

Play and work for greater good: the case of hackathons

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Introduction

Hackathons are a pervasive yet significantly understudied phenomenon in the management and Organization Behavior (OB) literature. These have been recognized as an alternative way of engaging with work (Schrage, 2013), which primarily relies on empowering collective intelligence to identify novel solutions for a given concrete problem. Hackathons are defined by minimal rules, designed to promote creativity, and safe spaces for people to experiment on unconventional ideas (Lifshitz-Assaf et al., 2020). Thus, these can be conceived as a perfect laboratory to study play at work. Consider the anthropological notion of true play (Huizinga, 1955). True essence of play lies in its voluntary, absorbing, and intense quality, as well as in its non-instrumental nature – play is not pursued because of its direct benefits to individual need. These conditions largely overlap with the hackathon environment.

In the present study we test if the success of hackathons in promoting innovation (Almirall et al., 2014; Briscoe & Mulligan, 2014) could be (partially) explained by participants engaging in play-at-work.

We tested this in an empirical study on multiple hackathons focused on promoting innovation for the United Nations Sustainable Development Goals (SDGs) and across European and Asian cultural settings. Here, we present what we learned from data acquired in 2020-2021, as a case study of work designed for (serious) play using the key characteristics of true play as defined by Huizinga (1955). We specifically chose to study not-for-profit hackathons to observe the conditions for true play. Firstly, we tested the fact that it is not intended to generate material benefits nor profit. In a setup where extrinsic motivation of immediate gain (prizes, work promotion, student credit, etc.) is excluded, we tested the motivations and expectations of participants in three different hackathons to pursue the following research questions: Why do participants come to hackathons? To what extent are participants driven by intrinsic motivation (e.g. contributing to social welfare) and/or by extrinsic factors (e.g. producing an innovative solution)? How important is the role of having the opportunity to play at work? Why do participants return to hackathons – in other words, what expectations must be met to provide a satisfying participant experience?

Our study demonstrates that people are mainly driven by an intrinsic motivation (compared to extrinsic) or by a combination of the two, and that by participating in the hackathon the role of

intrinsic motivation increases. Furthermore, we find that most people predominantly expect to engage in playful co-creation while working for generating solutions that can benefit society. Indeed, we suggest that play in a hackathon can give rise to the emergence of innovation precisely because it creates a special environment outside the control of management and work routine. We thus invoke the notions of *kairos*, outside of *chronos* (Orlikowski & Yates, 2002), that is similar to Huizinga's *magic circle*, as a key component of engaging collective intelligence and motivating individuals to pursue a common goal.

Hackathons as play

As striking as it may sound, most people in the Western world are unhappy at work (Bryson & MacKerron, 2017) so much so that the subject of “joy gap” at work was one of the themes discussed at the World Economic Forum in 2020 (A.T. Kearney, 2019). Efforts to make work more joyful include turning some of it into play – a behavior that has demonstrated benefits for reducing stress while improving emotional wellbeing, productivity and creativity (Oprescu et al., 2014; Proyer, 2014). Integration of work and play has become a trend in the Silicon Valley, with firms providing playful environments as a break from the long hours worked, as well as to attract talent. The Silicon Valley is also where hackathons originated, initially as punctual innovation events that software engineers would join in small (ad-hoc) teams to speed through creating an idea to produce a software prototype within 24 to 72 hours (Komssi et al., 2015). “Hackathon” combines the terms “hacking” and “marathon” and implies an intense, uninterrupted, period of focused problem-solving, involving collective intelligence. However, hackathons are also useful as social and educational events. They have since been adopted in multiple domains that do not entail hacking, from education to sustainable development (Taylor & Clarke, 2018). Hackathons usually focus on a theme, a problem or a particular technology, and adopt common rules, such as a strict end time and a clear deliverable format. The participants go through team-building, ideation, and development to produce a few-minute demonstration of their concept and its value. Crucially, many, if not most, participants take part in these events as a way to express their creativity and put their skills at work in a challenging environment. That is, most people have a strong intrinsic motivation to take part in these events. For instance, Lodato & DiSalvo, (2016) noted that since most hackathons are issue-focused, interest in the topic may well be one of the

most relevant intrinsic motivators for participation. Furthermore, intangible reward for many participants is personal development and a sense of achievement from working with a new problem. Meeting and collaborating with people they otherwise would not meet, and generally having a lot of fun, have also been found to be important motivators for people to engage in hackathons (Komssi et al., 2015). However, oftentimes, extrinsic incentives, such as a prize, are offered for the best project and promising ideas might receive funding for further development (Komssi et al., 2015).

