting admins more data "and thus more explicit insight into what drives engagement among their audience", which can be used for directing paid posts (ibid.). Thus, while the badge signals status and relatedness to communities of page followers, it also illustrates surveillance capitalist business models at work (Zuboff, 2019) where intensifying user involvement for the purpose of extending data rendition to be sold to, for example, advertisers is a guiding principle.

A different form of badge was introduced to Twitter in the intended service of SNS responsibility toward the community: a blue "verified" badge to signal the authenticity of "accounts of public interest" (Twitter Support, 2017). Since Twitter is a platform where public figures like politicians, celebrities or academics make statements, the need arose to verify accounts in order to avoid misrepresentation as well as misconduct of

profiles reaching wide audiences. While the verification badge attracted much public attention, research indicates that users do not take it into consideration when judging the reliability of information on Twitter (Edgerly & Vraga, 2019).

Although the badge was a future-focused attempt to support social sustainability, by preventing fraud and promoting accountability through verification, it came to be viewed as an SNS-endorsed social status signal. For this reason, users of some small notoriety coveted the badge, quickly putting it at risk of losing its authenticity, thus becoming a socially *un*sustainable feature. According to the official Twitter Support account "Verification was meant to authenticate identity & voice but it is interpreted as an endorsement or an indicator of importance. We recognize that we have created this confusion and need to resolve it" (2017). Despite the legitimate intent behind opening up for blue badge-nominations from users, the nomination feature was suspended as it proved disruptive to social sustainability by creating a biased recognition landscape. Users who were attracted to the status function were, in a word, gaming this opportunity and thus weakening the function of the badge as a general concept.

To sum up, the social sustainability of the two badge elements was undermined in different ways: by the contextualization of the Top Fan badge in SNS business practices and by user reception and practices toward the Blue "Verified" badge.

Trophies and Charms

Snapchat had a *Trophies* feature composed of 52 individual achievements (Patkar, 2018) that could be unlocked using the app up until 2019. Trophies represented challenges bound to engaging with Snapchat functionalities, such as sending content of a certain type (e.g. sending 50 videos or 10 zoomed photos) or in certain conditions (snapping between 4 am and 5 am or at a temperature below zero, etc.). This gamified feature provided a quantified score of user behavior that can signal status and expertise in the use of the platform.

In 2019, Trophies was replaced by *Charms* (Snapchat Support, 2019b). While the two features do not mirror each other fully, in 2019 the Snapchat support website announced "Trophies are no longer available. It's tough news, but check out Charms—a new way to celebrate your friendships!" (ibid.), thereby confirming the "replacement" that took place on the platform. While Trophies focus on the quantification of individual

achievements, which may incite competition, Charms emphasize commonalities between two users to enhance a sense of relatedness and reciprocity. For example, some Charms focus on the temporal dimension of reciprocity: for example, from "in touch" (users have been in touch recently) to "it's been forever" (Nace, 2019). Furthermore, although Charms take on the role of Trophies in quantifying relationships, Charms are displayed only as a relational set of scores, visible to the two interacting users. This shift to a more private tool emphasizing bonding, rather than social status display, can be read as Snapchat's attempt to improve the social sustainability of its gamification.

3.4 Fundraising

Finally, we may consider Facebook's Fundraising—a feature that calls for community responsibility and support for various causes (pressing issues at the present moment or future-focused goals). The feature uses several gamification mechanics: challenge (the announced financial goal of the campaign), progress bar (indicating the amount of money already raised with regard to set goal) and a reward (e.g. post displaying to others that a person has donated to the campaign). By raising funds and awareness, this gamified feature aims to make a difference outside of the SNS arena—in the "real" world.

Helping behaviors have traditionally been found to relate to expectations of strengthening social bonds and positive feelings (Schaller & Cialdini, 1988). As such, a donate feature is likely to interact well with the uses and gratifications (Katz, Blumler, & Gurevitch, 1973) commonly associated with social media as a way of fostering reciprocity, relatedness and community responsibility. However, research on helping behavior has found that negative moods arise through guilt and exposure to high-responsibility scenarios, which could create negative reactions to both the cause and the platform (Erlandsson, Jungstrand, & Västfjäll, 2016). For instance, a high degree of social policing was needed during the 2020 Coronavirus epidemic, when people formed impromptu role-playing communities as ants or office workers but wanted those groups to be safe spaces free of allusions to health and politics (Imam, 2020). As such, in communities where uses and gratification are mainly hedonic, real-world connections like those represented by fundraising may be antithetical to the sustainability of the social space.

Further, the payments from collections also run through Facebook, which automatically saves the payment details for future transactions (Campbell, 2019). Hence Facebook gets access to sensitive data as well as metrics for the conversion rates of user's involvement with a cause that can be used for a more extensive profiling and targeting. Because data rendering business models by Facebook Inc. has become the source of significant mistrust (Zuboff, 2019), such practices coming to light represents a serious challenge to the sustainability of Facebook as a whole.

Facebook's Fundraising represents an extensive list of social sustainability aspects: responsibility to supporting communities, relatedness and future focus, while at the same time being contextualized in for-profit business models.

4 Discussion

We first focus on each social sustainability aspect encountered across the different gamification elements, after which, we turn to a more general discussion.

While **relatedness and reciprocity** are fundamental to social media as a whole, they also underlie Likes, Streaks, Best Friends, Top Fan, Charms and Fundraising. These elements quantify (Likes, Streaks, Fundraising), rank (Best Friends, Charms, Top Fan) or time (Streak, Best Friends, Charms) reciprocity. For example, Best Friends and some Charms compare the intensity of reciprocal exchange among users—whom the user interacts with the most and since when. In addition, Charms also categorize the temporal dimension of relatedness, for example, "it's been forever" (since the two users communicated). Streaks are also based on timing reciprocity: users are required to exchange at least one snap per 24 hours. While fostering reciprocity can generally be seen as positive, when timely constraints are posed on the interaction, as in the case of Streaks, it can lead users to feel smothered and to break the exchange (Hristova et al., 2020; Salomon & Hristova, 2020). In addition, iterative circles of behaviorist reward, like Streaks, building up to habit formation, can foster a "potentially problematic use" of the platform (Meshi et al., 2020). Further, reciprocity is used to encourage or, in the case of Streaks, nudge users to engage more with the platform and to generate more content (Lampe, 2014).

All of the analyzed gamification features enable some semblance of **status accumulation or signaling**. It has been found that reputation

signaling (e.g. Likes, Followers) can be conductive to collaboration (Wu, Balliet, & Van Lange, 2016), and intertwined in social comparison or expressing admiration (Rosenthal-von der Pütten et al., 2019). Competition triggered by social comparison could work in favor of sustainability, by using the self-serving behaviors of participants holding what has been labeled as "pro-self" attitudes with less egoistic sustainability goals through extrinsic goal setting (van Horen, van der Wal, & Grinstein, 2018). However, competition has commonly been associated with negative effects. Controlled experiments have discovered that competition can lead to faster but more shallow cognitive processing of content (DiMenichi & Tricomi, 2015) and can especially work against the motivation and performance of users with lower abilities (ter Vrugte et al., 2015). Research indicates that such mechanisms are enhanced by various psychological traits such as lower levels of self-esteem (Weinstein, 2017) and higher levels of self-monitoring (Scissors et al., 2016) and decreased by others—for example, a sense of purpose in life (Burrow & Rainone, 2016). In practice, negative social comparison seems to be one factor that has motivated platform owners to alter or remove gamification features.

As **community responsibility** is close to the very definition of social sustainability as "a life-enhancing condition within communities, and a process within communities that can achieve that condition" (McKenzie, 2004, p. 12), its applications among the analyzed gamification elements have been manifold: the introduction of a Care reaction during COVID-19 outbreak as well as follow-4-follow user initiatives; shared responsibility for keeping a Streak thereby forming joint projects online; the Top Fan Badge as a way to advertise and thereby support a community; the attempt to verify accounts on Twitter through the Blue Badge as means to forge community-enhancing trust and the act of donating to support communities through Facebook's Fundraising. Developing active communities of online users has been a main goal of SNS (Lampe, 2014); however, it is crucial to understand gamification's impact on "real-life" communities. For example, an overemphasis on gamified behaviors can undermine the quality of communication, as seen with Snapchat Streaks (Hristova et al., 2020), and interpreting follower counts or likes as a signal status can lead to issues of body image and unrealistic social expectations (Hogue & Mills, 2019).

Future focus—a main aspect of social sustainability (Mehan & Soflaei, 2017)—has found different expressions in the introduction of Snapchat Streaks, Twitter's Blue Badge and Facebook's Fundraising. Similar to

Community responsibility, it is a crucial point whether platforms focus on maintaining future on-platform involvement or invest in future goals that reach beyond the SNS itself. While Streaks are primarily focused on upholding daily (often for years) on-platform interaction (Hristova et al., 2020), Fundraising is oriented toward investing in improved conditions for communities in "real life". Twitter's future focus is expressed in its efforts to verify accounts of public figures on the platform in order to make its online communication more reliable. However, the involvement in "real-life" politics can also be problematic as exemplified by the public uproar about the case of the verification of white supremacists' accounts on Twitter (Heim & Tsukayama, 2017).

4.1 Does Gamification De-emphasize Communication?

Though gamification mechanisms vary and often rely on the intentions of users, it becomes evident that when gamification focus becomes more important than communication, social sustainability is threatened (Hristova et al., 2020). For example, Instagram states that it is problematic when users are focusing more on the likes a picture gets than on its actual content (Meisenzahl, 2019). If gameful behavior gains prevalence over the quality of communication, a further challenge surfaces: users, and especially those with a vested interest in garnering followings, attempt to "game" social media status signaling systems in a plethora of ways such as the reciprocity-based like-4-like or follow-back campaigns or buying fake followers or likes (UpVotes, 2020).

A further example is provided by Snap Streaks—the time constraint that they impose on communication can foster more intimate daily sharing *or* lead users to obsess over the score instead of the content of their exchange. Adolescents keeping Snapchat Streaks who feel that their peers overemphasize their gamified behavior (Hristova et al., 2020) dropped either a particular Streak or the Streaks altogether. This response demonstrates how gamification can harm reciprocity and the sense of relatedness if it hijacks the platform's core values.

We suggest that there should be more reflection of the empirical implementation of gamification elements in order to avoid conditioning users with behaviorist rewards to perform certain prosocial behaviors. Indeed, motivation research has consistently found that extrinsic motivators may lead to greater quantity of behavior in the short term, but less variability in their qualities (Cerasoli, Nicklin, & Ford, 2014). Furthermore,

overemphasis on extrinsic markers can crowd out intrinsic motives, for example, to share meaningful experiences and information on social media, while the gamified behaviors in themselves are prone to extinction if the extrinsic markers of value cropping them up lose their salience (Frey & Oberholzer-Gee, 1997). As such, we surmise that gamification focused on short-term gratification and extrinsic markers might be antithetical to self-sustaining arenas for authentic social exchange.

4.2 Gamification Elements Are Continuously Monitored and Adapted

The elements analyzed so far might suggest that social media companies are monitoring the impact of their gamification elements in order to exclude ones that pose a serious threat to social sustainability. We have seen examples of negative social comparison being one factor that might motivate platform owners to alter or remove gamification features: Snapchat replacing Trophies with the less competitive *Charms* feature; Snapchat making the Best Friends feature visible solely to the user (Friend List Emojis); Twitter discontinuing user nominations for their Blue Verification Badge and Instagram experimenting with hiding numbers of likes.

Adaptations have also been made in response to real-life social sustainability issues: Twitter introduced a Blue Badge to verify accounts, while Facebook added a *Care* reaction as a response to social isolation during the COVID-19 pandemic. SNS platforms have thus been displaying effort to improve aspects related to social sustainability using gamification to flexibly adapt and evolve while preserving their "core loops". For example, Facebook CEO Mark Zuckerberg has "made it clear that finding ways to let people use Facebook for social good is important to him" (D'Onfro, 2015). Facebook's *Social Good* page describes their initiatives as: "In addition to our Social Good work, we have a number of initiatives that also help people come together in meaningful ways to support their communities" (Facebook Social Impact, 2020).

We must, however, also consider that many such efforts are responses to bad publicity and ultimately serve the underlying for-profit business models. If stock prices are at odds with the world sustainability goals, what measure of success will win out in the minds of SNS CEOs?

5 Conclusion

This chapter examined SNS's efforts in the direction of altering, removing or adding features in order to deal with complex social sustainability issues such as negative social comparison; gamification overriding communication; real-world embedding and impact of gamification.

Gamification may enhance user experiences in ways that can be understood as "life enhancing" insofar as they create a more useful, interesting and enjoyable space for user consumption and participation (Lieberoth, 2015). However, it can also create obligations and hedonic treadmills (Hristova et al., 2021) put in place by providers in order to elicit certain behaviors that may or may not run counter to the best interest of users. It is important to note that services that seem to be for free are, in reality, made available by the social media conglomerates in exchange for detailed data rendition on the users, ownership of materials shared by the users, and exposure to advertisements often enhanced by the data collected. These business practices are rooted in big data rendition and mining and termed surveillance capitalism (Zuboff, 2019).

Since the interests of user communities and of social media companies do not necessarily align, it is important to pose the question "sustainable for whom?". On the one hand, social media companies use gamification to encourage users to spend more time, have more interactions and generate more content and data (Lampe, 2014; Hristova et al., 2021) on the platforms. On the other hand, user communities are moved by countless motivations varying from finding followers for one's cooking page to mobilizing supporters for extremist rallies. Issues of politics and content, as in the cases of Twitter giving a verification badge to a person viewed as a white supremacist (Heim & Tsukayama, 2017), show that platforms, as well as how their gamification mechanisms enable endorsement and visibility, can quickly be experienced as socially unsustainable.

Our analysis revealed that while SNS display efforts to foster social sustainability, their gamification design is mostly focused on enhancing user involvement with their online products and not on "real-world" social sustainability. Notably, fundraising is an exception of a gamified SNS intervention with the explicit aim to mobilize resources and support for communities and causes outside of the SNS arena. While particular gamification mechanics may cease, longitudinal studies of social media as a gamified ecology evolving are needed to assess its development with regard to long-term social sustainability.

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Social Playfulness—Memorable Family Co-play Experiences with *Pokémon GO*

Elina Koskinen and Mikko Meriläinen

1 Introduction

Digital gaming is a common pastime enjoyed by children, adolescents, and adults alike. The social aspects of gaming, such as playing together, discussing games, and participating in gaming communities, are a common reason for people to play games, and games are played with both friends and family (e.g. Eklund, 2015; Lenhart, Smith, Anderson, Duggan, & Perrin, 2015; Schiano, Nardi, Debeauvais, Ducheneaut, & Yee, 2014). This study focuses on the latter, specifically in the context of the mobile game *Pokémon GO* by Niantic (2016).

Existing studies on *Pokémon GO* and social, family-related experiences have often concentrated on the relationship between parents and underaged children (e.g. Lindqvist, Castelli, Hallberg, & Rutberg, 2018; Sobel et al., 2017). However, interactions between parents and children are only one type of family interaction. This study fills gaps in our knowledge about

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family experiences with *Pokémon GO* by also studying siblings and romantic partners, as well as adults playing with their own parents. We explore memorable social experiences around the game to discern the ways in which *Pokémon GO* facilitates, supports, and augments family interactions. We argue that a playful mindset is an important part in these experiences.

1.1 Pokémon GO*: Blending Physical and Digital*

Pokémon, derived from the words "pocket monsters", is a media franchise about collecting Pokémon, a massive variety of fantasy creatures. The franchise, launched in 1996, consists of digital and non-digital games, animation series, movies, and an extensive assortment of merchandise.

In *Pokémon GO,* the player catches, collects, and evolves Pokémon creatures and battles other players' Pokémon. The game is location-based; the player's location in the physical world is connected to a virtual world through Global Positioning System (GPS). As the player moves around in their physical environment, Pokémon appear in the virtual world. When using the augmented reality (AR) feature of the game, the player is able to see the Pokémon against the real-world scenery on their mobile device. The player can capture these creatures by moving their finger on the device's screen to throw Poké Balls[1] at the Pokémon. The game also rewards the player for different actions, such as hatching Pokémon eggs,[2] spinning PokéStops,[3] and conquering Gyms.[4]

2 Background

2.1 Why Family Relationships Matter

The family, regardless of its composition, is a basic unit in society and holds tremendous significance for individuals' well-being and development (e.g. Buehler, 2020). Earlier research, discussed below, shows that

[1] An item with which the player is able to capture the Pokémon creatures.

[2] Players can hatch Pokémon from eggs by walking a specific distance.

[3] A location in the game that provides the player with items and quests. Represents a fixed real-world location, such as a landmark.

[4] Has the same features as a PokéStop, but in addition you can battle against other teams' Pokémon to conquer the Gym for your team. When the ownership of the Gym is on the player's team, the player has the option to add their own Pokémon to gather Pokécoins, which can be used to purchase in-game items.

close and supportive family relations benefit well-being through different pathways, changing through an individual's life and depending on their life situation.

In the context of children, adolescents, and their parents, close family relations have been shown to protect against risky behaviors such as substance use (Mahabee-Gittens et al., 2011; Moore et al., 2018), increase sleep quality (Tsai et al., 2018), and support psychological well-being (McConnell, Birkett, & Mustanski, 2016; Moore et al., 2018). Family relationship quality in adolescence can have far-reaching impacts: a longitudinal cohort study by Berg, Kiviruusu, Karvonen, Rahkonen, and Huurre (2017) found that poor family relationships in adolescence were associated with economic adversity in mid-adulthood. The importance of family relationships also extends to siblings, as having fewer sibling conflicts has been found to be associated with less internalizing (e.g. depression, anxiety) and externalizing (e.g. aggression) problems (Buist, Deković, & Prinzie, 2013).

In romantic relationships, relationship status and quality appear to be connected to subjective well-being. Married individuals in satisfying relationships have reported the highest levels of subjective well-being and exhibit fewer depressive symptoms, while singles have reported the lowest levels of well-being (Dush & Amato, 2005; Kim & McKenry, 2002; Soons & Liefbroer, 2008).

2.2 Gaming and Family Life

Research that addresses families and gaming has often approached the subject in the context of mediation, risks, or problems. Examples of this are studies on gaming mediation strategies (e.g. Jiow, Lim, & Lin, 2017; Martins, Matthews, & Ratan, 2017; Nikken & Jansz, 2006) and studies detailing conflict and communication between parents and their children (e.g. Brus, 2018; Su et al., 2018) or between spouses (Lianekhammy & van de Venne, 2015) in problematic gaming situations.

In contrast, there is a body of research that examines other types of impact digital gaming can have on families. It has been suggested that co-playing digital games can improve family closeness, especially in families with poor family communication (Wang, Taylor, & Sun, 2018). Playing digital games together can also provide ways to connect and maintain closeness with family members by encouraging conversation and self-disclosure (Osmanovic & Pecchioni, 2019; Zhang, 2018) and promote

learning through playful socialization (Gee, Siyahhan, & Cirell, 2017). The digital divide between generations can elicit interaction, allowing children to display expertise and regulate adult participation in digital games, and parents and grandparents to initiate dialogue and celebrate a child's competence (Aarsand, 2007; see also Zhang, 2018). This seems to happen not only between children or adolescents and adults, but also between younger and older adults (Osmanovic & Pecchioni, 2019).

Research on playing together with a romantic partner suggests gaming to be a common form of interaction for existing couples interested in games. This shared interest can be beneficial to romantic relationships by facilitating spending time together with a mutually enjoyable activity, whether co-situated or over a distance (Bergstrom, Jenson, De Castell, & Taylor, 2017; Consalvo et al., 2018; Evans, Craig, & Taylor, 2018). Having a shared knowledge of a game has been described as a form of "togetherness" that transcends game play (Carr & Oliver, 2009). However, co-play can also elicit conflict such as when players assign blame to their partner for in-game events (Evans et al., 2018). It is apparent that playing digital games together cannot be separated from the rest of the relationship but is instead an everyday way of spending time. Couple co-playing research has commonly featured sedentary games such as *League of Legends* (Riot Games, 2009) and *World of Warcraft* (Blizzard Entertainment, 2004) (e.g. Carr & Oliver, 2009; Evans et al., 2018).

Research on sibling gaming is limited and focused on gaming between young siblings, with little research on adults. Sibling play can differ considerably from play with non-related peers among children (Go, Ballagas, & Spasojevic, 2012). In a study of children's gaming with siblings, patterns of competition, dominance, and social roles could persist between games (Go et al., 2012). Whether these dynamics carry on beyond childhood is unknown, but earlier research has shown that new sibling roles are negotiated during the transition to adulthood while time spent with siblings lessens (Conger & Little, 2010; Shortt & Gottman, 1997).

To the authors' knowledge there is currently very little research that examines *Pokémon GO* in the context of playing with partners and very few references to playing with siblings (e.g. Sobel et al., 2017; Vaterlaus, Frantz, & Robecker, 2019). There are, however, studies about *Pokémon GO* related to parents and children. Sobel et al. (2017) found that the game enabled joint media engagement, promoted family bonding, and alleviated parents' concerns about gaming, producing experiences and interactions that went beyond the content of the game. Lindqvist et al.

(2018) discovered that cooperation and togetherness were highly valued in play between children and parents. According to parents' reports, the physical and outdoor activities encouraged by the game were another positive element (see also Koskinen, Leorke, Alha, & Paavilainen, 2019b; Militello, Hanna, & Nigg, 2018). The game has been argued to improve social well-being and connectedness in families (e.g. Militello et al., 2018; Vella et al., 2019). The intergenerational appeal of the game has been noted in earlier research: players can have different types of goals in *Pokémon GO* and the game supports multiple play styles, allowing children of different ages and parents to play together (e.g. Comunello & Mulargia, 2017; Tran, 2018).

2.3 Playing and Playfulness

Play is often a social activity (Burghardt, 2005). The role of play and playfulness in bringing people together has long been acknowledged (e.g. Caillois, 2001; Huizinga, 1949), and as Stenros (2015) points out, the social situation can be an integral part of play. Play can bring people together in a variety of ways, from sharing a gaming hobby (Carr & Oliver, 2009) to collectively fending off embarrassment (Deterding, 2018).

The concepts of *game*, *play*, and *playfulness* are important to this study. A game is a system of rules; playing, whether as free play or in the context of a game, is an activity, and playfulness is a mindset. While these three concepts are often closely linked, they are distinctly separate (Stenros, 2015; see also Makedon, 1984). In the context of our study, *Pokémon GO* is obviously a game. Play refers to both playing the game and playful interactions around the game, and playfulness is the adopted mindset that drives these playful interactions.

The definition of the word game is contested (see Stenros, 2017). In this study, we adopt the widely accepted and in practice useful (Stenros, 2015) definition proposed by Salen and Zimmerman (2003), in which "a game is a system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome" (p. 81). In *Pokémon GO*, examples of conflicts are the contests between players and teams, the rules are those imposed by the game on the players, and the quantifiable outcome consists of the various achievements the game tracks, for example, Pokémon collected, distance walked, and the player's level.

When discussing playfulness, we refer to Apter's reversal theory. In this approach, Apter (1991) identifies two metamotivational mindstates

between which people oscillate in their everyday life: the *telic* and the *paratelic*. While the telic mindstate is purposeful, serious, and goal-oriented, the paratelic in contrast is a playful mindset focused on instant gratification, spontaneity, and avoiding boredom (pp. 15–17). A paratelic or playful mindset does not require the social act of gameplay to be present, nor does playing a game automatically bring about a playful mindset (Makedon, 1984; Stenros, 2015). Instead, an individual can participate in a game, such as a competitive sport, without a playful mindset (Apter, 1991; Makedon, 1984), or adopt a playful mindset in a non-gaming context (Deterding, 2018).

3 Methods

In this study we explored memorable social interactions players had with their family members while playing *Pokémon GO*, to discern different ways of how digital gaming facilitates family interaction. Expanding on existing research, we drew from a large set of qualitative data and adopted a broad definition of family to chart the many forms of family interaction around *Pokémon GO*. We formulated our research question as follows: how does playing *Pokémon GO* facilitate, support, and augment family interactions?

Our data is part of a larger data set that was collected through a Finnish online survey focusing on game experiences with *Pokémon GO*. The survey included both qualitative and quantitative questions and was launched in September 2016. It was shared on Facebook in 15 Finnish *Pokémon GO* and related groups. In addition, two Finnish gaming news portals advertised the survey. The survey was open for one week, gathering a total of 2611 valid responses. This data has been used in studies on players' positive and negative experiences concerning the game (Paavilainen et al., 2017) and reasons to start, continue, and quit playing the game (Alha, Koskinen, Paavilainen, & Hamari, 2019). In addition, Koskinen, Alha, Leorke, and Paavilainen (2019a) have researched the topic of players' memorable experiences with *Pokémon GO* more generally, as well as from the point of view of middle-aged players (Koskinen, Leorke, et al., 2019b).

For this study, the open-ended question "Could you tell us a memorable game experience with *Pokémon GO*?" was examined. This question had 2400 valid responses in the original data set. The wording of the question was designed to highlight events that the respondents personally considered important: memories which had stayed with them. The wording "a memorable game experience", rather than "most memorable

experience" or "favorite memory" was chosen to leave space for negative memories as well, as they have been understudied in games research (Poels, De Kort, & IJsselsteijn, 2012). This data was originally thematically coded and analyzed for the earlier mentioned study (see Koskinen, Alha, et al., 2019a).

Instead of considering only parent-child relations (cf. Lindqvist et al., 2018; Sobel et al., 2017; Tran, 2018), we studied families more broadly. We separated from the previously coded data the answers that included one or more of the following four family-related codes: *Children (related)*, *Parents*, *Partner*, and *Siblings*. *Children (related)* were coded when the respondents appeared to mention their own children or other related children such as nieces, nephews, and grandchildren. *Parents* were used when the respondent mentioned their own parents or grandparents. *Partner* were used when the respondent mentioned their romantic partner, and finally, *Siblings* were used when the respondent mentioned one or more of their siblings. Since we concentrated on family interaction, we removed responses that only mentioned a family member but no interaction with them. This reduced the total number of responses used for the qualitative analysis to 263.

We re-coded and analyzed this separated data set by using thematic analysis. It is a flexible method useful for summarizing key features of large data bodies and generating unanticipated insights (Braun & Clarke, 2006). To ensure diversity of observations as well as agreement between observers, both authors coded two-thirds of the data independently, forming their own individual codebooks. After discussing and comparing the coding, the codebooks were combined into one and similar codes merged. The remaining third of the data was coded together, and the codebook was iteratively edited during the process. Through a hermeneutic process of analysis, discussion, and re-analysis, the codes were sorted to construct the themes presented in the next section.

4 Results

Our data featured a wide variety of memorable social experiences around family gaming. Through our analysis, we were able to identify four distinct themes: *Game-centered experiences*, *Embedded gaming experiences*, *Out of the ordinary experiences*, and *Experiences of togetherness*.

This section is structured following the abovementioned four themes. The illustrative quotes have been translated from Finnish. While spelling

mistakes and minor grammar issues such as lacking capitalization in the original language have been corrected in the translation, we have sought to retain the tone of the original responses (e.g. "didn't" instead of "did not"). The spelling of *Pokémon GO* as well as specific game terms has been made uniform throughout the data. Themes and example codes included in themes have been italicized. After the quote, we have reported the respondent ID. Additionally, while we have not explored the effects of age and gender (see Malik, Hiekkanen, Hussain, Hamari, & Johri, 2020), we have elected to report them to provide the reader with added context.

Our approach is qualitative, but we have utilized some descriptive wording related to quantity. There are different conventions for reporting prevalence in qualitative studies (see Braun & Clarke, 2006); we have opted for this approach to illustrate a substantial majority of responses or exceptional individual responses in a given theme when we have considered it important.

4.1 Game-Centered Experiences

The theme of *Game-centered experiences* included memories stemming explicitly from *Pokémon GO* gameplay. Although all the responses in the data are in some way related to playing the game, the experiences in this theme were directly connected to in-game elements. These included, for example, completing an in-game task or finding a specific Pokémon together for the *first time*, playing around with the game's *AR function*, *learning together* about the game, *achieving something together* in the game, or *thrill* or *disappointment* over gameplay events. While game content was central to these experiences, sharing the in-game event with another person typically augmented the experience (see Juul, 2009).

> *The moment when Dragonite appeared at a lure.*[5] *I didn't catch it, but luckily neither did my boyfriend. Shared moments of happiness and disappointment remain with you the longest. (ID 1530, female, 26)*

> *While sheltering from the rain with the children, a Drowzee appeared, and we took several photos with it. (ID 1672, female, 37)*

[5] An item a player can attach to a PokéStop, making it attract more Pokémon for a given time.

Memorable experiences were not always the result of the respondent's own gaming, suggesting that personally playing a game is not a prerequisite to enjoying a shared gaming experience (Consalvo et al., 2018; see also Sjöblom & Hamari, 2017). *Witnessing happiness* was coded when respondents described witnessing emotions of the other, typically their child, for example, joy excitement, or pride when they caught specific Pokémon, conquered a Gym, hatched an egg, or simply shared their enthusiasm over in-game events.

> *I was playing with my son and he caught an awesome Pokémon. We were driving home after hunting and I saw such huge feelings of success and happiness in my son that I was taken aback. My son hollered and whooped because of his fortunate hunting trip. (ID 1188, female, 37)*

> *I was sitting at my computer, when my little brother, who had been outside, called out to me in a panic that Blastoise had appeared in the front yard. I didn't catch it though, but my little brother's excitement was fun. (ID 2539, male, 21)*

4.2 Embedded Gaming Experiences

Some memorable interactions happened while gaming, yet were not directly related to gameplay. The memories, that were *not just about gaming*, included other activities in addition to playing *Pokémon GO*, for example, dating, picnics, birthday parties, or amusement park days. The theme reflects the ease of incorporating *Pokémon GO* into everyday social activities. The observation finds purchase in previous research (e.g. Vella et al., 2019) and appears to be an important aspect of the game when discussing social interaction.

> *Pokémon GO date. I went on a first date with my current boyfriend while playing Pokémon GO, and we played for six hours together in the city. (ID 619, female, 27)*

> *Looking for Mr. Mime with the children at Linnanmäki amusement park. The children did not know whether to go on rides or play Pokémon GO. (ID 966, female, 38)*

> *We went to the beach with my brother's family to see the Perseids [meteor shower] after eleven at night. There was also a PokéStop at the beach, so we combined watching shooting stars with catching Pokémon :) (ID 1191, female, 35)*

Exploration consisted of traveling to different cities to play, sightseeing and discovering in new places, as well as exploring more familiar surroundings (see Tran, 2018; Vella et al., 2019). While both parents with children and couples reported memorable experiences related to sightseeing, the experiences and the importance of playing the game differed. While parents and children specifically went to new locations to play *Pokémon GO*, couples reported using the game to add an extra layer of fun to sightseeing. These experiences underline the spatial nature of *Pokémon GO* gameplay, driven by its location-based mechanics.

> *On the day the game was released we played a lot with my girlfriend in a city that I was unfamiliar with. We cycled over 10 km and walked as much. In addition to the time spent together, the PokéStops offered information about the surroundings. (ID 1390, female, 21)*

4.3 Out of the Ordinary Experiences

Some memorable moments were out of the ordinary experiences, often playful exceptions to everyday behavior and rules. These experiences included playing outside during *night-time* and *changing children's gaming rules*, and often featured *novel experiences*, such as dashing outside in the middle of a rainstorm in order to catch a Pokémon. These suggest both the paratelic mindstate described by Apter (1991) and playful gaming as discussed by Makedon (1984); in other words, participating in the game in a playful manner. There were also instances of the game *facilitating something new*, such as exercise with family members who did not normally enjoy walking.

> *One summer night we traveled 35 km by foot and bicycle chasing Pokémon until the morning hours with childhood friends and my brother. Almost a marathon! (ID 783, male, 18)*

> *I looked at the app late one evening. The list showed a Snorlax, a rare Pokémon missing from both mine and my 7-year-old son's collection. It was past his bedtime, but we couldn't help but run outside in our pajamas to look for it. Even the drizzle did not bother us. In the end we managed to locate Snorlax and we both caught it. As we were contentedly walking back home, the man living next door to us came running towards us holding his phone. We didn't have to guess what it was all about (even though we had never discussed anything relating to playing). I immediately told him where to find Snorlax, he laughingly thanked me, and kept running. (ID 1355, male, 34)*

My partner and I were visiting my mother, and went for a walk. We simultaneously found Jynx for the first time, and it felt as if we had actually met this Jynx there on the street corner. Funny. (ID 2171, female, 35)

Just the fact that because of this game I've had my spouse take a walk with me for the first time! They don't do any sports or go out, so it was an accomplishment. One time we were outside during the night for many hours walking and looking for Pokémon. (ID 177, female, 23)

Respondents sometimes reported situations in which they ended up having *unusual interactions* with their family members. Some respondents, mostly adult, played together with their own parents, especially mothers. In some cases, the parents did not even have the game installed, but were still eager to join in. Respondents sometimes felt that their parents might have been more excited about the game than the respondents themselves. This was different from the previously discussed dynamic, in which parents of young children witnessed the happiness of their playing child. Instead, here it was sometimes the non-playing family member who was more excited.

I was surprised by how enthusiastic my mother was about playing the game with me, even though we never set it up on her mobile device. During the summer it was more common for my mother to say "is it time for a Pokémon chase?" than for me. (ID 741, female, 25)

I went home to visit my parents. The first words out of their mouths were whether we should go chasing Pokémon. We drove around the city center, and every time I made a sound in the backseat, my father would call out from behind the wheel and ask if we should stop. (ID 1150, female, 23)

Some out of the ordinary experiences revolved around *children's expertise*. In these situations, typical generational dynamics were reversed, and children took the role of teachers and specialists in relation to adult game players (see Sobel et al., 2017; cf. Tran, 2018). In addition to highlighting children's genuine gaming expertise (see VanDeventer & White, 2002), this may also represent adults engaging in play activity from the position of a novice, while allowing the child to control the activity (Aarsand, 2007). However, rather than demarcating gameplay as a non-adult space (cf. Aarsand, 2007), children appeared to be happy to include adults in *Pokémon GO* play.

My 4-year-old granddaughter took care of all my Pokémon, evolved the possible ones and taught the technique of throwing [Poké] Balls and the use of Razz Berries.[6] *(ID 1113, female, 60)*

I went to Suomenlinna [a historical district and popular tourist site in Helsinki] to play Pokémon GO and there my nephews taught Gym battles to me, my husband, and my friend. It was fun when we conquered the Gym as a group and the under 10-year-olds taught the 30-somethings to play. (ID 2524, female, 31)

4.4 Experiences of Togetherness

Many of the experiences mentioned by respondents were about doing something together that helped family members bond and strengthened social ties. Some respondents explicitly reported *bonding* with their family members through the game (see Sobel et al., 2017; Tran, 2018). By having a common hobby and sharing a mutual interest, parents felt closer to their children while playing together. This also worked the other way around, when adult players connected with their own parents. One such respondent described their relationships with one of their parents as complicated. For some siblings, playing *Pokémon GO* together was a great means for bonding, in some cases even despite a relatively large age difference. Non-game-related *discussions* also took place, sometimes explicitly enabled by the new shared activity (see Sobel et al., 2017).

Well for example the first time when we conquered the Gym with my boy, and the first time that our own Pokémon were able to hold the Gym for over 24 hours straight ;) For me the game has meant a new kind of bonding with my children, although we were close before, but with the game a new way of sharing interest in something has emerged, a lot of nice memories and experiences are attached to that. (ID 1145, female, 36)

[…] Another thing worth mentioning is that my mother, with whom I have an up-and-down relationship with, also plays Pokémon GO and the game is one thing in common for us. (ID 2220, male, 24)

My little brother (aged 23) asked me to join a Pokéhunt, which surprised me because we don't normally hang out together or see each other except sporadically. While hunting Pokémon we ended up chatting a lot and even about the sort of things that we don't usually talk about. (ID 1686, female, 24)

[6] An item that you can throw at the Pokémon to make it easier to catch.

Sometimes a respondent described spending *quality time* together with their family members or sharing a *special moment*. *Quality time* meant families spending leisurely time together in general (see Milkie, Kendig, Nomaguchi, & Denny, 2010), whereas *special moments* were individual memorable occasions.

> *We were out grilling at the nature trail lean-to with my child and grandchild, because there's a PokeStop there! We went up and down the trails with the little one to make eggs hatch! It really was quality time with the family!! (ID 181, female, 55)*

> *We went on a pub crawl walk together with my spouse and were catching Pokémon and racking up kilometers while getting tipsy. The weather was beautiful and the pizza at one of the locations was good. (ID 1436, female, 33)*

> *While hunting Pokémon, we have been spending more time together with my spouse than in a long time. Something memorable last week was when we were walking during the night on the outskirts of the city while hunting Pokémon, and saw a gorgeous sunset. (ID 644, female, 37)*

For some respondents *Pokémon GO* have become a *shared subject* to discuss with their family members, whether face-to-face or via social media. Respondents also mentioned the game eliciting elements of *boasting* and *competition* in their interactions with their family members. These discussions and interactions illuminate how the game's social aspects are not limited to the actual play situation, but rather extend beyond it.

> *We have a WhatsApp group together with my siblings (we live in different cities), where we share our most fun play experiences and pictures of best catches. The game and this mutual whimsy have connected us even more (the age difference between the youngest and the oldest sibling is 11 years). (ID 572, female, 27)*

> *I went jogging and took my phone with me. When I left, I was one level and 30 000 points behind my son. When I came back, I had passed him in levels, and in points I was ahead by over 20 000. The look on my son's face when I showed my game was the best. (ID 962, male, 43)*

> *When I got Snorlax from a 10 km egg almost right after starting [the game], and how serious competitiveness exploded between me and my spouse. :D Shared time became fun and goal-oriented at the same time. (ID 1019, female, 25)*

5 Discussion

Our thematic analysis reveals that *Pokémon GO* facilitated a broad variety of positive social interaction between family members, from shared play between parents and children to bonding between adult siblings over intimate discussions while playing the game and shared adult playfulness between romantic partners. The results are supported by previous research (Lindqvist et al., 2018; Loveday & Burgess, 2017; Sobel et al., 2017; Vella et al., 2019) and expand upon it. Our findings indicate that *Pokémon GO*, much like other types of digital games, can be a highly enjoyable shared recreational activity and a way to bond and connect with family members, both within and across generations (see Aarsand, 2007; Carr & Oliver, 2009; Wang et al., 2018).

The positive interactions stemmed from both sharing a mutually enjoyable gaming activity and specific features of *Pokémon GO* itself. Many of the reported positive interactions, such as game-related discussion or enjoying a shared activity, are commonly found around other games and hobbies. However, *Pokémon GO* facilitated not only these interactions, but a wide variety of others, including shared picnics, sightseeing, and even pub crawls. As a pervasive game built around movement in the physical world, *Pokémon GO* enables a different kind of joint experience for families than traditional digital games, which are often played at home on gaming consoles and computers. The location-based gameplay combined with other gameplay elements helped players to adopt a playful mindset, while also making the game accessible and appealing to a broad range of different players.

Based on our data, we argue that a playful mindset (Stenros, 2015) is an important element in the shared enjoyment of *Pokémon GO*. Parents were willing to suspend rules on gaming or bedtimes to keep playing with their children and did not express concerns over screen time (see Tran, 2018; cf. Sobel et al., 2017). Partners shared romantic sightseeing walks while also catching Pokémon, and adult siblings drove around the countryside looking for fictional creatures. Time spent with the game was described by many players as quality time, and above all appeared to be *fun*, suggesting the adoption of the paratelic mindstate described by Apter (1991). Many of the memorable experiences were described as spontaneous actions, which can be seen as nonsensical when removed from the play context, such as darting outside after imaginary creatures in the middle of the night, in pajamas. For adult players, the game provided both an alibi

for play (Deterding, 2018) and an extra layer of playfulness (Stenros, 2015) to other activities such as sightseeing or going for walks, thus augmenting existing enjoyable activities and social interactions as well as facilitating new ones (see also Koskinen, Leorke, et al., 2019b).

The most obvious gameplay element crucial to both cultivating a playful mindset and separating *Pokémon GO* from the vast majority of digital gaming is the game's pervasive (see Montola, 2009), location-based nature. The game is often played outside home; it encourages players to explore their physical surroundings and often brings players into contact with other players as well as bystanders (see Montola, 2009; Vella et al., 2019). The game was played together on family picnics, dates, theme park visits, and long sightseeing walks, all of which can be argued to be atypical digital gaming contexts. The location-based gameplay mechanics of *Pokémon GO* prompted shared playful experiences, as players dashed out into pouring rain to catch Pokémon, got lost together, or were caught up in mass events with tens or even hundreds of other players.

As shown by the themes of *Out of the ordinary experiences* and *Embedded gaming experiences*, the ease of integrating *Pokémon GO* into other activities (see Vella et al., 2019) allows the game to facilitate interactions that may be uncommon or even impossible with other types of gaming. Games that demand intense concentration or require the player to be stationary, as is the case with most computer and console games, are far more difficult to combine with discussion or other activities. This underlines the importance of the relaxed, location-based gameplay: it is not what the mechanic causally achieves, but rather what it enables. By taking gameplay outside and augmenting physical world with a digital overlay, *Pokémon GO* becomes pervasive. It blurs the boundary between the domain of play and the domain of the ordinary (see Montola, 2009), promoting a playful gaming (Makedon, 1984) experience. This happens most concretely with the game's AR function, as fictional creatures can be seen in everyday surroundings through the phone's camera, but it is also visible in the ways play is integrated into everyday activities.

As Huizinga (1949, p. 12) states, exceptional, playful situations retain their magic beyond the duration of the game. This was evidenced by the respondents reporting how, for example, the game was discussed in messages between adult family members, how children would show their new Pokémon to parents, and how parents of adult players would wait for them to visit in order to play together. These examples suggest that the interactions facilitated by the game extend beyond the immediate gaming

situation. We argue that engaging in these playful activities together serves to reinforce social bonds between the players, as seen in the *Experiences of togetherness* theme. It may also be especially important for adult players, as play is less common for adults than it is for children, and can even be perceived as embarrassing or inappropriate (Deterding, 2018; Koskinen, Leorke, et al., 2019b). However, embarrassing ourselves together with others in a non-serious manner can build trust and even out status differences (Deterding, 2018).

Pokémon GO does not require intense concentration or mastering difficult controls, making low-intensity participation easier and leaving more space for other activities. In our data, *Pokémon GO* blended seamlessly with other family activities and augmented both the activities and family relations, not only between parents and young children, but also between siblings, romantic partners, and adults and their own parents. *Pokémon GO* is what Juul (2009, p. 20) calls a *socially embeddable* game: the game by itself is not the only source of the interesting experience, but players add a significant part to it. Whereas Juul (2009) notes that playing games *against* a friend or a family member adds special meaning to the game, it is obvious from our data that the same applies for sharing and collaboration.

Despite the socially embeddable nature of *Pokémon GO*, it needs to be noted that the theme of *Game-centered experiences* suggests that for some players, a considerable part of the game's enjoyment explicitly lies in the game content itself. One of the biggest reasons to continue playing *Pokémon GO* is progression in it, especially collecting Pokémon creatures (Alha et al., 2019). Many of the memorable moments mentioned by the respondents stemmed directly from in-game events, such as capturing Gyms, hatching eggs, or catching a specific Pokémon. This suggests a delicate balance between *Pokémon GO* offering engaging gameplay with clear goals, yet keeping this gameplay at a suitably low level of intensity. The brand itself seems to be approachable to different generations (see Koskinen, Leorke, et al., 2019b) and is very suitable for this type of game: wandering around and collecting different Pokémon creatures lies at the core of Pokémon stories, regardless of medium.

Although the AR overlay feature of the game added another playful element to the gameplay experience, it mainly appeared to provide minor novelty value instead of profoundly impacting gameplay. To date, other location-based mobile games with successful brand tie-ins, including

Niantic's own *Harry Potter: Wizards Unite* (2019), have not been able to replicate *Pokémon GO*'s success. This demonstrates that technological elements such as AR and location tracking are not in themselves guarantees of a game's phenomenal success, but instead the success of digital games relies on the links between technology, gaming content, and culture (see Mäyrä, 2017).

Our study has some limitations. The data we have examined focuses on the respondents' memorable experiences with *Pokémon GO*. Thus, it may present a more positive view of the game, not accurately reflecting the respondents' broader views or experiences—although respondents were not specifically asked about a *positive* memorable experience. Despite the large original sample, our results reflect only Finnish families and *Pokémon GO* players. As the survey was primarily shared in *Pokémon GO* online communities and on gaming websites, it is possible that the respondents represent a particularly active and invested segment of *Pokémon GO* players.

The timing of the survey has two-sided effects. Since the survey was conducted in 2016, less than two months after the game was released in Europe, the responses reflect the time of a *Pokémon GO* craze: the phenomenon was at its peak and the game had considerable novelty value. Due to the game's summer release and the visibility of its masses of players in central everyday locations, the conditions were especially conducive to social interaction. On one hand, the responses illustrate *Pokémon GO* at a unique time when enthusiasm for the game was at its highest. In addition, people had ample time to play it during their summer holidays, which likely also contributed to the experience of quality time. Because of this, our data presents a snapshot of gaming circumstances ideal for family interaction. On the other hand, this data might not reflect the situation now, when enthusiasm for the game has waned. The memorable experiences of current *Pokémon GO* players might turn out to be very different.

Pokémon GO is an example of the potential power of games to bring people together, yet there are several questions that warrant future study: how has the tailing off of the phenomenon affected interactions around the game? Have positive and playful family interactions faded now that the biggest *Pokémon GO* hype has ended, or has it instead been easier to find new games and playful activities to share? Have shared gaming experiences brought about lasting changes in family relationships?

6 Conclusions

Through a qualitative exploration of survey data, our study suggests that playing digital games, in this case *Pokémon GO*, in a family context can elicit a variety of positive experiences between family members such as parents and children, partners and siblings. *Pokémon GO* is a potent reminder of how digital games can both facilitate new family interactions and augment existing ones. It also underlines the importance of gameplay elements and design approaches that support these interactions: all digital games do not turn into shared family activities, nor are they intended to do so. We argue that *Pokémon GO* succeeds in being one largely due to the playful mindset it is able to facilitate.

Pokémon GO facilitates new family interactions through a new kind of shared playful activity. In addition to providing an engaging gameplay experience, it supports and strengthens interpersonal connections by affording experiences of togetherness and bonding through quality time spent around the game. *Pokémon GO* augments existing family relationships by enabling new and novel, out of the ordinary experiences and interactions with the aid of the playful mindset it helps to adopt. It also augments everyday interactions by adding a playful layer to sightseeing, family picnics, and generally being outdoors, since it is easily embedded in and combined with other activities.