Despite growing popularity, hackathons do not yet have a clear definition in organization studies and we choose to define the kind of gathering we refer to here – an online innovation event open to all, with the purpose of advancing a solution for a sustainable development goal confined in duration to 24h-48h – as a moment of *kairos* – a time taken out of the usual temporal structure of their organization, i.e., *chronos* (Orlikowski & Yates, 2002) – that is opportune for play, creation and emergent innovation. This is similar to Huizinga's notion of the *Magic Circle* in which play happens – Play is not an ordinary or everyday life because play has a unique time and place. According to Huizinga, “play is free and play is freedom” and it is pursued for the experience of it, not for the direct benefit.

Importantly, Hackathons are closer to this definition of play and farther from what organizational behavior defines as gamification. Gamification is imposed by managers in work organizations with the intention to improve employees' experience and motivate them to achieve a certain goal that is incentivized by the rules of the game. In a hackathon, there is no script and no game designer. However, serious play has a goal (Rodriguez, 2006) while being a much more model-free alternative to gamification. Thus, we lean towards treating hackathons for SDGs as serious play.

Hackathon motivations and experiences

The experience of participating in a hackathon is often associated with building strong communities and cultures as time-pressure and problem novelty stimulate the release of adrenaline and dopamine, respectively (Lee & Reeve, 2017). Social bonds formed under such conditions can be intense and provide good grounds for future cooperation (Jackson et al., 2018). Most participants report the social experience as positive and ‘fun’ (Komssi et al., 2015). They also report feeling motivated and satisfied with having participated in the project independently

of its final outcome – all of these features are common with the definition of adult play (Burghardt, 2005)¹. Of note, play is a fundamental behavior that constitutes one of the core affects (Davis & Panksepp, 2011) necessary for healthy functioning, although its importance in work organization has only recently been acknowledged.

Yet, hackathons are typically organized with specific goals in mind such as creating new and innovative technologies, tackling civic, environmental and public health issues, spreading knowledge and expanding communities (Nolte et al., 2020), while adult play behavior has been defined to be autotelic, that is done for its own sake and its own rewards (Burghardt, 2005; Csikszentmihalyi, 2014).

Theoretical Background

In a hackathon, participants engage in serious play – playing with work tasks to come up with innovative ideas for *improving work output* (Schrage & Peters, 2002; Statler & Oliver, 2008). We suggest that hackathons, which are increasingly organized by private companies – mainly for recruitment, as well as by non-profit and education organizations such as universities – simply create space and frame for self-organization around a common purpose. When play is self-initiated in this way, it may lead to higher productivity (Fleming, 2005) because people pursue their intrinsic motivation of curiosity and learning from others (intrinsic reward), playing and experimenting with ideas (play behavior), and perhaps a desire to contribute to a bigger, societal cause (philanthropic motivation).

Here, we posit hackathon as a form of collective innovation for a purpose, that relies on the benefits of play without usurping participants' autonomy nor sacrificing authenticity. Through this study, we argue that hackathons inspire playful behaviors that bring the aforementioned

¹ Burghardt's (2005) working definition uses five criteria to classify behaviour as 'play' distinct from other forms of behavior: 1) play behaviour is not necessary for survival; 2) play is voluntary, spontaneous, intentional, pleasurable, rewarding, reinforcing or autotelic ('done for its own sake'); 3) play differs from 'serious' activities 'structurally and temporally, it is often incomplete, exaggerated, awkward, or precious.' (p. 74); 4) '... the behaviour is performed repeatedly in a similar, but not rigidly stereotyped, form during at least a portion of the animal's ontogeny.' (p. 75); 5) '... the behaviour is initiated when an animal is adequately fed, healthy, and free from stress or intense competing systems. In other words, the animal is in a relaxed field.' (p. 78) (Burghardt, 2005).

benefits of play because – in contrast to everyday work, they offer opportunities to engage with different people, technologies or issues (Henderson, 2015) while letting the participant enjoy freedom to explore new projects (Landwehr Sydow & Jonsson, 2015). Hackathons embrace most of the characteristics of play sought in organization management and innovation, including inclusion and playful exploration, that indirectly encourage learning and creativity. Indeed, dialogue between people with different skills and knowledge is one of the core elements of a hackathon (Komssi et al., 2015; Robinson & Johnson, 2016; Taylor & Clarke, 2018)

Our future analysis will also address the role of contributing to a greater cause as motivation to participate and thus develop a contribution towards two larger questions: (1) How to measure engagement in organizing for a common cause (such as grand challenges)? And (2) How to activate collective intelligence for grand challenges?

Hypothesis Development

In our study, we tested the potential intrinsic motivations enlisted above, under two complementary hypotheses. Under hypothesis 1, we propose that hackathon is a marketplace for philanthropic exchange of knowledge, skills and ideas but not for trading tangible assets of monetary value. Participants come primarily to share knowledge (contribute) and to receive a learning experience (learn) as a by-product of the goal to achieve a tangible goal or to obtain a prize. Thus, we predict that

Hypothesis 1: Main motivations for participation in the hackathon are intrinsic rather than extrinsic.