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Echoes of the Past: A Gamified Initiative for Audience Development of Cultural Heritage

Vincenzo Idone Cassone and Fabio Viola

1 Introduction

In the last decade gamification has progressively been applied in many sectors: health (Johnson et al. 2016), education (Nah et al. 2014), marketing (Noorbehbahani et al. 2019), productivity (Ferreira et al. 2017), social good (Thiel et al. 2016), and last but not least, in the field of *cultural heritage* (Champion 2016). Although more slowly than in other fields, there has been a growing awareness of the benefits of gamified applications, as well as serious games and VR/AR, in the field of cultural heritage (Cunha et al. 2018). Such initiatives have recently multiplied and diversified, with the use of gamification to promote learning (Tan and Lim 2017), make

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people engaged in heritage (O'Connor et al. 2020), or contribute to its valorization and sharing (Gironacci et al. 2017). Gamification has been applied to different cultural contexts and institutions, such as museums, places of interest, tourist itineraries, or intangible heritage (Bollo 2018; Paliokas and Sylaiou 2016).

However, the application of gamification to cultural heritage is still not mature (Rapp et al. 2019; Nacke and Deterding 2017). Today, it is still very much applied preferentially for a young audience, often taking edutainment forms. Game dynamics and mechanics that are used are still standardized according to the PBL triad (points, badges, leaderboards, Werbach and Hunter 2012: 69ss), while few applications are designed to create long-lasting effects and awareness dynamics in relation to cultural heritage. This is even more evident in Italy, characterized by a traditional inertia of cultural institutions in relation to digital innovation practices (Viola 2018), as well as widespread disengagement between cultural institutions and the population, and by difficult communication between the two (Solima 2018). As a result, many existing game-like experiences have focused on explicit education patterns, in-museum activities, and interactions, becoming a simple support to traditional methods, contents, and visitors.

The present contribution discusses an example of gamified initiative for cultural heritage in counter-trend to the previous ones. This application was devised to use gamification for the audience development and engagement of a state museum body, the MANN (National Archaeological Museum of Naples). Through a gamified cultural innovation plan, with a mobile video game (*Father and Son: the game*) as its first product, MANN tried to reach out to new audiences, raising awareness and establishing a form of communication appropriate to the practices of a digital generation (Viola 2018).

The case study discussed below presents a relevant set of characteristics that make it worthy of mention within the panorama of gamification initiatives for social purposes:

1. It represents a hybrid initiative, in which a gamified cultural innovation project develops a mobile video game (non-edutainment) as its first product;
2. It moves away from the typical gamification aims linked to cultural heritage, to focus on audience development, raising awareness through the development of forms of emotional communication (Kidd 2015);

3. It uses a series of less frequently applied gamification dynamics connected to narrative/storytelling, moving away from the frequent use of the PBL triad and focusing on a process of onboarding through emotional engagement.

The present contribution will discuss both the video game and the broader process of gamified innovation of the public Figure of the Museum. In the following pages we will first reconstruct the gestation of the project, defining its initial objectives and the project proposal. Then we will analyze the design dynamics underlying the game and the gamification initiative. Finally we will discuss the results obtained, starting from the quantitative data available in order to develop a reading of the phenomenon.

2 Development

In 2016 the MANN, under the impetus of Paolo Giulierini's new management, published a strategic action plan for 2016–2020, devised together with Prof. Ludovico Solima (Università degli studi della Campania "Luigi Vanvitelli"). The plan briefly mentions the intention to develop a game as part of the institution's *audience development* measures, with the aim of "improving the attractiveness to the Museum's various new audiences and strengthening the link with existing ones".[1] On that occasion, Fabio Viola—a gamification designer and a founder of TuoMuseo, and a collective working at the intersection of games, arts, and cultural heritage—was contacted for a consultancy. Through a series of exploratory meetings, TuoMuseo and the MANN discussed the possibilities and strategies to pursue an initiative of audience development with games in mind. The consultancy evolved into a collaboration for the design of a long-term gamified initiative starting with the creation of the anticipated video game.

During the first meetings, the objectives and aims of the institution were defined, so as to make it possible to identify possible directions for the initiatives. The objectives of the museum were based on the aforementioned desire to create a product aimed at audience development; furthermore, the Museum wanted to avoid forms of on-site entertainment, linked

[1] Available at https://www.museoarcheologiconapoli.it/wp-content/uploads/2016/06/%E2%80%A2MANN_piano-strategico_BASSA.pdf (last accessed 28/09/2020).

to the audience already present in the museum, having already implemented these initiatives in the previous years. In addition, during the discussion, both partners agreed to avoid forms of edutaiment in particular, designed for a young audience, thus focusing on a different target and game form instead. These needs were linked to the search for new/innovative communication practices that would allow the institution to address a specific audience, which is not generally interested in or sensitive to cultural heritage and thus not reached by the museum's typical forms of institutional communication (direct advertising, initiatives, free days, collaboration with schools, etc.). These wishes had been synthesized through the maxim of communicating "by taking the museum out of the museum".

During a short series of planning meetings between MANN and TuoMuseo, a gamified conceptual framework was used to guide and map the course of action: at the time still under development by Fabio Viola. The framework was based on the model of Project Canvas, while inspired by and structured using the principles of engagement design (Viola and Idone Cassone 2017). The framework "Canvas for Cultural Innovation" is grounded on gamification concepts as a guide for the design of such initiatives: the user centrality in the cultural process, the definition of user types and motivational dynamics, development of the modes of interaction and the player's journey, and justification of the forms of rewarding during the experience. These aspects were integrated in the model together with those typical of Business Canvas, thus combining them with demographics of players (Bartle 2004; Liu and Idris 2020), motivational factors grounded in the Self-Determination Theory (Deci and Ryan 2008; Landers et al. 2015), engagement loop and Player's Journey models (Kim 2011), and types of rewarding and emotional paradigms (Viola and Idone Cassone 2017) (Fig. 1).

With this framework, the subjects were able to define the fundamental characteristics of the initiative and key features of the video game.

- The developers aimed to target an international audience of adults (18+) with autonomy of budget and movement, but tending to be untied/disengaged from the museum's tourist and cultural circuit. Additionally, a digitally competent audience with no specific experience in games was targeted. In relation to the Bartle Test, the profiles identified as reference were those of *explorers* (leveraging the

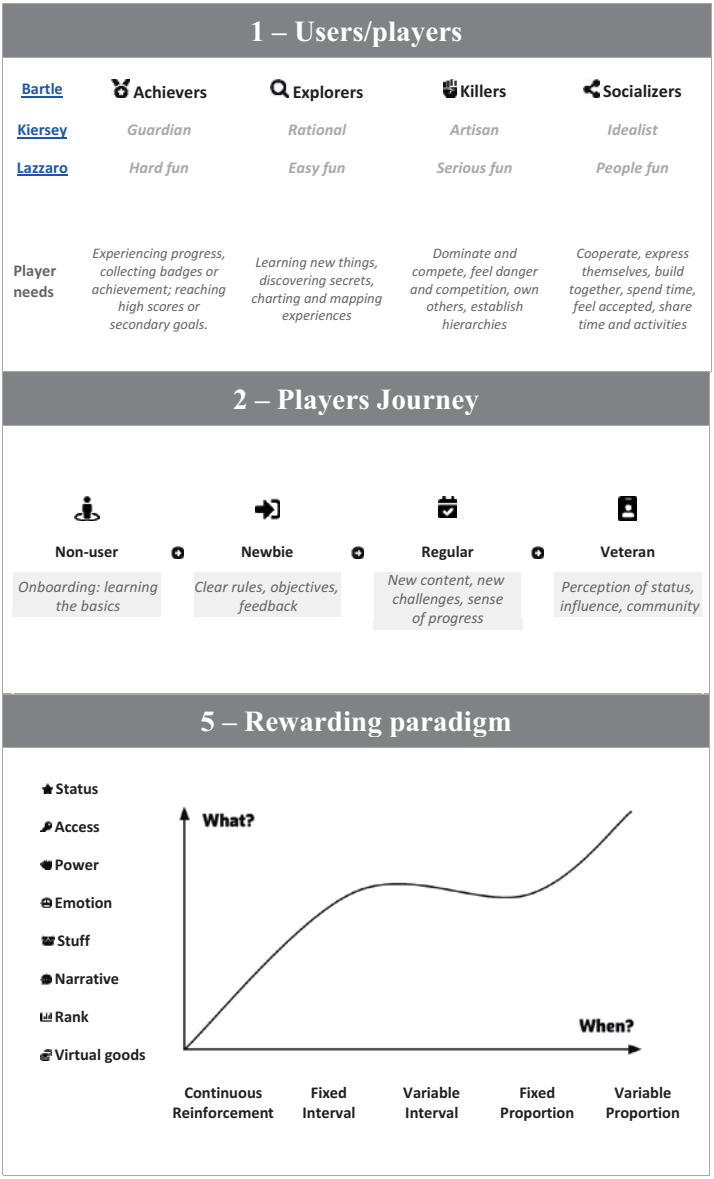

Fig. 1 The gamified Canvas for Cultural Innovation, page 2 (gamification tools)

sense of discovery, love of novelty and exploration) and *socializers* (linked to the aspect of the sense of sharing and communicability).
- In relation to the dynamics of the interaction implemented, the game was shaped as an *onboarding* process, which in the *Player's Journey* allows a foreign/external subject to come into contact with a service/product, being representative of the cultural heritage and manifested in the Museum. The game would thus constitute a first peculiar contact between a subject and an institution, different from the direct forms of institutional communication/marketing.
- This form of interaction was inspired by Fogg's (2009) *trigger* concept, specifically the *spark* type, that is, an interaction in which a skilled but unmotivated subject is brought to a state of sufficient motivation through interaction with the game/system. The spark was structured starting from motivational dynamics coherent with the identified types of users, and therefore, based on the development of the sense of *relatedness* and *autonomy* and structured as *experiential engagement* (Viola and Idone Cassone 2017: ch.2).

Based on these characteristics, the design elements of the project were defined, making it possible to move from the pre-production phase to the production phase (duration 8 months ca). The production phase included the following elements:

- A mobile platform for a wide audience with high digital literacy, including both casual gamers and non-gamers;
- A free and short-term game, ideally uninterrupted (45–60 min, modeled on the onboarding process);
- A graphic adventure game, which is story-based and has no challenge (exploration and discovery as main dynamics);
- A linear structure with simple decision-making process, avoiding differences in individual experience and game decision paralysis and ensuring narrative quality;
- The main theme including bonds/links between past and present and between generations (a narrative translation of the institution's function as guardian and a legacy of cultural heritage).

With these elements, the core of the *Player Experience Goals* (Fullerton 2018: 10ss) was defined, whereby a narrative would allow the player to indirectly (in undeclared way) experience the values that make the museum

important as a cultural entity and that would symbolize (through the player's adventure) the experiences and sensations related to the relationship with it. This led to the choice to use the museum as a scenario/environment of the story, rather than an object of the story itself. The core themes of the story would thus revolve around the relationship between present and past, the link between our culture and those that preceded it, and the role of the museum as a guardian and a teacher and a "father" who passes on to its children the family legacy.

On this basis, a series of videogame references were identified, which guided the development of the design document. This includes a series of interactive narrative productions, inspired by the adventures developed by TellTale Games (for the screenplay and emotional impact, while keeping in mind the budget difference), or *The End of the World* by Sean Wenham (a short minimalistic 2d adventure); *Islands of Nubla* (a mobile puzzle game created by the Thyssen-Bornemisza National Museum), or *Versailles:1685* (a video game developed by Cryo Team, set in Versailles palace and praised for the connecting historical reconstruction and playful dynamics).

3 Case Study: Father and Son

In March 2017, *Father and Son: the game* was published on the App store and Google play, with MANN as developer. The game was initially developed in English and Italian and was subsequently translated to French, Spanish, Russian, Chinese, Portuguese, German, Napolitano Dialect, and Japanese. The game is a two-dimensional, one-shot graphic adventure, 45–60 min in duration.

Players impersonate the son of a curator of MANN who receives a letter by the father: shortly before dying, the curator writes a letter of reconciliation to the son, in which he invites him to go to the museum to retrieve his notes and memories, as a way to understand the work that kept him away from his family. The initial prompt allows players to visit several areas of the museum, in each of which they come into contact with an archeological artifact, particularly dear to the father. Each one triggers a brief mental journey, with the player experiencing the past context in which the object was located, people the farther came into contact with, and common life at the period (e.g. Pompeii in Roman times, Egypt and Bourbon Naples).

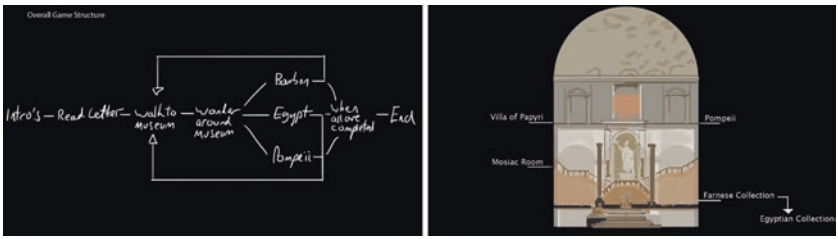

Fig. 2 The general structure of the game, and the Museum Hub

The narrative is linear, but the player can choose the order in which to visit the individual rooms, starting from the central hub at the Museum entrance. Although the game has a linear structure the player has a number of choices to make, for example, the order in which to follow the story sequences (Fig. 2). As a result, the game has several endings in the same scene: the son visits the father's tomb at the graveyard and receives one of the two versions of the final letter, which has been written by the main character and is defined based on the dialogue choices taken during the game. In one version, the son somewhat comes to terms with his father's life choices, in the other version, he still condemns the farther. The variations in the ending were reduced during the design phase, in order to avoid different interpretations of the game message and possible individual variations on the theme.

Although the game was designed as a one-shot, an automatic save mechanism via checkpoint has been developed, useful in case of forced pauses in the use of the smartphone or unexpected program interruptions.

The game includes a short tutorial/introduction, which quickly describes the player's interaction mechanics at the beginning, while presenting the game settings and introducing the time shifting mechanics. The scene opens with a view of the sky of Pompeii, followed by a scene of two lovers in the Bourbon Naples, and finally a sculptor in Egypt. Each of the scenes introduces characters who will be "met" later, while the game explains the mechanics of interaction and controls. In addition, the three scenes help to create the "meditative" atmosphere of the game, in the transition from the initial night/romantic atmospheres to a daylight in the modern atmosphere that the protagonist presents (Fig. 3).

The thematic core of the game is presented in the initial scene and develops on a narrative level translated by the mechanics of temporal

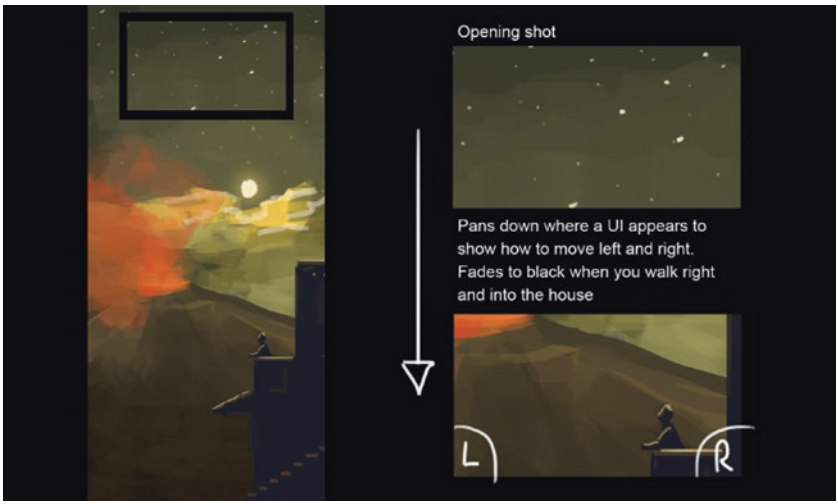

Fig. 3 Tutorial, first scene

shifting (Fig. 4). Through narration and player interaction, the game presents three aspects of the main theme of the bonds between past and present, which intersect and weave in order to trigger an emotional response in the player:

1. The most evident bond exists at a diegetic level, that is, between the father and the son, the former completely involved in his work, the latter completely separated from it. The premise of the game asks the player to accompany the son into the "discovery" of the father's legacy.
2. Another bond exists between the present and the past, which is linked to the generational discourse but extends to the relations between the civilizations that preceded us and our own. While being in present time, we can still interact with the legacy, and this link is expressed through the mechanics of temporal shifting, which connects/expands the individual father-son link to the collective past-present one.
3. Finally, there is an emotional bond between the player and the museum, developed through the game by making the player go through an experience that indirectly highlights the importance of the cultural entity as a guardian and a supporter of the cultural and personal ties. The

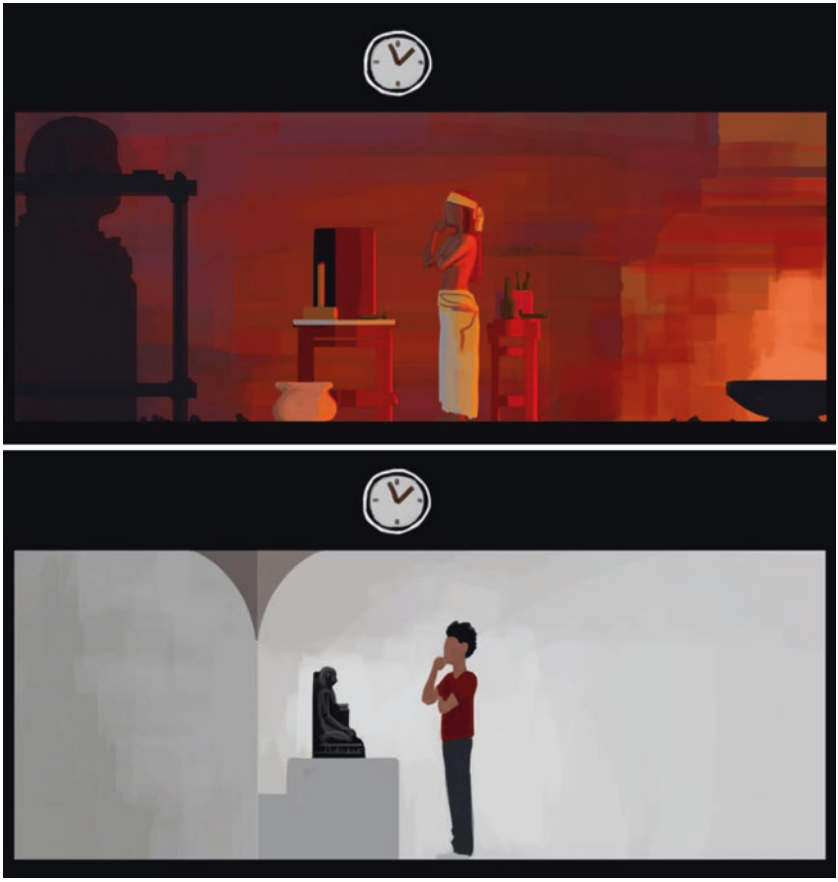

Fig. 4 Detail of the time-shift mechanics

museum simply plays the role of a "voiceless" setting, where it is possible to reactivate or rediscover the importance of the previous links.

The game triggers a process of awareness and engagement based on the experience of the game story, enabling the player to reconsider or rethink his/her relationship with cultural heritage in general and the MANN institution specifically. The game deliberately moves away from any form of "direct appeal" or explicit reference to the importance of museums, the

cultural-historical value of their collections or their educational function. In doing so, it shifts from the typical strategies of cognitive persuasion used in the institutional sphere, to a strategy of emotional experience, founded through the narrative dynamics of the game.

The core of the experience designed for the game is reinforced by the visual and sound esthetics. The graphics make use of hand-drawn scenarios, with an evanescent style and watercolor tones, deliberately without details and with the use of color for the masses of objects and persons represented. This reinforces the sense of impalpability and contributes to the provision of an "existential" atmosphere to the gaming experience. The soundtrack uses pieces on the piano and melodic orchestrates and a series of real sound effects, taken from the Museum and Naples' surroundings, so as to help bring out the details of the city, such as the sound of voices walking around Naples, the sound of birds, voices in the gardens, or the sound of the mocha gurgling.

These elements are added to a precise rhythm and timing of the experience: in addition to the idea of a game of short duration, designed for a single session (consistent with the idea of onboarding), the rhythm of the game is deliberately slower than in similar products, looking for an experience that recalls a "meditative" rhythm. This effect has been achieved by inserting relatively long segments of movement and foreseeing moments of "defibrillation" within the game: walking sections inserted after the most important emotional moments in the story. This framing of the experience and the rhythm of the game tries to translate in video game terms the characteristics of a typical visit to the museum, ideally characterized by a meditative, calm, concentrated, and emotionally intense walk.

Lastly, the game includes two additional (optional) mechanics: the first is linked to a process of collecting a series of sketches of works of art from the museum (5), hidden along the levels, which can be identified and "drawn" by unlocking the corresponding sketch. The second element concerns the unlocking of additional content on the basis of a geo-location system. If the player is physically at the MANN during the game, he/she will be able to change the protagonist's clothing and access an additional room in the museum. This unlocking effect is temporary and is not retained by the system the player is once outside the museum.

4 Results

The initial data analysis and interpretation allow for a preliminary overview of the results of the initiatives and provides a first evaluation of the project. The initial analysis was limited by the actual data available at the time.

In particular, the game did not feature an in-game system to record and collect data from players and was limited to the in-game check-in at the museum. Thus, the team relied on an analytics external system, in addition to the simple ones provided by the mobile platforms. Additionally, the data collected by the system only cover the first two years since the release (up to April 2019). This makes it difficult to correctly measure metrics such as playtime or completion rates.

The museum did not carry out any data collection or sampling in relation to the effects of the game for its audience. Furthermore, the Museum has little information about the demographics of its visitors, making it impossible to compare between the users of the game and other visitors of the museum. This problem is representative of many Italian institutions (including the museums) that have difficulties in collecting data about their audience or measuring the impact of their initiatives (Bollo 2008).

Finally, while there is abundant literature and market data on the performance of many mobile games, the vast majority of the literature discuss games with free-to-play, *live service* gameplay (i.e. Clash of Clans, Pokémon GO, or Candy Crush Saga), which are analyzed in terms of stickyness, player retention, conversion rate, and so on. These metrics are not applicable for *Father and Son: the game* because of its "traditional" nature of story-based adventure games. This makes it difficult to provide meaningful comparisons between the available data of the game and other mobile games on the store.

With these constraints taken into account, we have compared the available data in order to set up a preliminary interpretation on the results of the game. First of all, the game has registered over 4 million installations between the two stores in 2020 (Google Play and Apple Store, with a 3:1 ratio in 2019), far exceeding the internal 300 k download target set by the team and generating a (unplanned) net positive ROI for the museum in the first year (check-ins presented below). The game also showed a long-lasting trend of downloads, with the initial year downloads amounting to more than 2 million, and two more million in the following years from 2018 to 2020.

The free nature of the title, as well as the advertising obtained on the platforms through the featured titles function—which placed the game in high visibility positions in the stores several times—certainly contributed to this figure. In addition, the game has been widely covered in numerous newspapers, blogs, and cultural heritage pages in Italy in 2017. In the same year, MANN won the ArtTribune award as innovative museum of the year, which was linked to the experimental initiatives such as Father and Son, further contributing to the Figure and dissemination of the title.

The internal analytics and Google data indicate that the audience was of the average age above 30 years (54%) and had medium-high education. Gender ratio between men and women players was 57% to 43% (data up to 2019). Over 93% of the audience were non-Italian, which might be linked to the use of English as the language of production and primary dissemination of the title, as well as the developers being an international team. The players come mainly from China, the USA, Russia, India, and Brazil. The Italian audience accounted for less than 7% of the players. If adjusted for the population size of each country, this proportion becomes more significant (Fig. 5).

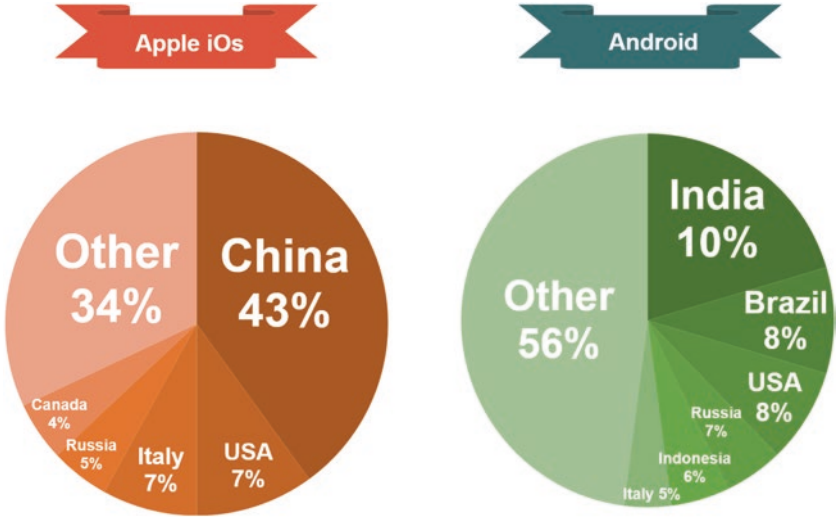

Fig. 5 Audience by nationality in 2019, per platform

The estimated accumulated player time amounts to 820,000 hours. If divided by 3.67 million players (up to 2019 at the time of the recording), it suggests an average play time of approximately 15 minutes. This rate should be read in the context of the free nature of the mobile game, whereby such games usually have a very low completion rate, in both traditional games and those with continuous/long gameplay loops. Furthermore, a highlight effect created when the game was included among the featured titles on the Apple and Google platforms, might have increased the number of downloads, but simultaneously increased the number of users who did not actually play the game and simply downloaded it.

In this context, a more representative evaluation might be the rating of the game in the two stores, which corresponds to an all-time average of 4.6 on App Store and 4.5 on Google Play Store (based on 29 September 2020). Combined with a total number of reviews of over 45,000 and the reviews of the MANN itself (over 9000 on Tripadvisor), it suggest that the game might have been effective at engaging the players and subsequently attracting more visitors to the museum.

Although we do not have a precise evaluation of the number of people who have visited the MANN following the experience of Father and Son: the game, an indirect link can still be derived. The first evaluation was provided by a study carried out by Lorenzo Bagnoli (2018), who ran a parallel between the MANN monthly ticket data in 2017 and the number of downloads of the game in the same period. The study shows a correlation between the release of Father and Son and the increase of tourists at MANN in the following months, as well as a correlation between the download peak periods of the game and the monthly peaks in tourists at the museum.

The second evaluation is based on the game's geo-unlocking mechanics, which recorded 40,000 check-ins at the Museum by players to unlock the game's bonus content. This figure takes into account only those players who have visited the museum and activated the unlock mechanics during their visits. However, this can be interpreted as the direct effect of the game, especially given the free nature of the game and its mobile distribution.

5 Conclusions

This chapter presented an example of gamified initiative for cultural heritage, which resulted in the development of a videogame for audience development for MANN. Through the gamified cultural innovation plan and the subsequent development of *Father and Son: the game*, the institution tried to reach out to the new audience, raise awareness about its role, and establish a form of communication adapted to the practice of digital natives.

As previously said, Father and Son represents a peculiar case study for the gamification of cultural heritage, both in relation to the initiative itself, to the final product, and to the features of the gamified elements:

- The initiative represents a hybrid mix of serious games and gamification: a gamified cultural innovation project that developed a mobile video game as its first product, distancing itself from forms of edutainment or typical gamification initiatives.
- The initiative also moved away from the typical gamification aims and practices linked to cultural heritage, to focus on audience outreach, raising awareness through the development of forms of emotional communication;
- The game has been developed through a series of less frequently used gamification dynamics and frameworks, connected to narrative/storytelling dynamics, avoiding typical mechanics such as PBL triad, and focusing on the development of an onboarding process driven by emotional triggers.

The positive reception of the game by the public and the MANN led to the collaboration with a planned set of initiatives and products related to father and son (a direct sequel, a theatrical release, a virtual re-enactment of the MANN on Minecraft). Furthermore, it led TuoMuseo to further collaborations with cultural heritage institutions, such as the MARTA (Archeological Museum of Taranto) and Teatro Regio di Parma.

With the positive initial results, further data collection and cross-analysis may contributed to an in-depth understanding of the results and reception of the initiative in the future. Similarly, direct collaboration with the museum institution, as well as proper qualitative analysis of the reviews on Google and Apple Store may improve our understanding of the effect of the affective trigger dynamics as well as long-term effects of the game.

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Serious Games for Peace Process Support in Yemen: Managing a Multicultural Team in a Fragile Context

Philipp Busch

1 Yemen: A Suffering Country

Yemen has existed in its present form since May 22, 1990, when the former South Yemen (People's Democratic Republic of Yemen) and North Yemen (Yemeni Arab Republic) became the Republic of Yemen. The conservative-religious North Yemen was under the influence of Saudi Arabia with a market economy-oriented development. South Yemen, however, was an ally of the Soviet Union and thus influenced by communism. With the disintegration of the socialist states, there was a rapprochement beginning in 1986 and finally unification in 1990. This unity was, however, fragile. Tensions resulted in armed conflicts and a brief secession of southern Yemen in 1994, which was resolved by military means in the same year. The result of the brief civil war was an increased Islamization of

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life in the south, and people have felt like a "colony of the north" ever since. Since 2004, there has been an ongoing conflict in the northern province of Saada by Shiite forces under the leadership of the Houthi clan, which are allegedly supported by Iran. The advance of the Houthis has led to a quasi-disempowerment of the former Hadi government. Saudi Arabia intervened in the conflict in 2015 and began a military intervention. The consequences of the military operations by different actors are immense material damage and great human suffering. Furthermore, groups such as the Southern Movement and the Islamic State have taken control of various areas and are pursuing their own interests in the country (Walther, 2017).

Yemen is perceived as a poorhouse of the Arab world. In 2018, 48.6% of Yemenis lived below the poverty line with less than US$2 per day (Walther, 2020). After the riots in the Arab Spring, the population has become increasingly confronted with worsening living conditions such as water shortages and hunger, but war and spreading diseases also mean that the country is in a very poor condition. In a few years Sanaa may become the first capital of the world without water; also the oil of the country—mainly to be found in the south—will soon be gone because of exploitation. Yemeni society is highly fragmented by historical, tribal, economic and religious fault lines. Likewise, the country is increasingly being identified as an area of retreat for al-Qaeda, which is exploiting the weakness of the state. Finally, newly arriving refugees from Africa, particularly Somalia, are turning Yemen into a country of refuge (Amira Augustin, 2014, p. 246). Most of the Yemenis are younger than 30 years. Many of these young people are, however, now better educated than ever before and possess media skills that permit new social networks. During the Arab Spring, young people in particular are repeatedly at the center of mass movements (Gertel, Ouaissa, & Ganseforth, 2014, p. 12).

2 Peace Process Support for Yemen: The Structure of the Project and Its Stakeholders

At the time of writing, Yemen was a country in conflict. On behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ) and the European Union (EU), the Project "Peace Process Support for Yemen" (PPSY) was initiated by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, aimed at improving the capacities for non-violent conflict transformation in Yemen. In order to

achieve this objective, the project works in the following main three interlinked fields of activity (GIZ, 2020):

1. Strengthening local peace capacity through civil society organizations and peaceful coexistence projects. Local peace capacity will be strengthened through Yemeni civil society organizations and "peaceful coexistence" projects, targeting decision makers at local community, district, governorate and, where possible, central level, youth, women and vulnerable groups, including people with disabilities and internally displaced persons (IDPs).
2. Enhancement of women's participation. Setting up a dedicated platform and a series of conferences for women's participation to reflect and strategize their role in the peace process as well as in future post-conflict reconstruction.
3. Support of the coordination of peace efforts. Analysis papers on peacebuilding opportunities with a special focus on the role of women are produced regularly and shared with other relevant actors.

The activities of the project are implemented in different governorates in Yemen (Aden, Hadramout, Ibb, Sana'a and Taiz). Due to the fragile crisis situation, international employees have not been allowed to travel to the country since December 2013. Since the closure of the German embassy at the beginning of 2015, there has been a general travel warning as well as a ban on sending international employees, experts and consulting firms on behalf of GIZ. The project and the responsibility for the assignment is therefore based in Eschborn, Germany (GIZ, 2020).

In order to achieve the objectives of the three interlinked fields of activity, the project incorporates a set of additional sub-activities. One of the sub-activities is called "Conducting public relations campaigns." In this field of activity, Serious Games are developed aiming at the support to peaceful coexistence by using the interactive medium to reach out to the youth of Yemen. The Serious Games are supported through online and offline promotion campaigns.

So far, seven Serious Games on the topic of non-violent conflict transformation have been developed. GIZ is responsible for the implementation of the Serious Games and is supported and steered by the Federal Ministry for Economic Cooperation and Development (BMZ) and the European Union (EU). Furthermore, a consulting firm from the Netherlands is responsible for the coordination and co-creation of the

different actors in the project. A network of Yemeni story writers, coders, game designers, artists, graphic designers and composers have the task of giving the game the essential Yemeni touch. They are supported and trained by two game studios from the Netherlands. Finally, a German consulting company takes care of integrating the learning messages into the game and including impact measurement for monitoring. The next section describes how this complex undertaking was realized.

3 Building the Team

The project team was faced with the challenging task of managing the development of a complex application via remote management, integrating an intercultural team from five different countries. This project was certainly only possible through the digital change, because weekly and sometimes daily meetings across national borders were a permanent part of the development process. Open and transparent communication therefore plays a key role in team collaboration. In particular, cultural misunderstandings must be addressed quickly and openly—this way, a nuisance can quickly turn into a humorous, shared memory through openness, acceptance and understanding. However, this transparency requires an appropriate team culture. The approach of the organizational culture profile (OCP) consists of a variety of items such as achievement orientation, being socially responsible or being innovative (Sarros, Gray, Densten, & Cooper, 2005). These behavioral norms, shared values and identification with artifacts can be represented both analogously and virtually. Part of the team culture are common identifying characteristics, which can be represented as symbols or rituals such as objects, regular meetings without a concrete work content or a shared group name. A healthy team culture facilitates the feeling of belonging to a group.

In terms of agile project management, the team needs sufficient freedom to develop itself. This counts for agile project management in general but also specifically for the development of Serious Games in international cooperation. Individuals must be able to play to their respective strengths, but at the same time they must see themselves as a group that shares the same targets and respect and value the other members. The granting of this freedom is also a prerequisite for what is probably the most important success factor of the project: ownership. In a scenario without direct contact and meetings in the analog world it is challenging to build interpersonal relationships. Individuals must feel that they have a stake in the

project and that they can change certain parameters of the outcome, be it the name of the game, the style of the graphics, the architecture of the code, the story or the mechanics of the game. From the perspective of gamification, we speak of "Meaningful Choices," and this is exactly what should be offered not only to the players of the final product, but already to the team of the co-creation process. This leads to an ownership that goes beyond the boundaries of the project, so that the vision and the software can be continued even after the official end of the project. Achieving sustainability through ownership is one of the key takeaways of the project team.

Another important factor to strengthen the efficiency and the affiliation to an intercultural project team is the purpose. The feeling of belonging to something that is bigger than oneself is obvious and easy to communicate in the example of Arabia Felix, because after all, the peace process in Yemen will be supported and thus lead to an improvement or stabilization of the situation. The higher purpose serves as a link between the different cultures and stakeholders, so that it is much easier to overlook minor misunderstandings or the odd faux pas while collaborating within the team. It corresponds to the first core drive by Chou called Epic Meaning and Calling (Chou, 2014, p. 66).

Inspired by the self-determination theory (Deci & Ryan, 2000), the project team decided visualize and celebrate progress and their increasing competencies. Finding a way to show and communicate a "way of mastery" within the project team can be a motivating factor. Overcoming obstacles, integrating lessons learned into the process and being prepared for an upcoming, similar obstacle. In the case of Yemen, the project team had to face frequent power cuts during workshops and even airstrikes in regular meetings. Next to the adaption of the process to these challenging situations, the team became better in tailoring the Serious Games to the Yemeni target group. They became better in both the processing and the creation of the game itself. Shared kanban boards, which visualize the workflow and the celebration of milestones and individual or team successes, are a source of motivation that should not be underestimated. On the one hand, the team has the feeling of progressing and becoming "better" in the fulfillment of the project, while at the same time this progress is also celebrated in the group, using the aspect of social relatedness of the self-determination theory. Granting the freedom and support of the aspects mentioned above, however, also requires a certain courage from the project management, because naturally, by applying these

management techniques, a certain amount of control is waived. Nonetheless, this perceived loss of control does not have to contradict the limitations and fixed parameters of the project. By introducing a suitable monitoring system, regular meetings in the group and with the individuals as well as the visualization of the workflow, the project management can keep the overview and react if necessary. Thus, this approach does not require a classic top-down management, but rather a serving leadership approach. The project management must explore what they can do so that the team can work more efficiently and in a more goal-oriented manner. This also requires a high degree of empathy and knowledge of human psychology, because people communicate their needs and concerns in different ways. It is also important to make sure that the given free space is not used by destructive members of the team. If this happens, it must be taken up in individual discussions and decided together whether further cooperation on the project still makes sense for both sides.

4 Results: Intended and Unintended Outcomes

The project now comprises seven Serious Games, at the time of writing this chapter, the eighth application is currently in the development phase. Each of the seven games has already achieved over 10,000 downloads, with 90% of the downloads coming from Yemen. The average rating of the games is currently 4.5 of 5 possible points. In order to make the games known, an online promotion campaign is running using the platforms Facebook, Instagram and YouTube, with Facebook being used as a preferred platform due to the Yemeni usage culture of social media. The Facebook page of Arabia Felix currently has over 54,000 followers, 95% of whom are from Yemen. The Instagram page currently has over 3300 subscribers. Furthermore, six YouTube videos about the first games were created in a "Let's play" format. Yemenis play the games in front of a running camera, comment on them and then talk together about the learning content of the applications. The games were also flanked by an offline promotion campaign. This included announcements on a public radio station, a soccer tournament, social events in schools and the creation of a game box. In this "Box of Joy," information material was provided in tangible form, including fan stickers, a QR code with a link to the digital games, an analog Ludo board game with visuals by Arabia Felix, and a comic strip that highlights the characters of Arabia Felix and offers additional learning content.

In the course of the Arabia Felix series, Yemen's first Game Jam Hackathon ever was also held in 2019. In this event, which took place in the capital Sana'a, different teams competed against each other to develop a community game for the Arabia Felix series. The event efficiently led to further promotion of the Arabia Felix brand.

The planned activities led to the emergence of game development in Yemen, which was not in the scope of the project originally. After two years of collaboration with GIZ, some of the Yemeni story writers, artists and coders have founded their own game design studio called Arkadia Studio. On the one hand, this enables them to process GIZ's requests more efficiently, on the other hand they work independently of GIZ on their own projects for non-violent conflict transformation. This success was enabled by capacity building through the project as well as the group of talented and highly motivated professional Yemenis pursuing their personal interests. Part of their motivation clearly came from the ownership that they felt toward the project.

Gender, however, is a cross-cutting topic of the project. The activities within the Arabia Felix series try to achieve a balance between female and male participants as much as possible, while adapting to the specific context. The games are also designed with this in mind. The players can choose between female and male game characters and may customize them accordingly. Depending on the choice of character, the conversations between the actors in the game change following the rules of the Arabic grammar, which required relatively complex adjustments in game development. Despite these efforts, it was found that the first four games were predominantly played by male users. For the development of the fifth game, it was therefore determined more precisely which games in Yemen are played by women. It turned out that casual games that follow the "match 3" approach are greatly popular, which also seems to be true for some countries in North America, Europe and Asia: "Across all platforms, men favor the strategy, sports, action adventure, and shooter categories. In comparison, women enjoy a broader genre of games, including puzzle, simulation, and arcade" (Newzoo, 2017). Thus, the fifth game explicitly focused on a female target group, both in the game approach and in the learning content of the game. The resulting game "Arwas World" has been the most successful game in the Arabia Felix series so far and it turned out that this approach was accepted by female and male users alike.

5 Serious Game Design in Yemen: How the Applications Were Developed in the Fragile Context

In the course of the Yemen project, various steps and milestones have emerged that can be extrapolated and used for the development of a Serious Game in other contexts of international cooperation. The process partly varies from traditional game design frameworks or guidelines, for instance Schell (2015). International cooperation does not primarily focus on the entertainment of the user, but often tries to tackle global problems. The project should be sustainable and the solutions should be developed in cooperation with the local stakeholders from the partner country. It requires high sensitivity toward political agendas, the artistic freedom within the game is restricted due to the label of the donor organizations. These circumstances require an adapted process that includes the different stakeholders as well as their agendas. Of course, the game should be still enjoyable for the user at the end. The process normally takes between 6 and 12 months.

Step 1 Kick-off: Project Framing and Stakeholder Analysis
At the start of the project, the stakeholders and decision makers involved must come together in a joint kick-off workshop and define a common vision for the project. In international cooperation, you have the donors, the executive organization as well as consultants and companies that take over the coordination of the process. The problem to be solved must be defined, the goals for the project must be agreed upon and project-specific limitations such as time and budget must be clearly visible to all participants. Next to other decisions of a classical kick-off workshop, a rough definition of the target group as well as the communication of the key performance indicators should be done in the kick-off phase. In the context of developing games in Yemen, the project team had to identify potential game designers, story writers and so on who have regular access to the internet. They were key for the contextualization of the games as well as integrating the required capacity building activities of the donor organizations. Next to these chances and opportunities, the risks had to be discussed. Which groups or institutions might be against the development of games that spread peace in Yemen? Are the local game designers in serious risk? There is no easy yes or no answer to these questions, but a constant observation of the situation is the key to minimize the potential risk for the project and its stakeholders.

Step 2 Design Thinking: Problem Statement and Target Group Analysis
Before the ideation of the Serious Games in Yemen can start, analyzing the context of the problem and doing user research is key to create a software that fits the Yemeni culture. Thus, following a Design Thinking approach can help to understand and reframe the problem, get familiar with the target group and ensure that one of the most important project phases is not skipped: the detailed analysis of the context to get an overview about the stakeholders involved and a getting a clear idea about the underlying problem itself (Brown, 2019). Design Thinking can be viewed from different perspectives. First of all, it is a structured process that guides the user through different phases to innovative approaches and prototypes for products, services and other applications. Furthermore, it is a way for teams to collaborate with each other to increase their efficiency, for example by visualizing the workflow or the precise analysis of a problem to be solved. Finally, Design Thinking is also a mindset that puts user-centricity at the heart of project design. This focus on the user is also necessary to create a successful gamified system or a Serious Game. The precise investigation and definition of the underlying problem is the first step to generate innovative ideas. The analysis of the target group and the context is considered in most of the projects in development cooperation; however, it is often not applied in a sufficiently structured way. A joint workshop between the project team and the designers raises interesting questions that were originally thought to have been clarified. For example, the semantic analysis of the problem statement often reveals that even the members of a small project team do not clearly agree on the parameters behind a superficial problem statement. This clarification should take place at the beginning of the project so that time-consuming and costly misunderstandings do not occur in the further process of the project. In addition to the exact (re-)definition of the problem, the target group should also be examined from different perspectives, for example, with regard to digital literacy, media use, distribution of devices, access to the internet, and usage behavior of digital and analog games as well as preferences for other media. All this information facilitates the tailor-made design of an application for the target group including the corresponding use case. While following the Design Thinking process in Yemen, the approach of Serious Games turned out to be a well-fitting solution to support the peace process. The Yemenis are digitally literate and used to Games on Smartphones and due to the fragmented situation in Yemen with a lot of checkpoints and different local authorities, reaching out to the youths via a Serious Game seemed to be promising.

Step 3 Ideation: Generating Vision of the Serious Game
The next step in the process is the start of ideation. After developing a shared understanding of the target group and the problem statement among the team, this part of the process is coming up with initial ideas on the solution. Having a co-creative workshop with important stakeholders will increase their sense ownership of the final solution, because they are able to participate and integrate their own ideas to the gamified system or Serious Game. There are a lot of easily accessible gamification frameworks that can be used, for instance, the Octalysis Framework by Chou (2014), the Gamification Design Framework by Werbach and Hunter (2012), the Hook Model by Eyal (2019) and the different game design lenses by Schell (2015). It is recommendable to generate as many concepts as possible, and then cluster and select the most promising approaches. Reviewing and summarizing different ideas and working out the best approach for the target group will lead to the vision statement. In the Arabia Felix games, the ideation included to find the right game approach for the target group that the project team wanted to tackle with certain games. For instance, a mini-game collection as well as an endless runner game approach came up, targeting children, and were implemented later in the games called "Eduo Run" and "Eduo Quest." These games communicate the importance of education and the Yemeni culture to children between 5 and 12 years.

Step 4 Vision Statement: Concluding the First Ideation Process
The vision statement is a short document that serves as a summary and conclusion of the first three steps. It consists of the project parameters, stakeholders, chances and risks, problem statement, an overview about the analysis of the target group as well as one or two of the most promising game approaches. The vision of the game is included and may be supported by visuals. The vision statement allows for an estimation of the scope of the project and how much the development costs and duration might be. The vision statement of the Arabia Felix games was checked by the project managers by GIZ.

Step 5 Contracting Procedures: Formalities and Bureaucracy
With the vision statement it is possible to get an overview about the scope and specifics of the project. This means the team can start the selection process of the development studio and other relevant stakeholders like the artists, story writers and so on. The duration of this process highly depends on the organization as well as the context of the project. The contracting procedures typically take around one or two months. In the example of Yemen, the project team hired a local game studio that was supported by an international game studio, additional story writers and artists, a sound artist that provided Yemeni game music next to a team that was responsible to promote the games in Yemen offline and online. Finalizing international contracts and conducting payments to Yemen is also a challenge that should be taken into consideration while designing the process duration.

Step 6 Game Design Workshop: Co-creating the Core of the Game
With all the relevant stakeholders on board for the creative process, the Game Design Workshop can start which is a core element of the process and mainly is shaping the software into a specific direction. The decision makers and project managers can also join that session, however they have already set the limitations and key performance indicators beforehand. In the workshop, the Theme, Genre, Setting, Story but also specific game elements and mechanics is discussed. Of course, the technical infrastructure and its requirements need to be adapted to the target group. Within the different game design sprints, the so-called game design pillars is defined, quite often between three and five of them. Those pillars serve as guidelines for the game. If there is a game design decision that needs to be taken, the team first checks the game design pillars they agreed upon beforehand to have a unified shape of the game. It can be also recommended to have the game design pillars signed by the team, so the feeling of agreement is increased. One example of a game design pillar can be: “There is always something new to discover” or “Each quest should be as different as possible.” Another example from the Arabia Felix games was “embracing cultural differences” and “build empathy for internally displaced persons.” After the important game design pillars are set, the High Concept can be created.

Step 7 High Concept: Concluding the Second Ideation Process
The High Concept builds on the vision statement but also includes all the decisions made in the game design workshop as well as the game design pillars. The creation of this document is started in the game design workshop, however normally it needs more elaboration and iteration, which takes additional time. The High Concept can be communicated to the decision makers and project managers to also receive their feedback. It can be understood as a middle step to get a clearer picture of some game mechanics, the story as well as the specific learning content and the impact measurement system. In the Yemeni games, it includes the learning topics (for instance, accepting cultural differences, integration of internally displaced persons [IDPs] into villages, etc.) as well as the translation of these learning topics into game mechanics. An example from one game: If you integrate the internally displaced persons into your village, you unlock certain research branches that give you an advantage within the game. The High Concept also includes the impact measurement system—what kind of data should be collected, how can the impact be proven?

The High Concept can incorporate a small prototype of the game. This prototype can be tested by the target audience and other important stakeholders involved. By integrating the feedback in an iterative way, the High Concept will step by step evolve in to the Game Design Document.

Step 8 Game Design Document: The Blueprint of the Game
The Game Design Document is the blueprint for the game. It includes all the important elements such as story, characters, dialogues, game mechanics, progression but also technical requirements. This core document serves as the go to place for the developers and artists if they are in doubt of any project related matters. The decision makers and project managers need to approve the document before the development can start. This artifact is a living document, meaning some changes might still occur during the process, however basic decisions should be already made and agreed upon by the stakeholders. In the context of Arabia Felix, teams from Yemen and Europe were co-creating the Game Design Document within several weeks of work.

Step 9 Development: Transparent Communication and Visualization of Workflow

There are different stakeholders involved in the development phase. The decision makers, coordination team, the game developer, the artists, musicians, story writers, test group and so on. This depends on the product itself, however the process should be designed in an agile way. Next to synchronous meetings, setting up asynchronous communication channels and the visualization of the workflow should be initiated by the coordination team. The development of a Serious Game in Yemen is challenging, a time buffer should be integrated in to the process. There are delays due to power cut-offs, internet problems as well as serious security issues like airstrikes, shooting in the streets, shortage of supplies and so on. Since the personal security of the staff involved is of highest importance, the time plan has to be adapted if such harmful events occur, which happened several times while developing the Arabia Felix games.

Step 10 Improvements: Iterating and "Do No Harm" Assessments

The development phase is supported by consequent testing to minimize technical bugs as well as collect feedback from the target group and tailor the software to their needs. Balancing of the game mechanics, the look and feel as well as the usability and navigation are all important success factor of Serious Games. In fragile contexts within international cooperation, it is essential to include "do no harm" assessments when specific milestones are reached. In this assessment, a group of country experts is scanning the documents or prototype in order to find aspects in the game that might result in unintended consequences. An example that occurred during the development of the Arabia Felix games was the advice from the Jinn. The main character in one of the games should have a jinn as a tutor that gives advice on peace building. Jinns do not count as wish-granting blessings for most of the population of the Arab world, but quite often are linked to bad events and diseases. Linking peace to a diseases is not the message that the project wanted to deliver. Another example would be the unintended linking of artifacts, colors and symbols that represent specific tribes or religions to an antagonist within the game would cause harm and could cause political consequences. In a prototype of one of the Arabia Felix games, the antagonist had a specific accent that pointed on a region within Yemen. In the do no harm process, this unintended message was found and had to be erased by re-recording and giving the antagonist a neutral accent.

Step 11 Publication and Implementation: Bringing the Serious Game to Life

Once the game is ready for publishing, it needs to be uploaded to different distribution stores. The software must satisfy the requirements of the specific store and will be checked by the store, so a certain amount of time (around 1–2 weeks) should be planned for this step. Especially in the first month there will come up a lot of bugs and technical problems that need to be fixed as soon as possible. Proper testing beforehand will reduce the amount of bugs; however, some will still pop up. Together with the technical kick-off of the app, the project team might decide to also launch this game on an offline kick-off event, including the involved stakeholders as well as the potential target audience. Some of the Arabia Felix Games were launched offline through the already mentioned box of joy, a tangible surprise box that included the links to the games, a comic, a board game and other supporting material. These boxes were distributed in schools and hospitals in Yemen.

Step 12 Promotion: Gaining Visibility and Community Management

Promotion of Serious Games is a topic of its own that is only briefly mentioned in this chapter. The project team should from the beginning think of a strategy for how they want to promote the game and deliver it to the audience. It might be a mixture of offline and online promotion. Social media and search engine optimization are important for the strategy, additionally certain in-game mechanics like "friend invitations" might cause a snowball effect. The game and its project targets will highly benefit from an active community. While promoting the game among their friends and families, the community can also report bugs and discuss the topics of the game among each other. The project team should make sure to channel this activity on existing platforms, such as social media platforms or specific communities on games. Depending on the project and the target group, this channel can also be aligned with training communities, if the Serious Game is part of a training curriculum. Channeling the activities of the user can lead to the critical mass that represents an active community. This community needs to be moderated in order to respond to questions, trigger further interactions as well as delete inappropriate posts. Thus, the moderators should also give enough space for creativity and self-actualization by the users. The community might come up with their own ideas and content that can be integrated into the game. This kind of community inputs are rare but very precious for the project.

Step 13 Impact Measurement: The Search for the Holy Grail of Serious Games

Impact measurement is one of the hardest things to include in Serious Games. Depending on the mechanics that are integrated into the game, activities of the users within the game and on the community channels can be operationalized and reported. The project team is able to react accordingly only if the necessary data is provided. This includes both quantitative and qualitative data.

The first instrument for impact measurement in the games includes questionnaires. For most of the Arabia Felix Games, there is one pre-questionnaire and one post-questionnaire per game. The two questionnaires are integrated into the game design, as if they are embedded in the game itself. In some games the questions are asked by the game characters in order to not distract the player from the game. However, it is communicated transparently that the answers to the questionnaire are used to improve future games of the series and to measure the impact. Besides questions concerning the game itself, some questions are aimed at general attitudes and behavioral patterns, in some applications even prejudice. The first questionnaire can only be answered in the first phase of the game, which corresponds to about one hour of gaming time. The player does not get an extrinsic reward in the game for filling out the questionnaire, because this could distort the sincerity of the answers. Alternatively, the player can get a reward at the end of the questionnaire as a surprise. Once the player reaches the end-game (here the playing time varies greatly depending on the approach of the game), the post-questionnaire is unlocked.

The learning messages throughout the game can be explicit or implicit, depending on the target group and the approach of the game. The following rule of thumb was applied for the Yemeni games: The younger the target group, the more implicit the learning message should be. However, Serious Games with explicit learning messages should also integrate their learning content into the game experience as much as possible in order to maintain immersion with environment in which they can try things out without causing any impact on the real world. A sequential order of gaming fun followed by "dry" learning messages or exercises should be avoided. For instance, in one of the Yemeni games there was a character that taught different learning messages explicitly to the players between

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the games. These text passages with no interaction by the players (therefore not integrated into the real gaming experience) were skipped by almost every player of the testing group. The messages were not internalized by the players with this sequential design. The post-questionnaire tries to measure, besides general feedback on the game, whether and how the initial assumptions and prejudices of the players have changed after playing the game. Additionally, the integration of a longitudinal design can be applied. This approach includes a third questionnaire, which re-surveys the players after three months of playing the game and measures whether the changes are sustained, regress or have changed due to other factors not related to the game. The results of these influencing factors are very hard to measure, since the user might experience a lot of direct and indirect events that could potentially change her attitude without explicitly being aware of it. Due to a variety of activities within a project in international cooperation, a Serious Game should be supported by further measures and activities to raise awareness and to self-reflect assumptions and prejudices. The questionnaires in the game help to prove this reflection, but events in online or offline promotion can also have an impact on the user.

Another evaluation technique in the Yemeni games were the "real-life challenges." Within the game, users are asked to apply and reflect on certain learning content conveyed in the game in relation to their own life. In other words, they are intentionally and actively encouraged to leave the magic circle of the game in order to transfer the game content to their real environment. The real-life challenges may call for initiating certain activities in the direct environment of the player. This "offline jump" leads to a better learning outcome by being anchored with other experiences and impressions of the real world, because the given learning content is brought into relation with the own situation. Measuring this form of interaction with the analog world is difficult and to a large extent simply not possible. For example, in a game of the Arabia Felix series, users in Yemen are encouraged to ask their family about educational topics and discuss them. Another real life challenge gives the player the task to come up with three persons that she or he learned most from and why. This

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type of interaction can have a strong impact on the user, as the game content is mixed with the experiences of trusted persons, but measuring it within the game is difficult. However, a certain degree of reflection and awareness raising in the game can be evaluated through reflection questions within the game environment that are thematically integrated into the corresponding game scenario. The user thus receives a question from the game, which he or she must answer within the game by entering a written message, for example, "What would be three simple steps in your village to create a better learning environment in your school?" The user mentally leaves the magic circle and considers what simple measures can be taken to modify his or her own environment. Ideally, the measures were dealt with in the game beforehand. The user receives an in-game reward for answering the question without knowing beforehand. Now the answer must still be checked for validity. This can be done either by using simple artificial intelligence, by validation by the project team or by peer reviewing. The amount of solved real life challenges can be measured by the system. Thus, a simple form of reflection and awareness raising can be quantified indirectly, even if no statement can be made about the quality of the reflection.

Impact measurement and the measurement of behavioral change caused by gamified applications and Serious Games pose great challenges for project teams working in international cooperation. Changing the behavior of individuals in a sustainable way requires a variety of interventions, events and the understanding of the motivation and core drives of individuals. A change in behavior can be initiated externally, but must ultimately be accepted and internalized by the individual. The motivation behind the change of a behavior depends on various parameters. At the same time, the change of behavior can happen consciously or unconsciously. Thus, a sustainable behavioral change requires a variety of internal and external interventions, and can hardly be traced back to the interaction with a single Serious Game or a gamified system. However, the applications can be used to question previously established opinions and attitudes, to stimulate self-reflection and to stimulate awareness raising for a variety of users. A Serious Game can therefore be seen as the first step that partially initiates a change in behavior.

Step 14 Maintenance, Updates and Handover: Sustainability Through Ownership
Once a game is uploaded to the store, many unexpected bugs and other things that need to be fixed will appear, like balancing of some game mechanics or fulfilling the needs of the store. New content can be published to keep up the engagement of the community. In international cooperation, the budget and contracts for maintenance end at a certain point. Sometimes it is ok to let applications "die" that are outdated and that already had a good amount of impact. On the other hand, trying to design a sustainable project by handing over the games to a local partner can keep the games alive, if the local partner feels ownership for the games. It should provide an added value for the partner, which might occur due to positive spill-over effects of the Serious Games to other projects of the partner. For instance, the Arabia Felix games gained a lot of attention by different institutions and teams within international cooperation. Once the project by GIZ is closed, it still might have a positive impact on the reputation of the local game studio to have the games in their distribution channels.

6 Conclusion: Arabia Felix as a Success Story Within International Cooperation

Developing Serious Games in fragile contexts is a challenging process that needs to be planned carefully. Applying a mixture of Design Thinking, Gamification and Agile Project Management can support the management of cross-functional and cross-cultural teams. As a project manager, finding the right balance between control and free space for individual self-actualization within the team requires empathy, intercultural management as well as a clear, transparent and trustful team communication. Creating ownership of the Serious Games among the collaborators is essential to realize a digital project remotely. Furthermore, ownership will increase the probability of a successful handover of the project to the local team to keep the games alive.

In sensitive contexts such as Yemen it is also important to include a set of "do no harm" assessments in order to remain neutral and avoid unintended political or religious statements. Game design should integrate an impact measurement system to be able to gain insights of the learning

outcomes, awareness rising and behavior change. The series of Arabia Felix realized by GIZ, and co-financed by BMZ and the EU improved its project approach step by step. Each Serious Game achieved more than 10,000 downloads, delivering a message of peace through the interactive medium of a game. The Social Media campaign on Facebook has more than 45,000 followers from Yemen, fans are discussing about the content of the games and news of the games are spread via the platform. One studio working on Serious Games in Yemen was founded as a result of the project and Yemen's first Game Jam Hackathon was conducted. The project started to establish a network of highly motivated, young entrepreneurs and game designers among Yemen that are keen on actively improving the current situation in Yemen. The Serious Games are one pillar of the peace process support by GIZ that gathered game designers, story writers, musicians and visual artists under the brand of Arabia Felix. This channel empowers them to express their hope and their games are developed to initiate a change in Yemen.

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Gamification Design for Behavior Change of Indigenous Communities in Choco, Colombia, During COVID-19 Pandemic

Ganna Borzenkova, Polina Golovátina-Mora, Paula Andrea Zapata Ramirez, and Jose Mauricio Hernandez Sarmiento

1 Introduction

Indigenous people around the globe tend to be at higher risk from emerging infectious diseases compared to other groups of population (United Nations, 2020) and could be even more vulnerable during COVID-19 pandemic due to the factors, such as their lack of access to effective

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monitoring and early prevention systems and adequate medical and social services. Local medical facilities, if any, are often under-equipped and under-staffed. Their cultural, epistemic and economic presence continue to be marginalized (e.g. Rosiek, Snyder, & Pratt, 2020).

In this chapter, we share the experience of interdisciplinary and intercultural collaboration and its multiple impact. COVID-19 pandemics became a catalyst of cooperation, as its extreme conditions revealed and accentuated the existing and often well-known but largely ignored social, medical, economic discrepancies. With this chapter, we also draw attention to the gamification design as an engagement tool and as a mindset (Goethe, 2019) or onto-epistemological perspective.

This project was undertaken with the support of the Scottish Funding Council as part of Global Challenges Research Fund, to develop a communicative strategy for indigenous communities of Choco, Colombia. The partners used design for behavior change to help bridge indigenous traditional beliefs and strategies for preventing transmission of COVID-19.

The project brought together partners from two universities—Heriot-Watt University, UK, and Universidad Pontificia Bolivariana, Colombia and the Indigenous Health Centre—*IPS INDÍGENA* ERCHICHIJAI, Colombia.

2 Choco Region

Choco region, which is the focus of this study, is the remote geographically, biologically, ethnically and culturally diverse area on the Pacific coast of Colombia. It has an approximate population of 65,000 indigenous people living in about 120 native territories and speaking their own languages, predominantly of the Embera and Wounaan groups. The communities in focus of the project are Embera Dobida, Embera Chami, Embera Katío, Wounnan, Zenu and Kuna Tule. Each has their own distinct language (or a dialect), way of dressing and cultural and everyday practices. While Embera and Wounaan share more similarities, Zenu and Kuna Tule are more distinct. Choco has a unique ecosystem and is rich in natural resources surrounded by sea and land. This unique system has been sustaining indigenous and afro-descendants' communities over centuries.

Despite the richness of the resources in the regions, its population has one of the lowest standards of living and the highest poverty rate[1] of the country. Almost 60% of inhabitants live below the poverty line and 34% in extreme poverty (Hume & Gillies, 2018) with per capita income less than 70 USD/month. This is about six times higher than the poverty level of the country's capital, Bogotá. The region is the second largest producer of gold in Colombia, the majority of the mines, however, are in private and often illegal ownership (Lara Rodríguez, Tosi Furtado, & Altimiras Martin, 2019; OECD, 2017). Because of its strategic location, the region is also affected by drug trafficking.

The region is the center of the continuous armed conflict that aggravated after the signed peace agreement, when the territories that used to be under the Revolutionary Armed Forces of Colombia control became the subject of the disputes between other groups (Aselma, 2019). The forced displacement increases 240% within a year. Indigenous and Afro-Colombian rural population of Choco are the most affected ones. This and other factors illustrate the difficulties of conducting research in such areas.

Of the total 980,000 confirmed COVID-19 cases in Colombia, over 30,000 are in the indigenous territories (ONIC, 2020). For the past 194 days since the monitoring started, on average 159 new cases have been registered daily. While the number of the recovered is quite high—over 29,000 persons, over 1000 deaths have been registered to date (the beginning of October 2020). 537,252 families are estimated to be in a high-risk zone. The list covers almost every indigenous community. As the medical participant of the project team reported from one of his field trips in May–September 2020, even though the survival rate is impressive and somewhat surprising, one can feel that the virus has passed through the territory. It affected both urban and rural areas, even in the most remote locations. In many cases, the death is the result of a co-infection rather than of COVID-19 directly. Besides COVID-19, there are many other diseases in the region including diarrhea, malaria, and dengue, which affected the perception of the new disease by the indigenous people.

Many communities are isolated and hardly ever receive medical or other professional attention out of fear. The medic of the present research team reported that for the communities his visit was the first medical visit in their memory. With difficult weather conditions and the lack of

[1] https://colombiareports.com/colombia-poverty-inequality-statistics/

infrastructure, that is, communication, roads, poor transportation, the medics often have to walk for hours or days and sleep in a tent in the forest to reach some communities. Rains and thunderstorms can make the trip more difficult or even impossible. Such trips require dedication, knowledge of the territory, planning, financial support, time and physical training.

The medical member of the research team shared in one report that despite the fact that he knows the region quite well, he still fears that if someone gets sick over there—not necessarily with COVID-19, but appendicitis, heart attack, fracture, traffic accident to name a few, there will be no one within reach to help. The only official medical centers have a limited number of medical mobile groups (IPS indígena, 2020). Pandemics brought on the brink of collapse the fragile infrastructure of the health system in the region. Simple requirements, such as alcohol, electricity, water and connectivity are missing. According to him, poor health system and disruption in services are the top causes of death rather than COVID-19 itself, which coincides with the reports by WHO (2020).

3 Developing an Interdisciplinary Indigenous Methodology

The 600 years of colonialism in Colombia not only created the atmosphere of distrust to the state and mestiza population in general, but there has been no official apology and the prevailing mindset continues to be racist and colonialist (e.g. Espinosa Bonilla, 2014; Hellebrandová, 2014; Peña, Ricardo, & Santamaría Chavarro, 2012; Taibou, 2019). Indigenous population is generally unprotected and experiences threat from paramilitary groups, illicit businesses, the army and the state. The population is unprotected from the disrespectful and unethical behavior of tourists, continuous stigmatization, and exoticism (López Bandera, 2013) on an everyday basis.

Invisibility and silencing are a routine practice and often incorporated in the methods, criteria and values of Western scholarship, market economy or nation-state (Constitución política, 2019; Escobar, 2010, 2014). They are quotidian and systemic and have multiple expressions that demonstrate the indifference of the state to the indigenous population and contribute to the distrust from them.

For instance, The Constitution of 1991 that is the contemporary constitution in Colombia was the first official occasion when representatives of the indigenous population were consulted and invited to collaborate in the construction of the defining state document. There are still no clear mechanisms of protection of the indigenous population, encouraging their cultural development and assuring the execution of the law (Constitución Política, 2019; Orduz Salinas, 2020). The most powerful mechanisms are tutelage, Court decisions and protests of the social leaders and activist organizations, which is the reaction to the atrocity happened.

There is a constant violation of the agreements and human rights in the territory, basic and fundamental rights are not secured (Constitución política, 2019; Defensoría del Pueblo, 2019, p. 57; ONIC, 2019; Reliefweb, 2017). The commercial and industrial projects, as the case of the construction Urrá Dam, are carried out without consultation with the indigenous population of the territories or considering the consequences of the construction for the well-being of the territories (Durango Alvarez, 2008; ICCHRLA, 2009; OCA, n.d.; Rodríguez Garavito & Orduz Salinas, 2012). The expressions of disagreement and protests continue to be silenced or eliminated physically (NODAL, 2020).

The indigenous reservations are predominantly located in the rural regions, which generally complicates their situation. While the UN (n.d.) goals for sustainable development emphasize the essentiality of the rural sustainable development and respect of the rural initiatives for peaceful and sustainable development of a nation and the world, the global dominating tendency–and Colombia is not an exception—is still focused on the urban innovation and development (e.g. Duque Escobar, 2010). The growth and development are generally evaluated from the positions of the Western (anthropo-, logocentric) values. The territories are often surrounded by the territories in control of different illicit groups and are often in the center of the armed conflicts.

Cultural educational events are quite sporadic; census and votes are conducted with the breaches in agreements and without taking into account cultural particularities of the territories (ONIC, 2018). The laws on protection of the linguistic heritage of the population are quite recent—1978, 2010 (Ospina Avendaño & Acevedo Vélez, 2018). While indigenous languages are recognized as the languages of the communities, there is no national obligation to learn indigenous languages for the rest of the country. At the same time, the members of indigenous communities indirectly have to learn Spanish, in order to be heard. The percentage of

the indigenous people graduated from the higher education is low and there are more external experts in indigenous communities assuming the roles of doctors, lawyers, and so on than local ones. This is generally connected to the absence of accordance between the cultures and system in place to facilitate higher and professional education among the indigenous population (Londoño Calero, 2017; García Anaya, 2013). Many indigenous people have to have both personal names in their own language for the inner use and their Christianized "official" names for use outside their community. One of the most widespread groups in Colombia and in the discussed region is the Embera group that includes Embera Dobida, Embera Chami and Embera Katio. They have managed to preserve their culture and traditions. However, because of the contacts with the "outside" world and changing environment, their traditions are changing and the "Western" style is being appropriated. While it could be a natural process, independently of the reasons of changes, that is, against their will or with their consent, the communities have to have a possibility of a choice and their will and choice have to be respected.

When working with indigenous communities, it is important to consider the values defining the traditional lifestyle, social organization and interpersonal relations within the communities, values and beliefs that shape their understanding of the territory. The territory is not seen in terms of private property; its borders are not defined by horizontal geographic measures and concepts (Constitución política, 2019; UPME, 2015; UTCH TV, 2016), but the approach to it is relational (Escobar, 2010, 2014; Mavisoy, 2018; Ulloa, 2002) and integral. Relational approach to the territory and definition of its borders means that everything that they consider part of their relations is their territory: plants, water sources, animals, air and people of the community. They consider themselves children of the territory and nature as their mother. Repressing nature means not only a mere destruction of habitat but has psychological and existential impact. Elimination of any usual parts of the territory would create the sense of unbalance, destruction of the ecology in the territory (Constitución política, 2019). The style of life has developed and proved by centuries as members of the ecosystem. The sense of time differs from the linear and strictly measured Western time perception. It is rather measured in processes and actions as part of the ecosystem of the relations. Spiritual leaders see and connect community members through time and space, visible and invisible relations and, so, can indicate how to maintain the balance of the ecosystem (e.g. Ulloa, 1992). The members of

the community do not consider desirable leaving the territory, so as to, for example, go to schools or clinics.

The present project that informs this chapter was not the only effort in the times of pandemics to support the indigenous communities to respond most effectively to the pandemics. UNO, BID, Health Ministry of Colombia, and The National Indigenous Organisation of Colombia (ONIC) among others developed recommendations on how to work with indigenous communities and how to address the threat when living in a community. For example, ONIC created informational audios in different native languages and reminded the communities in their regular newsletters to remember the wisdom of the ancestors and develop tighter connections with the territory.

Listening to the voices of the communities was the key principle that defined the methodology of the project. Overcoming the centuries-long distrust in the outsiders that is recurrently reconfirmed by the state and overall society was the main difficulty. Developing the informational visual materials was part of the medical mission. The primary point of contact for the communities was the medical specialist who was very well familiar with the territory, known to the communities and recognized by their members and authorities. In his trips, he discussed the pandemics with the spiritual leaders and other members of the communities, inquired about their perception of the virus, shared information about it and public policies of the pandemics and helped the rest of the team test drafts of the communication strategy materials. His reports, previous experience and the knowledge of beliefs and principles of the communities were supported by the secondary research (e.g. anthropological publications by Astrid Ulloa and Luis Guillermo Vasco Uribe, information available on the sites of ONIC and Ministry of Culture of Colombia, videos and interviews on Youtube). Attention to the details was essential in developing the designs.

4 Exploring Beliefs and Their Perception of COVID-19 in Indigenous Communities

The historical and systemic distrust is based on the ontological invisibility. The field trips revealed the lack of communication between the authorities, medical centers and the communities. Intentional or not, it contributes to the overall distrust that the indigenous population has toward the state institutions and corresponds to the colonial mindset that treats

indigenous population as passive subjects to be enlightened, fixed, Christianized, cured or explored. On multiple occasions, after the medical brigades conducted COVID-19 tests, they never shared the results nor did they follow up on the communities. It is unclear where exactly the communication fails. As a result, the communities do not see testing as something important, in some cases the whole community refuses to be tested, most likely as a result of the collective decision approved by the leaders.

Many prefer dying in the community over going to the hospitals in nearby towns. In several cases, bodies of the dead were not returned to the community, which means a person and the entire community were denied of a dignified and proper farewell. In fact, as the interviews revealed, arriving to a hospital was considered the cause of death. Inability of hospitals to provide answers about the nature of the disease and often the medical help required, whether for COVID-19 or other diseases, defines the reluctance of the indigenous population to contact the hospitals especially in the beginning of the pandemics. The communities generally refused to accept the medical teams that wanted to perform more tests, but which did not offer medical assistance to those in need.

In the first meetings with the medic of the project's team, they expressed concerns about other more common diseases, ability to hunt and gather food during the lockdown, and questioned the use of face masks and antibacterial gel, and their capacity to protect from the virus. The overall preference has been given to ancestral knowledge and traditional medicine. The ONIC newsletters (e.g. ONIC, 2020) reflect this approach: masks, face shields and gel are mainly recommended for use outside the community—when someone travels to a town, in the big cities or participates in protests (Minga). It is thought that communities should maintain togetherness and sustain a natural balance of the body and of nature; they should have access to the official information about the pandemic. All measures work together with the purpose of protecting the territory and its people. ONIC supported six rituals of harmonization and healing of the sacred territories to be performed in the following months to fight the pandemics, one of which would be in the Choco region.

Conversations with the community members and their leaders demonstrated a concern about the pandemics and interest in getting as much information as possible. All the information was questioned and contested with the knowledge that they trust. During the field trips, the physician of the research team conducted unstructured interviews, that resembled discussions, consultations and conferences, with the population of different

ages. He performed tests and had to share the test kits with other communities upon request, communities that were outside the focus of the research. He worked with different patients and visited communities on demand, when it was possible. He also participated in church services for the fast recovery of the sick and for peace of the gone. The fact that he was invited among traditional healers to take part in the healing ceremonies demonstrates that he gained trust and recognition of his dedication and efforts and for the team's work.

While developing the design of the communication materials, we faced the dilemma of what information to include in the posters to make it more engaging. We had to consider the conditions and the environment in which the communities lived, their beliefs and preferences, and at the same time provide them the known information about the virus. Information already available and distributed in the communities recommended washing hands regularly, wearing masks and maintaining distance. Most of these recommendations are however impractical inside the communities, for example, the water is sourced from rivers and creeks and is brought and kept in containers. The number of masks is limited, and the use of fabric is commonly decorative and minimal. So, covering one's face with masks would be seen as rather excessive. It would be difficult to convince people to use the masks in their home for the same reasons as in the rest of the world, where people find it difficult to wear masks in parks, forests and homes. Finally, while the communities are quite isolated from other settlements, in many communities most houses are widespread in the territory, and therefore keeping distance within the family would be nearly impossible. Ignoring these realities would mean risking the success and the purpose of the communication materials: it would make it just another infographic—strange and external to the community.

Perception of COVID-19 and the pandemic is accompanied with a lot of fear, concern and distrust. The common belief is that the virus was a creation by the "white" to exterminate the indigenous population, especially the elderly, as they are affected more severely. The elderly are seen as the carriers of wisdom and ancestral knowledge, the foundation of the community and an indigenous nation. While not being afraid of individual death, people express fear of the extinction of their peoples. In their address to the indigenous people and authorities, ONIC (2020) summarized the risks: "*they are potentially grave and can bring irreversible consequences for the health of the indigenous people*". In conversations, participants

questioned the animal origin of the virus, as bats and other animals have lived in their houses and close proximity for centuries.

Conversations with the representatives of the communities revealed that they are very attentive to the symptoms. A clear preference is given to the tradition medicine: making a patient sweat, consuming hot herbal beverages with lemon, ginger and elder, or taking baths with gliricidia (*mata raton*). However, traditional medicine is not limited to the use of the herbs. It is based on the belief that the cause of the disease and the subsequent pandemic is a destroyed natural balance: between the humans and nature, among humans, within each individual person. The will of the patient is a key element in reestablishing that balance. The spiritual leader who knows the spirits (*Jaibana* in Embera and Wounaan; *Nele* in Tule) and the herbal specialist (*tonguero*) interpret the symptoms with the help of plants and spirits and think of the best healing strategies (e.g. Meneses Lucumi, 2006; Reglamiento; Vasco Uribe, 1985). The patient and their family search for plants, participate in engaging the spirits and accompany the wise and the community in reestablishing the balance. In addition, names, body painting and ornaments on clothes can have protective and healing meaning, by engaging spirits and establishing the connection between the person and nature—plants or patron animals.

As a possible echo of colonialist biases, the team expected that poor access to the health services, poor basic sanitary conditions and poor nutrition would cause the severe symptoms among the indigenous COVID-19 patients. However, as the field trips and general statistics confirmed, the mortality rate is quite low considering the number of confirmed cases. The symptoms are overall lighter than in the rest of the country. While it could be the effects of traditional medicine, climate, psychological effects, healthy environment, life style and eating habits, low stress exposure, stronger immune system and/or a lack of chronic diseases and obesity, it would be irresponsible to ignore traditional medicine and ancestral knowledge in the design of the communicative materials.

5 Designing for Bridging Indigenous Beliefs and Official Medical Guidelines

To help indigenous communities to make sense of the situation during COVID-19 pandemic and to tailor official medical recommendations to their realities, communicative materials were developed in the form of educational posters. The posters were based on the findings from the data

collection in the field trip, official medical guidelines and the principles of traditional medicine. Photographs from the field trip, pictures and videos on the ONIC and Ministry of Culture pages, children drawings (Ulloa, 1992), a wall drawing discovered during one of the trips and consultations with the local artists all inspired the design of the posters and informed the decision-making on their visual image.

The design concept development of the communicative educational materials required a systems approach that interconnected various aspects of designing. A systems approach (Andersson, 1990; Luthe, Kaegi, & Reger, 2013), together with creative thinking, provided a platform for discovering multiple aspects and conditions necessary for solving the problem—designing visual materials for bridging COVID-19 prevention strategies and traditional beliefs of the Choco indigenous communities. The concept attempts to incorporate the design components with the social components into one holistic system. This allowed bringing a new perspective on finding the design solution to a social issue in the context of this project.

The design development started from the exploration of how to adopt medical recommendations to the realities of life of indigenous communities and how to present these with respect to the indigenous beliefs and traditions. Based on this, the first ideation round was conducted using brainstorming of possible solutions. The process started with quick sketches of a whole idea, which was then developed and refined through several iterations. Through this phase, hand sketching was used as a process of thinking and an exploratory technique in gaining an understanding of the posters visual image and educational qualities (Karaata, 2016; Silav, 2013; Stones, 2006). The focus was on generating conceptual ideas without detailed elaboration and quality analysis. It was important in this stage not to be judgmental, so as not to stifle imagination. An example of the results from one of the ideation sessions is presented in Fig. 1.

The ideas from the first brainstorming sessions were analyzed in order to define which of them corresponded most to the findings from the data collection. The next stage of ideation was more analytical. A range of techniques was used in the sketching process, starting from pencil drawings and marker sketches to watercolour sketches. They were produced for the purpose of thinking about the design task and presenting ideas visually (Stones, 2006) to communicate to indigenous communities in a way appropriate for them. The sketches provided evidence of creative thinking and of the process of development toward the final design solution. The

Fig. 1 Initial ideation

design ideas for the posters were presented to, and discussed with, the local artists and community members; their feedback was considered to make necessary improvements. The sketches provided concrete visual information for critique. This process deepened on the understanding of the design task and gradually led to the final idea.

Developing an educational experience for a target audience has at least two cornerstones, such as the presence of educational material and the organization of activities with that material (Hadzilacos, Kalles, Karaiskakis, & Pouliopoulou, 2010). In the context of this project, posters form a repository of educational material, while looking at, reading through, exploring and playing with the posters is an educational activity. Thus, the posters are treated as a tool for engaging indigenous communities in the educational activities.

An indigenous community can be seen here as a heterogeneous group consisting of a number of individuals with different ages, sexes, occupations, literacy levels and so forth, but with a common culture, traditions and beliefs. From this arises the requirement that the posters should

Fig. 2 An indigenous settlement as a thematic environment of the poster 1

provide different levels of heuristic opportunities to engage with these. For instance, the posters may include images along with text, which should be intuitively understandable for both adults and children.

The final idea of the posters consists of creating a composition of informative blocks, where each block is responsible for delivering a particular message. Thinking about the poster as a whole, it was important to create blocks, which complement each other and would not stand in a competition. This led to a decision of designing a thematic environment on the poster with one dominant theme—indigenous settlement (Fig. 2), where each informative block would be a live scene/situation from the life of the indigenous community. Creating a thematic environment allowed for the depiction of the traditional environment of indigenous communities in the Choco region with cultural attributes, people in traditional costumes, local landscapes and so forth. This makes the visual images of the posters more habitual and brings in the element of relatedness. Creating the thematic environment also allowed to bring play aspect into the posters.

Two sets of posters were created: for internal community use and for travelling to a town. The poster for internal use aimed at helping to understand the current situation with the pandemic, the virus' origins and recommendations for people staying inside the community. Since COVID-19 is considered a Western disease, the space of the poster was also divided into two parts. The smaller outside world briefly introduced the origin of the virus and the pandemic, and suggested that to overcome it, we hope that the world will work together. The main part presented the world inside the community (see Fig. 2). The poster contains the following messages, which were considered the most accurate at the time:

- COVID-19 virus originated in animal markets where animals were kept in captivity and treated with disrespect.
- COVID-19 affected many people globally, including indigenous people and their younger brothers.
- The virus is very dangerous, because it can hide in your body for 8–10 days without any symptoms.
- You can catch the COVID-19, when a person with the virus coughs or sneezes indoors. But with 2 m distance you are safe.
- When you cough or sneeze, cover your mouth with your elbow or a piece of clothing.
- Wash your hands regularly. It helps to reduce any virus infection.
- Drink infusions with ginger and lemon but eat and drink only from your own totumo or plate. The virus can spread through your saliva, if you share the totumo or the plate.
- The major threat comes from the outside. Stay in your village and avoid communication with outsiders or other villages.
- If you have symptoms, isolate for 14 days with the rest of your family from the others to protect your village from the virus. Symptoms: fever, headache, chills, muscle pain, sore throat, cough, difficulty breathing, loss or change to your sense of smell or taste.

The messages were illustrated and accompanied by the text blocks. Figure 3 presents two examples of such illustrations.

The poster for travelling to a town communicates the following recommendations:

1. Travel only if it is necessary.
2. Wear a mask in public places.
3. Wash your hands regularly.

Fig. 3 Illustrated recommendations from the poster for the internal community use (translated)

4. Maintain social distancing.
5. When you come back, change your clothes and wash your body as soon as you enter your home.

Both the poster for the inside-community use and the poster for travelling (for Embera community) presented in Figs. 4 and 5. While the general recommendations are similar, the clothing is different, sources of water are presented in a different way—a container in the community and tap water in a town, the mask was recommended for the travelling purposes as it would hardly be of use inside the community for the reasons discussed in the previous section. Also the male figure was chosen for the trips as it is most likely the men who would travel on business to a town, while women would most likely stay busy in the village caring responsibilities for culture preservation, education, household and children.

The esthetics of commonly used COVID-19 infographics consists of mostly schematic graphics that employ isolated icons; the image of the virus is often used just as an illustration to the word COVID-19 without any particular educational purpose; the color palette is limited. In our design, we took a decision in favor of presenting more of a territory to create space for creative storytelling. Vivid colors and detailed images were chosen to facilitate the engagement with the image.

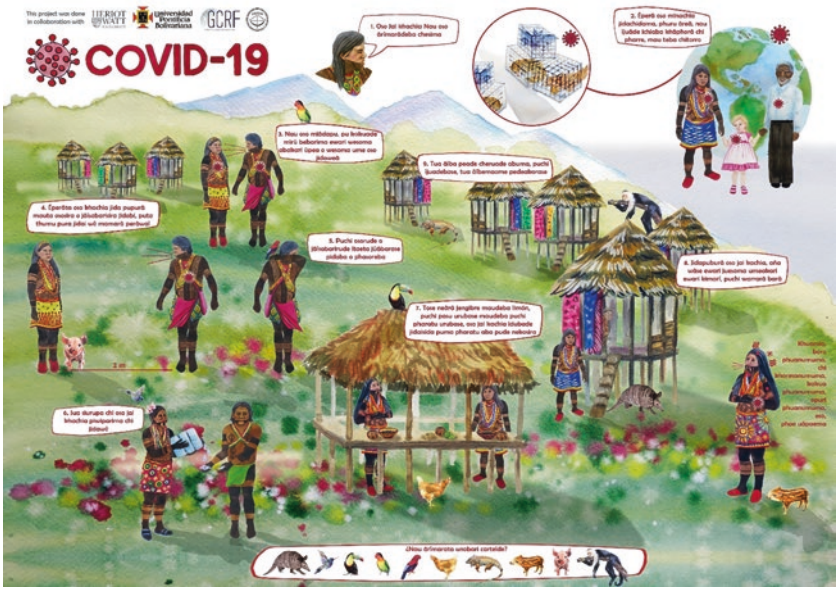

Fig. 4 The inside-community poster for Embera

To increase engagement with the communities with the posters and to keep their attention for longer we also designed gamification elements for the posters. Using game elements in a context different from that of the games influences behavior, engagement and motivation (Marczewski, 2013). The first element we used was an avatar. While avatars are typically visual representations of players within a game (Werbach & Hunter, 2012), the avatar on the poster represents the spiritual leader of the indigenous community—Jaibana, who is telling the story of how to behave during the pandemic (presented in Fig. 6). Jaibana is easily recognizable, as his avatar has circular body paintings which are inherent only for Jaibana (Ulloa, 1992).

The second game element is Easter Eggs—hidden endemic animals on the poster, as a form of variable rewards (Eyal, 2014). The Easter Eggs game was designed to bring fun to the educational material and to attract and engage children in exploring the poster. The process of finding hidden animals can foster paying attention to details, keep attention and interact with the poster for longer.

Fig. 5 The travel poster for Embera

The third game element is a storyline. According to Kapp (2012), a good storyline can help to maintain interest and motivation throughout the process of learning. The posters do not just present recommendations, they tell stories about living in the community on the first poster and travelling to and back from a town on the second poster.

Fig. 6 Avatar (gamification element)

While the organization of the world in the indigenous imaginary is altogether hierarchical, and the territory of one community is separated from the territory of the other communities, distrust of the world of the "white" is manifested in the mental separation between the world of the indigenous community and the world of the "white". This divide implies the use of different practices, habits, clothing and different language by the community members. The posters were adapted to each community: the recommendations were written in the corresponding language; the clothing corresponded to the style of each community. Figure 7 presents the poster developed for Kuna Tule, where one can see the difference in the clothing compared to the poster designed for Embera group (Fig. 4).

The division of the image corresponds to the common logic of story-telling in the indigenous drawings (Ulloa, 1992). The design carefully considered the specificities of the local esthetics and beauty standards. That made posters more recognizable and personalized.

6 Discussion

The reaction to the poster was "a total success", as the medical expert of the team reported on multiple occasions from the field trip. As he observed and supported his observations with the photographs, the members of different age groups in all six communities studied the posters with a lot of interest and enthusiasm (see Fig. 8).

They were involved in searching for the hidden animals, exploring ornaments on female clothing, body painting and details of the

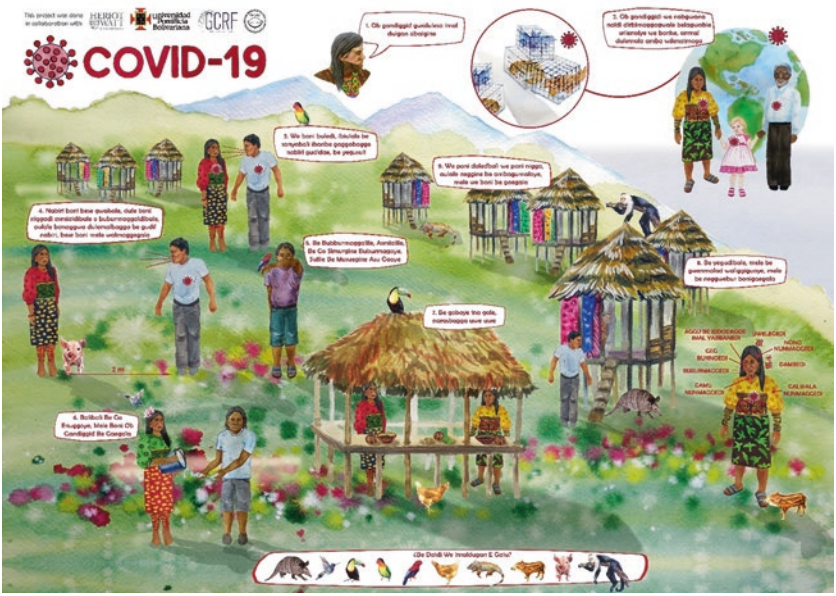

Fig. 7 The inside-community poster for Kuna Tule

surroundings. They were also reading the poster, engaging with the "text" and illustrative materials. Formal (design) and informal (everyday) learning/knowledge worked together (Kalantzis, Cope, Chan, & Dalley-Trim, 2016) as they were reading the multimodal narrative of the posters and adding it to their previous knowledge. The vivid colors and multiple familiar details of the images became the gamification media, invoking the connections with an everyday reality and creating recognition of the individual and collective self. Commentaries—recommendations on the prevention of the spread of the infection written in the community's language—made the "Western" terms more understandable. Together with the poster they were creating a story, and the story was theirs.

The posters and the information presented were not just made for them but together with them, by them. From the first drafts, the team consulted with the local artists and community members and made modifications according to their recommendations and suggestions; community members did collective translation with dedication and engagement (field trip observations). This direct participation in the design development also facilitated the recognition of self in the poster. The co-design required

Fig. 8 The reaction of indigenous communities to the poster

sensitivity, openness, self-reflexivity and care from the team members, the communities responded in the same way.

The posters were not just delivered, but even their delivery, presentation and placing became a communal event based on the simultaneously shared and distributed responsibility. Presentation was accompanied by the discussions, conversations and talks about the pandemics, preventive measures and general health. The process was part of the medical mission. It was a process and an event of creating new meanings.

As discussed throughout the chapter, the situation is very complex and requires complex approach. Multiple subjective and objective factors shape the responses to the pandemics. From the very first day of pandemics, individual communities as well as the collective of indigenous nations in Colombia demonstrated concern, interest in learning more and cooperation with those who are open to it. Their attitude was critical, reflexive and open. Having learnt through centuries to trust only in themselves, and accumulated proven and working knowledge, they contested all of the new information with what was already known to them. Their reaction proved to be less rigid than that of the "Western" world. They dynamically adapted to the changing conditions.

The project discussed in this chapter became an act of solidarity by outreaching to the communities and accompanying them in the process, sharing risks and demonstrating recognition that the issue concerns all of us in the country and in the world. While it is hardly possible to completely escape the "White man's burden" mentality as it is deeply and firmly incorporated in the global societal structure and processes, the present project team members were doing everything possible starting with the design of the project to recognize our privileges and using them in the service of the others for the common good.

Evaluation of the impact is a very sensitive ethical matter. As authors working with community-based methodologies emphasize, only the community itself can evaluate the impact (e.g. Caine & Mill, 2016). Their engagement and openness demonstrate the growing trust. The impact of the project goes beyond the COVID-19 prevention, as pandemics become the wakeup call and an incentive to act together toward making the planet a better place for everybody and everything. The engaging design discussed in this chapter aimed not at reproducing informative material, but rather at expressing solidarity through listening, learning, sharing and co-creating. And finally, it was the learning process for the team more than the communities, placed across disciplines, cultures, knowledge and experiences.

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Disaster Prevention and Awareness

Toshiko Kikkawa

1 Gamification and Disaster Prevention and Awareness

I use the term "gamification" to identify the point at which games motivate people to engage with a social problem, in this case, disaster prevention and awareness. I will not introduce digitally related trials (e.g., Ikejiri et al. 2015), as their impacts in Japan are not as pervasive in this field as in other fields, such as marketing or health. Another reason for not introducing gamification in the strict sense (e.g., Deterding et al. 2011; Kapp 2012) is that many local communities in Japan are older and have only limited access to these technologies. Instead of introducing gamification as it is strictly used, I focus on the fact that game techniques with playful experiences do have impacts on people's attitudes and behaviors from a psychological perspective, that is, by motivating people intrinsically.

From this perspective, gamification is embedded in Japanese society. I adopt the term "embedded" to indicate that ordinary people actively use and play games, regardless of whether they are aware that they are playing

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them. Especially in the field of disaster prevention and awareness, game-like activities have frequently been used for educational purposes. Two factors underlie this situation. First, ordinary people in local communities assume key roles in disaster education, the background and history of which will be explained in this section. Second, Japanese bottom-up culture, to which I will refer later in Sect. 5, may enhance this trend.

The Great Hanshin–Awaji Earthquake played a pivotal role in the emergence of the field of disaster prevention and awareness. It occurred at 05:46 h on January 17, 1995. The earthquake's magnitude was 7.2, and its epicenter was directly beneath Kobe, one of the biggest cities in western Japan, with a population of 1.5 million. The damage was widespread in terms of lives, property, and infrastructure. More than 6400 people were killed, and 15,000 were injured. At least 200,000 buildings were damaged or destroyed; 400,000 people were left homeless; and 240,000 people sought public shelter.

Since the immediate impacts of the disaster were huge, official rescue efforts by firefighters or city employees failed to secure the situation. Therefore, around 70% of the people trapped and confined in the wreckage were saved by people in the community. From this experience, people in Kobe drew a lesson that emphasized self-help and mutual help when facing disasters. Since then, "Self-help, mutual help, and public help" has become a disaster management motto and is widely shared in Japan. It facilitated the establishment of voluntary disaster management organizations ("*Jishu Bosai Soshiki*" in Japanese) in local communities. The Japanese government has officially supported this movement. On average, coverage by such organizations is 83.2% as of 2018, though the figure varies with geographic area, ranging from 29.9% to 97.5%. In addition to these organizations, other voluntary organizations related to disaster prevention, such as volunteer firefighters, also work in communities.

This is a good example of empowerment of the populace. However, I would like to point out a downside, namely, that official support for disaster management, especially financial support, by central and local governments decreased, whether intentionally or unintentionally. Although the original motto "Self-help, mutual help, and public help" highlights the importance of citizens' autonomy in tackling disasters in communities, the government may reinterpret it as "Self-help first, mutual help second, and public help comes last", assigning priority among forms of help.

These voluntary disaster management-related organizations not only give practical help during and after disasters but also contribute

considerably to disaster education aimed at increasing public awareness of disasters. As they are composed of community members, their motivation to save lives is high, and their attitude toward learning is very serious. This community self-education approach has increased the demand for self-teaching materials such as games and related methods.

2 Disasters and Disaster Education in Japan

Japan has experienced innumerable natural disasters such as earthquakes, typhoons, and volcanic eruptions, among others. The Great Hanshin–Awaji Earthquake in 1995 and the Great East Japan Earthquake in 2011 remain vivid in people's memory. The Great East Japan Earthquake, which occurred at 14:46 h on March 11, 2011, had a magnitude of 9.0 and killed more than 21,000 people. It is unfortunate, however, that they will not be the last earthquakes to strike Japan. Japanese seismologists agree that other catastrophic earthquakes will occur within the next 20 to 30 years. For example, the Nankai Trough Earthquake and Tokyo Inland Earthquake are expected to occur in the near future, as large earthquakes are known to occur periodically. In addition to large earthquakes, other disasters will affect people's lives, whether the scale is large or small.

Because disasters are frequent and their scale often large, activities to increase awareness and broaden knowledge of disasters are common and have been increasing in number. Typical examples are evacuation drills, lessons at schools, and memorial museums for disasters. However, these activities are not sufficient, as the risk of disasters (hazard) and their impact differ from region to region. For example, the vulnerabilities of urban areas caused many of the casualties in the Great Hanshin–Awaji Earthquake, whereas a *tsunami* was the main cause of casualties in the Great East Japan Earthquake. The former occurred in a city and the latter hit the coastal area. Considering that Japan expects various types of natural disasters, and the impacts will vary depending on the region, each community requires custom-made educational methods and materials that reflect the possible situations in that community. Games and related materials have an advantage from this perspective, as they offer flexibility for changing content and rules. Furthermore, games not only deliver information but also facilitate systems thinking, which I will discuss later.

The first game to gain recognition in disaster education in Japan was the "Disaster Imagination Game", or DIG, developed by Professor Takeshi Komura at Tokoha University, Shizuoka Prefecture, Japan.

Shizuoka is one of the leading Prefectures in disaster prevention because scientists have predicted, based on historical data, that the region will be hit by a devastating earthquake in the near future. Since this prediction was issued in 1976, many measures, including disaster education, have been carried out. The game DIG, which was developed in 1997, can be categorized as a workshop-style simulation. In the game, local people use an area map and identify risks in their community (Figs. 1 and 2). Although Japan is disaster prone as a country, and the Japanese know with certainty that disasters will occur, it is rather difficult for individuals to imagine the consequences because they rarely experience disasters in their own lifetimes. By discussing disaster responses as if they were participants at the headquarters for disaster control, local people come to imagine disasters in the future. They can share knowledge about the risks in their community and increase awareness about disaster preparedness.

Although the system cannot be interpreted as a "game" in the strict sense of the term, DIG opened the way for games as a part of disaster

Fig. 1 Maps used in DIG

Fig. 2 Players are identifying risks in the communities

education. That is, before DIG was well known, it could have easily been misconstrued as inappropriate for education dealing, as it does, with issues of life and death, such as disasters, given that the Japanese term for "game" is associated with play. DIG has overcome this reluctance to use games and related methods in disaster education. Fidelity of the game to the real world, as seen in the use of accurate area maps of the community, may have contributed to reducing the resistance to games, as well as contributing to increased seriousness about disasters.

3 Gamification for Increasing Awareness and Improving Disaster Prevention: The Case of "Crossroad"

In 2003, a group of researchers, including myself, developed the game "Crossroad" (Kikkawa et al. 2004). It was originally designed as a tabletop exercise for people to learn about disaster preparedness and

responsiveness. It is pioneering in that it is a game in the strict sense; it has fixed rules.

The game is based on extensive interviews with Kobe City employees who had participated in the response to the disaster in 1995. The interviews started about eight years after the Great Hanshin–Awaji Earthquake, which meant that the interviewees had had a long time to reflect on their experiences. Disaster response consists of a series of serious decisions, each of which contain dilemmas. Examples of these are whether to start handing out food if the available food is insufficient for the number of disaster victims and whether to build temporary housing for the unhoused victims in schoolyards if there is a shortage of sites. The game presents dilemmas such as these on cards describing situations that people may face in disaster situations (see examples in Table 1).

The game has several variations, with slightly different rules; here, I introduce the most frequently played version. Players play the game in groups of five to seven. Each player has exactly the same deck of ten "episode" cards at hand. S/he also has one "YES" card and one "NO" card. Every "episode" card has the same format, consisting of three parts. The first part is the description of a person who is faced with a dilemma. A short description of the situation follows as the second part. The third part is a description of the decision to be made, either "YES" or "NO". Each player puts a "YES" or a "NO" card face down on the table. When these cards are revealed, each player who votes with the majority gains a point. For example, if three of five players vote "YES" for an episode, each of those three players receives one point.

Table 1 Examples of "Crossroad" episode cards

	Situation	*Decision (YES or NO)*
Kobe	You are: A senior administrative officer and 24 hours have passed since an earthquake. City Hall is full of people who have been evacuated, but the hall is not an authorized evacuation center. Do you force them to leave City Hall?	YES (force them out) / NO (do not force them out)
3.11 earthquake	You are: A citizen who works as a volunteer at an evacuation center. You are distributing food; 150 loaves remain, but their expiration date is today. Do you distribute them to whoever wants them?	YES (distribute them) / NO (do not distribute them

There is an additional way for players to gain points. If a player is the only person in the group who makes a decision that is different from all the others, that player can gain a special point. For example, if one player of five chooses “YES”, and the other four players choose “NO”, then the “YES” player gains a “gold” point. After gaining points, discussion follows. All players explain the reasons for their decisions and share any relevant knowledge and experiences.

The aim of the game is three-fold. The first aim is for players to learn from the 1995 earthquake. Although it is true that the Japanese might have learned a lot from this tragedy, it seems that the lessons have not always been correctly read and absorbed in Japanese society, even at that time, probably because there is a general tendency for people to forget. Second, the rules facilitate players’ naturally disclosing their opinions and perspectives. The rule that players first show their “YES” or “NO” decision naturally leads to further discussion. This is especially meaningful for Japanese people, as they tend to be hesitant about expressing their opinions in public. Most of the episodes used have a more or less “it depends” quality. The contradictory nature of the episodes and the rule requiring an either-or decision nonetheless evoke spontaneous discussions among players during the game.

The third and most important aim is for players to continue thinking about disasters after the game is finished. Although the rules dictate that the number of “YES” or “NO” responses determines points, this does not imply that either the majority or the minority opinion is correct. Instead, without declaring which decision is correct, the game leads players to feel a sense of indecisiveness or lack of closure. According to Zeigarnik (1938), unfinished or interrupted tasks are better recalled than finished ones (known as the “Zeigarnik effect”). The designers of “Crossroad” intentionally created this psychological situation, hoping that players would continue thinking about it and discussing it with others after the game had finished. One indication of the persistence of this psychological effect on players’ attitudes and behaviors is seen in voluntarily held national and local meetings of game players and facilitators (Figs. 3 and 4).

The original game was sold through a shop affiliated with Kyoto University. Since 2004, more than 5000 copies have been sold. Given that one game can be played with up to 20 players, around 100,000 players have had the access to the game, excluding players who do not use the actual game kit.

Fig. 3 Facilitators of Crossroad meetings held annually

Due to the game's simplicity, people other than game designers can create their own episode cards and thereby share their experiences or lessons learned from other disasters on a nationwide scale (Kikkawa 2014). For example, after the Great East Japan Earthquake in 2011, victims of that disaster created new episode cards and shared their experiences (see Table 1).

4 Expansion of Games in Disaster Education

As Crossroad gained considerable popularity, many other games have been developed and used for disaster education. "HUG" (*Hinanjo Un-ei* Game; a direct English translation might be "Shelter Management Game") was one of these (Komori et al. 2019). Because shelters for disaster evacuees are typically operated by volunteer disaster management organizations in Japan, that is, by general citizens, this game is focused on learning how to operate community shelters. It was developed by a public employee in

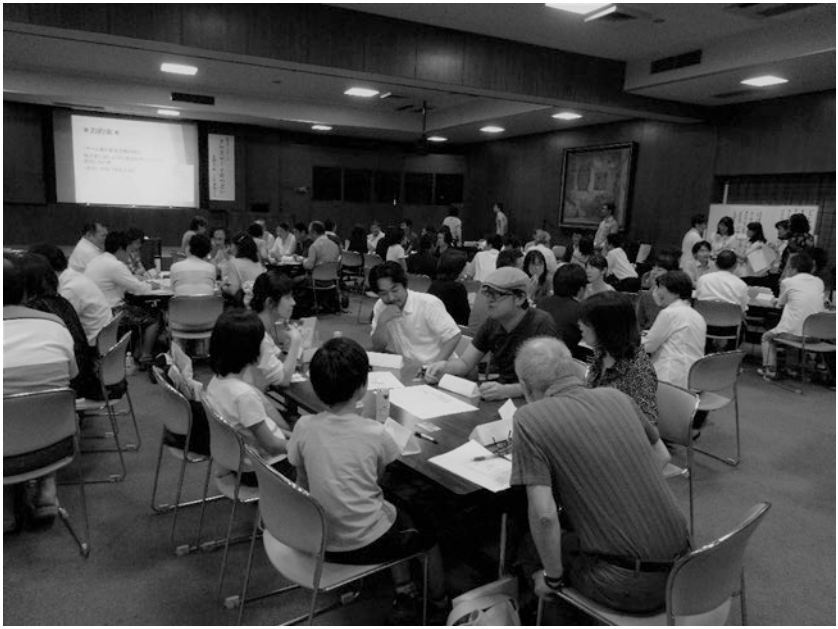

Fig. 4 Facilitators of Crossroad are exchanging their experiences

Shizuoka Prefecture, where a catastrophic earthquake is expected to occur, as mentioned earlier. The game is a simulation game in which players are asked to deal with events arising in the evacuee shelter. The events are described on cards distributed, one after another, by controllers, and players discuss and decide on their responses in a limited amount of time.

The success of the three games mentioned above has accelerated the use and development of games in disaster education. Fidelity is key for the gamification of disasters in Japan. DIG uses area maps, Crossroad uses episodes based on previous disasters, and HUG deals with shelter management. Maintaining a certain degree of fidelity to reality fosters a recognition of the seriousness of these games and encourages immersion by the participants.

Many new games have been developed, especially using traditional Japanese games as frameworks for game design. That is, the content of existing games is replaced with content developed for disaster education, while the rules remain the same. This approach has at least two benefits:

first, it saves time and effort otherwise required to explain the rules to the players, since they are already familiar with them; second, it enables ordinary people to customize the content of games to fit their aims, even if they are not familiar with game design. As mentioned earlier, Japanese disaster education has a bottom-up quality; thus, people, especially voluntary disaster organization members, have started to develop their own games based on the history and knowledge of their communities.

I introduce two examples of games that are commonly used in the area of disaster education, *"Karuta"* and *"Sugoroku"*.

"Karuta" is a Japanese card game played with a deck of cards. The name *Karuta* derives from the Portuguese word "carta" (cards). The deck consists of two types of cards: reading cards and grabbing cards. Reading cards are read by a reader, while players find as quickly as possible the corresponding grabbing cards among cards spread on the floor. Players must grasp the one-to-one correspondence between reading cards and grabbing cards. The principle of memory being the key to winning, like memory games with playing cards, is a suitable basis for people to disseminate basic knowledge of disasters and disaster prevention. For example, the association of "*Tsunami*" with "Rapid evacuation" is indispensable knowledge for people living in a coastal area. In this case, "*Tsunami*" can be a reading card, and "Rapid evacuation" a grabbing card. By playing *"Karuta"*, people can establish an association between two words and learn the importance of rapid evacuation in the face of a *tsunami*.

"Sugoroku" is a Japanese board game similar to "Snakes and Ladders" or "Game of the Goose". It uses a linear race track, along which players race by throwing dice. Basically, it requires no special skills or strategic thinking because the dice decide the next moves; therefore, the game can be played by anyone, from small children to older people. It has been frequently used for educational purposes as well as played for fun, as information can be added on squares (spaces) of the board (Fig. 5, see also Strouhal 2015). Like in Monopoly®, when a player stops on a square, s/he follows the instructions written on that square. This differs from "Snakes and Ladders" or "Game of the Goose". People can make their own *Sugoroku* boards, and these can be self-explanatory, with information on the squares. The frame is especially suitable for teaching chronological information since the game is basically a race to reach a goal.

Various "*Bosai* (disaster prevention) *Sugoroku*" have been developed by local people because the frame is so familiar, making it easy to create content for the game. Because the content is localized, the relatively high

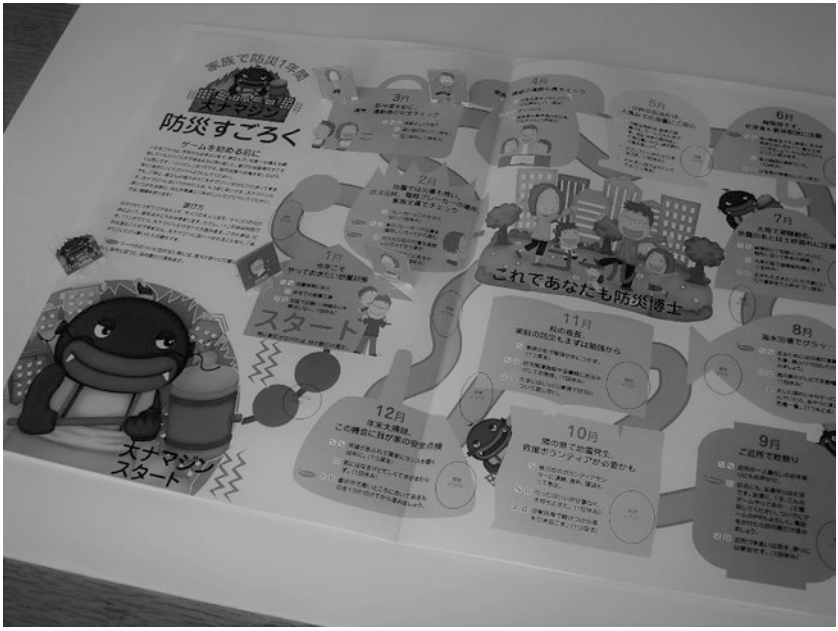

Fig. 5 An example of "Sugoroku"

fidelity of the games attracts people, leading them to learn more effectively. In addition, because the game frame uses a linear track, the game is suitable for teaching people the chronology of disasters. For example, the game can educate players in how to prepare for disasters in a step-by-step manner, before they happen. Alternatively, the game can educate them about the process of reconstructing communities after disasters. It all depends on how the goal of the game is set.

In addition to local community people, various non-profit organizations (NPOs) specializing in disaster prevention and education have begun to develop games for educational purposes. For example, "Plus Arts", one of the leading NPOs founded after the Great Hanshin–Awaji Earthquake, promotes workshops. It developed a board game, "*Gura Gura* Town" (A variation on *Sugoroku*. *"Gura Gura"* is an onomatopoeia term meaning "shaking", i.e., earthquake) and two card games, "Shuffle" and *"Tasukarutetto"* (Direct translation, "Saving Life Quartet"). The games are sold in shops in Japan and are therefore easily obtained. The

workshops and games have been translated and used in other Asian countries that are also vulnerable to natural disasters.

Here, I would like to emphasize that the above-mentioned efforts at developing games can themselves be a learning process about disasters. Especially in the case of *Karuta* and *Sugoroku*, it is necessary to study previous disasters in one's community before creating new content for the games, in addition to learning some basic information about geology, meteorology, etc.

These trends have been accelerating, and ordinary people who are not necessarily interested in disaster education have also developed games with disasters as a main topic. Many of these are available at the Game Market described in Sect. 5.

5 The Bottom-Up Culture of the Japanese Gamification Field

I would like to point out that Japan's bottom-up culture may contribute to the rise of gamification in disaster prevention and awareness. In addition to the fact that voluntary disaster prevention organizations play key roles, which is one indication of the bottom-up culture, ordinary people bolster gamification of the field in general.

The Game Market is a good example (Fig. 6). It is the largest tabletop game event in Japan and is held three times annually. As an illustration of its popularity, the spring market held in Tokyo in 2019 had over 25,000 participants across two days.

The key characteristic of this event is that the exhibitors are mostly independent game designers, that is, ordinary people and not professional designers. Of a total of 454 exhibitors on the first day of the Tokyo game market in 2018, 350 were independent game designers. Like the *Comic market* (*Comiket*) held in Japan, this is a grassroots event, founded by an elementary school teacher. Printshops that have helped groups at the *Comiket* and already have expertise in small-scale publishing have supported the independent designers publishing games at the *Game Market*.

Games sold at the *Game Market* cover an enormous variety of topics, so various disaster-related games are regularly developed and sold. This could be because disaster prevention is one of the major concerns among the Japanese, as we usually experience several disasters annually.

Fig. 6 The Tokyo Game Market

With respect to disaster-related games, the main difference between games developed by local community people, introduced in Sect. 4, and those developed by independent designers is the sophistication of their rules. Local people generally use existing games like *Karuta* and *Sugoroku* as frameworks. In this sense, the games are used as a vehicle for disseminating known facts or accurate information about disasters. On the other hand, games developed by game designers, regardless of whether they are independent, have original rules. Thus, they offer an interpretation of systems of the world, in this case, of disaster-related events. For example, in the case of disaster-centric games, players are dealing with ongoing disasters and with people. Consideration of disaster responses inevitably involves interaction between authorities and the regular population, and unexpected reactions often occur in reality, like the events described in a particular game. By playing games with sophisticated rules and systems, players learn meta-knowledge about disasters, even if it is based on the game designers' world views, which are not necessarily accurate from the perspective of disaster experts.

The implication is that these disaster games could offer different and sometimes eye-opening interpretations of what happens before, during, and after disasters, though the designers may not be aware of this possibility. In addition, and more importantly, these games are more playful than

typical disaster-related games developed for educational purposes, and they therefore leave people intrinsically motivated to continue learning more about disasters.

6 Future Gamification in the Disaster Prevention and Awareness Field

In this chapter, I have focused on the history and advancement of gamification in the field of disasters. Three pioneering games initially opened the doors, and gamification expanded in the field. The general bottom-up culture and the fact that volunteer disaster prevention organizations play important roles in disasters accelerated the trend. Not only the games themselves but also the whole learning system using games, which I refer as "gamification", have contributed to the disaster prevention knowledge and increased public awareness.

In addition to the grassroots or bottom-up component to this trend, researchers have contributed considerably to an increasing general awareness of disaster prevention using gaming and simulation. Many games have been developed in this regard. For example, "Evacuation Simulation Training" (EST) (Toyoda 2018) is focused on increasing awareness with the aim of community-based disaster risk reduction. "*Yonmenkaigi*" (e.g., Na 2016) and "*SASKE-NABLE*" (Otsuki et al. 2016) are better characterized as workshops than as games. The former is focused on local community decision making and the latter on shelter management. A comprehensive review of Japanese simulation and gaming developed by researchers is offered by Toyoda (2020).

The quality of games developed by researchers could be better than those developed by non-researchers with respect to both the accuracy of the facts about disasters and the refinement of the game systems. However, these games also have disadvantages. One has to do with access. Games developed by researchers are usually facilitated by them, resulting in relatively few playing opportunities for ordinary people. The three pioneering games overcame this disadvantage. DIG has a system of training facilitators, Crossroad is sold in a shop and online, and the Shizuoka Prefecture game kit and manuals are available free of charge. Since distribution is a key for spreading learning, especially in a disaster-prone country like Japan, it is necessary that more games become available in the market or provided for free.

Games developed by researchers have different types of advantages. For example, games with disaster topics developed by Japanese researchers have been transported to other Asian and South American countries, mainly by foreign exchange students as well as the researchers themselves (e.g., Kikkawa and Suzuki 2013). These countries are also vulnerable to natural disasters. Although their social systems or the particular characteristics of their disasters may differ from those of Japan, the games are localized so as to be suitable for the countries and communities involved and, thus, contribute to disaster education. Accumulation of such practices will lead to the sharing of experiences of education and the enabling of mutual learning.

In contrast to the games developed by researchers, the games introduced in Sects. 4 and 5 that were not developed by researchers or by people with comprehensive knowledge concerning disasters are sometimes criticized for not delivering accurate information and for lacking seriousness. However, all of these games are serious to some extent if we focus on the motivations of those who design disaster-related games.

Expanding the range of games, including digital games, will contribute to the improvement of disaster prevention and increasing awareness that will eventually save lives.

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Disaster Risk Reduction Towards Community Resilience: Empirical Model of Decision-Making Process Through Stop Disaster Game

Tri Mulyani Sunarharum, Hilya Mudrika Arini, and Indah Sepwina Putri

1 Introduction: Yogyakarta's Vulnerability and Its Efforts Towards Community Resilience

This chapter focuses on improving disaster risk reduction efforts aimed at building community resilience in Yogyakarta Special Province, Indonesia. Based on existing research on at-risk communities' perceptions of an

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online disaster-related game, Stop Disasters, this chapter aims: (1) to find the factors influencing people in the Yogyakarta Special Province to use the Stop Disasters Game for disaster preventive action, and (2) to develop an empirical model of the decision-making process in the event of a disaster based on the intention to use Game Stop Disasters. The use of this game might increase the awareness and literacy of the vulnerable community regarding natural hazards as well as enhance effective collaboration amongst relevant stakeholders during disaster preparation and emergency management.

A disaster is an event or series of events that cause loss of life, property, and resources, and also have a psychological impact. Yogyakarta Special Province is vulnerable to a wide range of natural disasters. Most of the infrastructures and populations in Yogyakarta are located near the Merapi volcano and coastal areas. According to Mujiatun (2017), there are nine types of disaster that threaten Yogyakarta Special Province: earthquakes, volcano eruptions, landslides and erosion, abrasions, droughts, floods, disease epidemics, technological failures, and extreme weather. The most common and historically most significant of which are earthquakes and volcano eruptions. Merapi volcano, for example, is one of the world's most active volcanoes located in Yogyakarta Special Province (Anjasni, 2013; Susmayadi, Sudibyakto, Kanagae, Adiyoso, & Suryanti, 2014; Sutikno, 2016). According to Anjasni (2013), Merapi volcano contains an active lava dome which regularly produces pyroclastic flows—more so than any other volcano in the world—making it extremely dangerous for the people who live on the Merapi slope when an eruption occurs.

As Yogyakarta Special Province is vulnerable to a wide range of natural hazards, disaster risk reduction (DRR) is required to minimize the victims, property loss, and environmental damage caused. Prevention, mitigation, and preparedness are components of disaster management that help to reduce the extent of the damage before a disaster occurs, while relief, rehabilitation, and reconstruction are components of disaster management that come into play during and after the occurrence of a disaster (Sutikno, 2016).

2 Strengthening Community Resilience

Generally, there are two approaches to disaster risk reduction: (1) by implementing a set of regulations and (2) by increasing community resilience. First, regarding regulation, Yogyakarta Special Province already has a set of regulations governing the implementation of disaster mitigation,

which follows the national regulation related to disaster management. This regulation is used as a reference for creating disaster management policies. For example, the Sleman Regency, one of the regencies in Yogyakarta Special Province, will refer to the Sleman Regency Disaster Management Plan for 2018–2022 if a disaster occurs in the regency. However, upon examining the Yogyakarta Special Province Government's policies in more depth, Yuanjaya and Fajri (2020) found that these policies are project- and reward-oriented, and view the community only as objects of environmental programmes. This kind of policy will produce unsustainable results, or even fail. Rather, the solution for reducing environmental degradation must be based on repositioning the community as the subject and at the centre of the policy.

Accordingly, besides government regulation, the role of community resilience is also essential to disaster risk reduction. The community has the resources and capacity to face and respond to change and uncertainty, which might reduce the risk of disasters (Fawcett et al., 1995; Godschalk, 2003; Kretzmann & McKnight, 1993). Community resources and capacity may also contribute to building resilience in a broader context of disaster risk reduction, allowing multiple stakeholders to be included in the existing governance mechanism (Djalante, 2012). Jha, Bloch, and Lamond (2012) emphasize that building resilience requires the inclusion of multiple stakeholders as well as vulnerable groups in decision-making processes, through informal and formal planning activities.

In Indonesia, community resilience is built through educating and preparing the community for further disaster. By increasing community resilience, the population can more easily characterize the different types of disaster: they can understand how to effectively recognize and deal with a further disaster when it occurs (Susmayadi et al., 2014). Magis (2010) added that community resilience is an important indicator of social sustainability. According to Tran, Kaneko, Shaw, Victoria, and Oi (2009), the most appropriate way of implementing disaster risk management is through community disaster management organizations (CDMO) that are truly local in nature and create a sense of ownership as well as a long-term presence.

The Disaster Resilience Village (*Kampung Tangguh Bencana*) is a disaster risk prevention effort implemented by the Yogyakarta provincial government. *Kampung Tangguh Bencana*, which is part of the Yogyakarta Disaster Agency (BPBD) programme, has run quite well with various activities carried out. In 2016, there were 55 *Kampung Tangguh Bencana*;

the number has since increased significantly, particularly in the areas that are periodically affected by disasters. The programme aims to actively involve the community in disaster management, such as providing education on disaster risk assessment and disaster risk reduction (DRR). Unfortunately, the education that is commonly provided is limited to evacuation drills and simulations. The use of online games, particularly the gamification concept, has not yet been introduced to the community to prevent further disasters.

3 Gamification for Disaster Risk Reduction

The word gamification began to receive global attention in 2010 (Schimak, Havlik, & Pielorz, 2015). According to the most quoted definition, gamification refers to the application of game thinking in non-game contexts, with the aim of increasing awareness and engagement, and changing people's behaviours (Deterding, 2012). Gamification plays the same role as games in giving players psychological experiences (Huotari & Hamari, 2012). Deterding, Dixon, Khaled, and Nacke (2011) explain that, regardless of the outcomes, the capability and skills used in gamification should be the same as those used in games. Based on these definitions, in the case of disaster risk reduction, there is room for further investigation and research on how gamification relates to: (1) motivation, (2) behaviour, and (3) capacity in understanding risk and responding to disaster.

Over the last few decades, the increasing popularity of video games has indicated the potential for disaster studies and research, particularly in terms of interactive education in disaster reduction strategies. As an example, video games such as SimCity and Minecraft can engage players from all walks of life in developing geographical knowledge, creativity, spatial awareness, and problem-solving related to environmental issues, including disaster preparedness. It is believed that video games are able to convey messages regarding disasters and disaster risk reduction (DRR), including portrayals of hazards, vulnerabilities, capacities, and numerous disaster discourses. This aligns with the suggestion made by the United Nations Office for Disaster Risk Reduction (2009), that video games have the potential to increase user engagement through active participation, a key concept for disaster risk reduction (DRR) practitioners.

Research on disaster-based video games continues to be carried out, as preliminary research has demonstrated that these games can convey DRR messages. Video games should provide players with five levels of learning:

how, what, why, where, and when. Players of disaster-based video games can explore ideas related to DRR rather than being directed systematically, as part of a top-down approach, regarding what they should or should not learn. How a player approaches the game will depend on their previous knowledge and experience of disasters and DRR, but the important thing to understand is the constructive mechanisms present within a video game that can enable all players to build upon their existing knowledge and that provoke interest and engagement in DRR. In this way, disaster-based video games could be effective tools to generate sustainable DRR awareness in players.

However, there remains debate about whether video games could be effective tools for enhancing DRR awareness (Pereira, Prada, & Paiva, 2014). The effectiveness of using games in DRR is closely linked to the player's motivation. Kapp explained that consideration of player motivation is important as it can determine what skills a player will potentially learn. The fact that a player returns to a particular challenge can reinforce the particular game content involved with that challenge. A point to raise here is the idea of reverse learning, where players purposefully experiment with the boundaries of the video game and attempt to play the game in an alternative fashion. The "experiment and play" dimension of video games gives players the opportunity to play a game how they want, and so can potentially engage players in a thinking process regarding their actions.

Theory of Planned Behaviour (TPB) suggests that a certain set of motivational factors, including attitudes towards a behaviour, subjective norms and perceived behavioural control, lead to an intention to perform a behaviour (Ajzen, 1991). According to the TPB, a certain set of motivational factors, including attitudes towards a behaviour, subjective norms, and perceived behavioural controls, lead to intention to perform a behaviour (Ajzen, 1991). Other sources have confirmed that prior knowledge, perceived usefulness, and ease of use are factors that can reinforce the intention to perform a behaviour. Therefore, in this study, TPB with some modifications was used as foundation to develop the conceptual model.

4 Method

This section explains the methods used in this study. It starts by explaining the development of a questionnaire adapted from previous researchers, as shown in Table 1. After this, the pilot study, that is, validation and

reliability test for the questionnaire, was conducted. Regarding the validation and reliability test, all items in the questionnaire proved to be valid and reliable; thus, it was used to collect the data. In total, 202 residents of Yogyakarta Special Province participated in the online survey, and the final sample for this study consisted of 180 respondents. Finally, a descriptive analysis was performed and the Partial Least Square Structural Equation Model (PLS-SEM) used to analyse the data. Over the last two decades, PLS-SEM has been widely applied in management, marketing, management information systems, and other social science disciplines (Hair, Hult, Ringle, & Sarstedt, 2017; Hair, Risher, Sarstedt, & Ringle, 2019).

The PLS-SEM method is especially useful in developing theories in exploratory research because of its ability to estimate complex models with many constructs, indicator variables, and structural paths without imposing distributional assumptions on the data. Moreover, PLS-SEM is a causal-predictive approach to SEM that emphasizes prediction in estimating statistical models, whose structures are designed to provide causal explanations (Sarstedt, Ringle, & Hair, 2017). These characteristics make PLS-SEM a robust modelling method suitable for this study.

Table 1 Operational definitions of variables

Variable	*Operational definition*	*Reference*
Prior knowledge	The knowledge that stems from previous experience	Hove et al., (2011)
Perceived usefulness	The degree to which a person believes that using a particular system would enhance his/her performance	Zayyad et al., (2018) Hoque et al., (2017)
Ease of use	Straightforward and simple to use	Hoque et al., (2017) Dou et al., (2017)
Intention	The motivational factors that influence a given behaviour where the stronger the intention to perform the behaviour, the more likely the behaviour will be performed	Hoque et al., (2017)
Decision-making process	Focusing on behavioural tenets, performance, and approach to decision-making during emergencies	Kapucu and Garayev (2011)

5 Results

5.1 *Profile of Respondents*

The respondents' backgrounds are shown in Figs. 1, 2, 3, 4, and 5. Most of respondents (138 people) lived in urban areas, with the rest being located in suburban areas. However, a significance test, conducted to compare urban and non-urban people's intention to use the Stop Disasters Game, showed no difference between those who lived in urban and those in suburban areas. Regarding gender, age, and work status, 118 respondents were female, and 62 respondents were male; most of the respondents (156) were under 30 years old and studying at university (129). Regarding their mobile game user status, 118 respondents were gamers, and 62 respondents were non-gamers. However, the variations in the intention to use the Stop Disasters Game between gamer and non-gamer respondents were not significant, based on a one-sample Kolmogorov-Smirnov test conducted; thus, the analysis performed in this study was undertaken on data for all respondents, regardless their status as a gamer or non-gamer.

5.2 *Conceptual Model*

The analysis of the data using PLS-SEM was based on the conceptual model obtained from previous research. As mentioned in the literature review section, this study adopted the TPB model and modified it

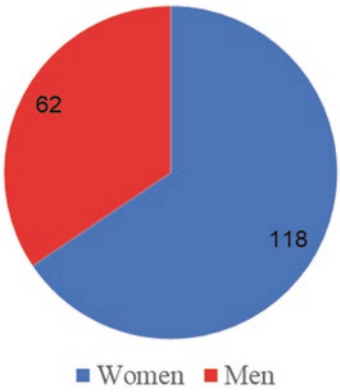

Fig. 1 Respondents' profile based on gender

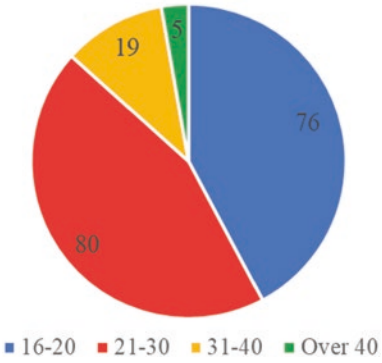

Fig. 2 Respondents' profile based on age

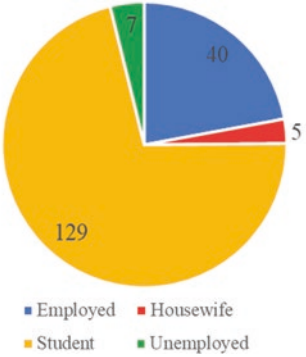

Fig. 3 Respondents' profile based on work status

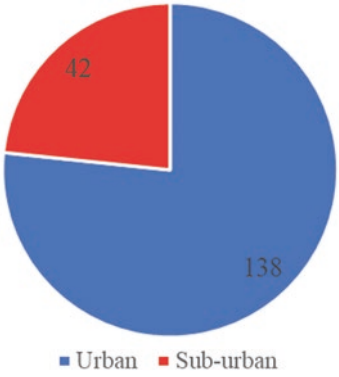

Fig. 4 Respondents' profile based on residential area

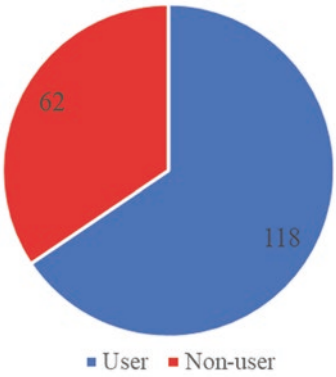

Fig. 5 Respondents' profile based on mobile game user status

Fig. 6 Conceptual model of the decision-making process during a disaster, regarding the intention to use the Stop Disasters Game

according to the gamification case. As shown in Fig. 6, theoretically, people with a higher prior knowledge of disaster preparedness and who find the game ease of use have a higher perceived usefulness and easiness of playing the game. Higher perceived usefulness can increase the intention of people to use the game which, in turn, can improve their ability to make decisions when the disaster occurs. The operational definition and references adopted for each variable are depicted in Table 1.

5.3 Evaluation of PLS-SEM Results

After data was collected and the conceptual model developed, the next stage in developing the empirical model was to evaluate the PLS-SEM results. Evaluating PLS-SEM results involves a two-step process: assessment of measurement models (outer model) and the structural model within the path model (inner model). The first step in evaluating PLS-SEM results involves examining the measurement models. If the measurement models meet all the required criteria, the next step is assessing the structural model (Hair et al., 2017).

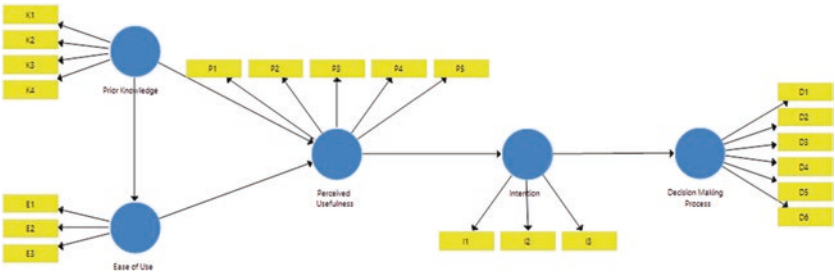

Fig. 7 Initial model in PLS-SEM

As shown in Fig. 7, the first conceptual model, shown in Fig. 6, was converted into the PLS-SEM format, where each variable is broken down into various items. Prior knowledge (K) has four items, ease of use (E) has three items (E1, E2, E3), perceived usefulness (P) has five items (P1, P2, P3, P4, P5), intention (I) has three items (I1, I2, I3), and decision-making process (D) has six items (D1, D2, D3, D4, D5, D6).

5.3.1 Assessing Measurement Models (Outer Model)

Measurement outer model aims to ensure that the model is valid and reliable, as reflected in (1) the indicator loadings, (2) the internal consistency reliability, (3) the convergent validity, and (4) the discriminant validity. The first step in measurement model assessment involves examining the indicator loadings. The indicator loadings show the correlation between the variable and the items within it. According to Hair et al. (2019), loadings above 0.7 are recommended, as they indicate that the construct explains more than 50% of the indicator's variance. Thus, in this study, one item in the knowledge variable (K2), two items in intention (I2 and I3), and four items in the decision-making process variable (C3, C4, C5, C6), were eliminated. Consequently, only 14 of 21 items were analysed in the further process.

The second step was to assess the internal consistency reliability. Higher values of composite reliability (CR) generally indicate higher levels of reliability. Cronbach's alpha is another measure of internal consistency reliability that assumes similar thresholds but produces lower values than composite reliability (Hair et al., 2019). We found that all Cronbach's alpha values and composite reliability values for all variables were well above the required threshold of 0.6 but were still below the maximum threshold of 0.95, indicating that the internal consistency reliability was acceptable.

The third step of the measurement model assessment addresses the convergent validity of each construct measure, using the average variance extracted (AVE). According to Hair et al. (2019), convergent validity is the extent to which the construct converges to explain the variance in its items. An acceptable AVE is 0.5 or higher, and Table 2 shows that the AVE values of all variables are well above the required threshold, which indicates a high level of convergent validity.

The last stage of the measurement model assessment is to assess discriminant validity, which is the extent to which a construct is empirically distinct from other constructs in the structural model. This test is conducted by comparing the loading value between the latent variable and other variables; the discriminant validity can be depicted as the square root value of AVE for each variable. A model has good discriminant validity if the square root value of AVE for each variable is higher than its correlation value. Table 3 shows AVE square root for each variable, and shows that this outer model has good discriminant validity, as the AVE square root values are higher than the correlation values.

Table 2 Validity and reliability of the model

	Average variance extracted (AVE)	*Cronbach's alpha*	*Composite reliability*
Decision-making process	0.756	0.677	0.861
Ease of use	0.764	0.846	0.906
Intention	1.000	1.000	1.000
Prior knowledge	0.606	0.740	0.821
Perceived usefulness	0.719	0.902	0.928

Table 3 AVE square root for each variable

	Decision-making process	*Ease of use*	*Intention*	*Prior knowledge*	*Perceived usefulness*
Decision-making process	0.869				
Ease of use	0.266	0.874			
Intention	0.302	0.504	1.000		
Prior knowledge	0.310	0.352	0.293	0.779	
Perceived usefulness	0.263	0.655	0.628	0.425	0.848

Table 4 Significance level for each dimension

	Original sample (O)	*Sample mean (M)*	*Standard deviation (STDEV)*	*t-statistic (|O/STDEV|)*	*p-value*
Ease of use > perceived usefulness	0.577	0.575	0.062	9.367	**<0.05**
Intention > decision-making process	0.302	0.307	0.083	3.629	
Prior knowledge > ease of use	0.352	0.356	0.071	4.968	
Prior knowledge > perceived usefulness	0.221	0.227	0.074	3.004	
Perceived usefulness > intention	0.628	0.631	0.054	11.605	

Once the outer model had been proved valid and reliable, bootstrapping was performed to identify the significance of each dimension to the latent variable. As shown in Table 4, all dimensions were significantly different with a *p*-value under 0.05.

5.3.2 Assessing Structural Models (Inner Model)

The second step in evaluating PLS-SEM results is assessing the inner model, also known as model structural analysis. This measurement aims to ensure that the developed structural model is robust and accurate, as reflected by certain indicators, for example: (1) variance inflation factor (VIF), (2) determination coefficient (R^2), and (3) predictive relevance (Q^2).

First, before assessing the structural relationships, collinearity must be examined to ensure it does not bias the regression results (Hair et al., 2019). For this study, VIF was utilized as an indicator for evaluating multicollinearity. According to Hair et al. (2019), VIF values should 3 and lower; indicating that there is no multicollinearity in the inner model. The analysis showed that, there is no multicollinearity in the inner model (Table 5).

If collinearity is not an issue, the next step is to examine the determination coefficient (R^2) value of the endogenous construct(s) (Hair et al., 2019). The R^2 is a function of the number of predictor constructs that explain the prediction level of the model; the greater the number of predictor constructs, the higher the R^2. According to Hair et al. (2019), R^2

Table 5 VIF values

	Decision-making process	*Ease of use*	*Intention*	*Prior knowledge*	*Perceived usefulness*
Decision-making process					
Ease of use					1.142
Intention	1.000				
Prior knowledge		1.000			1.142
Perceived usefulness			1.000		

Table 6 R^2 and Q^2 values

	R^2	Q^2
Decision-making process	0.091	0.086
Ease of use	0.124	0.119
Intention	0.395	0.391
Perceived usefulness	0.472	0.466

values of 0.75, 0.50, and 0.25 are considered substantial, moderate, and weak, respectively. R^2 values of 0.90 or higher are typically indicative of overfit. Meanwhile, predictive relevance (Q^2) is used to measure the observation value and its parameter estimation. As a guideline, Q^2 values should be larger than zero to indicate predictive accuracy of the structural model for that construct. Values higher than 0, 0.25, and 0.50 indicate small, medium, and large predictive accuracy of the PLS path model (Hair et al., 2019). Table 6 shows the value of R^2 and Q^2 of the inner model. Considering the VIF, R^2, and Q^2 values shown in Tables 4 and 5, the inner model developed in this study is robust; therefore, hypothesis testing could be conducted in the next stage.

5.4 Empirical Model

After assessing the outer and inner models, the hypothesis test was conducted to find the path coefficient. The PLS results for the path coefficient explain the relationship amongst variable at a 5% significance level (two-tailed test), in terms of the direct effect and total effect. Table 7 shows the path coefficient of the model.

As shown in Table 7, all variables are significant: (1) ease of use influences perceived usefulness; (2) prior knowledge influences ease of use; (3) prior knowledge influences perceived usefulness; (4) perceived usefulness influences intention; and (5) intention influences the decision-making process. Based on the original sample (o), and as shown in Table 7, the correlation amongst the stated variables is positive. Figure 8 depicts the results of the empirical model PLS-SEM after all statistical tests had been conducted.

The empirical model shown in Fig. 8 suggests that people who have higher prior knowledge about disasters find it easier to use the game and

Table 7 Path coefficient of the model

	Original sample (O)	*Sample mean (M)*	*Standard deviation (STDEV)*	*t-statistic*	*p-value*	*Interpretation*
Ease of use > perceived usefulness	0.577	0.575	0.062	9.367	<0.05	Significant
Intention > decision-making process	0.302	0.307	0.083	3.629		Significant
Prior knowledge > ease of use	0.352	0.356	0.071	4.968		Significant
Perceived usefulness > intention	0.628	0.631	0.054	11.605		Significant
Prior knowledge > perceived usefulness	0.221	0.227	0.074	3.004		Significant

Fig. 8 Empirical model of the decision-making process during disasters, regarding the intention to use the Stop Disasters Game

have higher perceived usefulness of the game. Furthermore, people who find the game easier to use also perceive it to be more useful, and people who perceive the Stop Disasters Game to be useful are more likely to use it in the future. Ultimately, people who are more willing to use the game will have a better decision-making process when a disaster occurs.

6 Discussion

From this study, it can be concluded that prior knowledge among the at-risk community in Yogyakarta Special Province is a key factor in influencing this population's motivation to engage in the DRR decision-making process. This study has shown that the quality of this prior knowledge depends on people's understanding of risk and disaster risk reduction, which reflects their lifetime's experience of dealing with disasters.

In addition to prior knowledge related to DRR, prior knowledge related to technology utilization should also be improved. Enhancing the community's technical literacy capacity can reduce the risk and impacts of disasters (Sunarharum, Sloan, & Susilawati, 2014). According to the Technology Acceptance Model (TAM) by Davis, once people are familiar with a new technology, they will perceive it to be more usefulness and ease of use. Ultimately, this means they are more likely to have a high willingness to use that technology, in this case a diasaster-based video game, in the future.

This study also highlighted that people who intend to use a disaster-based video game will have better decision-making and a higher willingness to collaborate with the government during a disaster situation. The study also found that this motivation is not dependent on people's gender, age, social status, or whether they live in an urban area or hinterland within Yogyakarta; rather, it is dependent on their familiarity with video games/online games. This finding is similar to what was reported by Gampell et al., who found that disaster risk education is a core link connecting video games to DRR and enables the exploration of disaster video games as a potentially effective future learning and decision-support tool.

If the government in Indonesia wants to use a disaster-based video game, such as Stop Disasters, in the future, it must seek to increase the level of prior knowledge held by people in the disaster area, and determine whether they have good knowledge of DRR. This can be enhanced by adding the number of regular socialization or knowledge-sharing on DRR by educating and preparing the community through regular socialization

or knowledge-sharing about DRR, as well as evacuation drills and simulations to at-risk communities in disaster-prone areas. Currently, though the government has claimed to have implemented evacuation drills and simulations, these are not regularly conducted (Arini, 2018). Therefore, people may forget the damage and impact caused by previous disasters and be less ready to deal with future disasters.

This research has proven that the way a player approaches the game will depend on their previous knowledge and experience of disasters and DRR. The constructivism mechanisms present within the Stop Disasters Game enable all players to build upon their existing knowledge and provoke interest and engagement in DRR. The greater their capacity to understand DRR and the better their ability to utilize online technology, the more motivated they will be to trust and collaborate with the government in DRR. Therefore, the positive effect of gamification on increasing awareness related to disaster risk reduction has been proven in this study. The positive influence of gamification also improves community resilience and potential collaboration amongst stakeholders in facing future disasters.

7 Conclusion

This analysis has resulted in an empirical model of decision-making processes based on the level of literacy in disaster risk and management. This research found that the greater the capacity of the at-risk community, the more willing they will be to contribute to decision-making processes for disaster risk reduction in Yogyakarta. This result is in line with the conclusion of Tran et al. (2009) that the most appropriate way to implement disaster risk management is through community disaster management organizations that are truly local in nature and create a sense of ownership as well as a long-term presence. This highlights the need to improve the community's capacity and literacy regarding disaster risk, disaster preparedness, and disaster risk reduction.

Gamification, in this context, is a potential strategy to facilitate the integration of community participation in disaster risk reduction and climate change adaptation planning. The United Nations Office for Disaster Risk Reduction also suggests to use of disaster-based video games to increase DRR awareness in players. Although our findings have shown to meet the reliability and validity standard set by social science researchers (Hair et al., 2017), for future research, the results could be further improved by adding items of questions in each variables to increase the reliability and

validity. In sort, our study offered useful initial insights about how the gamification increasing awareness and engagement, and changing people's behaviours in terms of DRR. This study may serve as a reference for future research using PLS-SEM if a similar study is to be conducted.

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Index[1]

[1] Note: Page numbers followed by 'n' refer to notes.

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