Moreover, because learning and meeting new people is in itself intrinsically rewarding for curious minds (Gruber et al., 2014; Lee & Reeve, 2017), we expect that :

Hypothesis 1a: The participants' motivation to share knowledge with other participants is philanthropic and they are motivated because their contribution goes to a common cause of societal importance.

Secondly, we expect that hackathons are places for serious play and therefore the behaviors of true play should be evident in participants' expectations pre-hackathon and in their post-hackathon experiences. An observation often reported about issue-oriented hackathons is that they are attractive participatory activities that capture the imagination and imbue the participants

with a sense of urgency and optimism (Irani, 2015). This would suggest that although around one-third of projects result in a tangible innovation and are followed-up (Nolte et al., 2020), the original motivation of the participants is really centered on play that may result in creative output. Play is characterized by open-endedness (end goal is not essential), non-judgment (failure is accepted), and experimentation (risk taking, trying out new things; Akgün et al., 2009; Proyer, 2014). Learning happens implicitly and is not the primary goal of play. Adult play is often characterized by creativity and improvisation that leads to innovation.

Hypothesis 2: Participants come to the hackathon to play.

Thus,

Hypothesis 2a: A key reason for hackathon participation is to experiment with new ideas in a no-risk space, where they experience freedom of self-expression and creativity and have fun at it, alone or through relating to others.

Hypothesis 2b: The outcome of play (such as project success) is less important than the experience of freedom and experimentation during the hackathon.

Winnicott (1991) describes play as taking place in a transitional space between the inner and outer reality which enables creative action. In this space attributes of objective reality are combined with attributes of imagination leading to the creation of a transitional reality in which one can experiment with different ways of relating to the external world. The notion of detachment from reality is a premise that suggests that to fully embrace its function, play for creativity and innovation should be done in a context separate from everyday work.

Methods

The project is developed and ran by a multidisciplinary team of behavioral scientists and is organized and implemented in close collaboration with open innovation actors and hackathon organizers at two partnering universities: Université de Genève (Switzerland) and Tsinghua University (China). An online survey was developed and first piloted in spring 2020 where we collected pre- and post-online hackathon responses from N=37 participants (GE20). Further data was collected in November at a hackathon on sustainable finance in Geneva (N=35; GE21) and from 20 SDG-based hackathons ran at Tsinghua University (N=333 from Beijing and Shenzhen

campuses; TH20). Further data collection is planned in Geneva in March. Besides collecting demographic data that can inform us about participants' diversity (background, education, current job, age, gender, location), the questionnaires focused on the questions and hypotheses described above. The questions were adapted to capture the cultural and organization aspects of the different hackathons but focused on measuring participants': 1) motivation to participate (intrinsic and extrinsic), 2) expectations, 3) goals (intrinsic and extrinsic), within which we included questions to test for the features of play, as tested by (Akgün et al., 2009), namely a context for experimentation, safe space that tolerates mistakes and encourages new ideas. Furthermore, the questions tested 4) satisfaction with hackathon outcome in terms of project and teamwork, 5) preferred and actual role in the group, 6) familiarity and expectations of the hackathon culture, especially in terms of common societal goals (SDGs).

The data were analyzed separately for each sample and merged when possible. Many of the questions were similar across the three surveys but many were differently encoded or formulated and therefore merging was not possible. We provide a full overview of the number of complete responses from the three hackathons as well as of the similarities and differences in the measured variables in Figure S1 in the Appendix. The analysis presented in this paper focused on the commonalities in the three samples (where possible) and on those participants who completed both pre- and post- hackathon surveys. Specifically, motivations to participate were measured and analyzed only in GE20 while playfulness enrichments on goal/hackathon expectations and goal experiences were homogenized and analyzed across surveys.

To interrogate motivations to participate and how they were shaped by participation in the hackathon, participants' responses in pre- and post- survey were independently 2-D reduced using UMAP and motivational groups were defined based on the combination of umap coordinates and participant's mean scores for intrinsic vs extrinsic motivations. Percentage enrichments with respect to this grouping were calculated for pre- and post- answers independently and flows were analyzed by building an alluvial network measuring participants' transitions across groups.

In order to evaluate the importance of play-related expectations with respect to all possible hackathon experience and goal expectations in the datasets, we first rescaled all measurements on the same numerical range (1-10). Where variables were encoded as text, TF-IDF (term

frequency-inverse document frequency) embeddings over participants' answers were scaled accordingly. Play enrichment score was defined as an intra-category ratio of play behavior variables with respect to non-play ones. This score was thresholded at 1 and used to categorize participants as play-oriented or not. Percentage of participants showing each of those orientations as well as their score values are presented in Figure 2. This score expresses a relative preference to the play-related behavior over the entire range of choices in a given category (goal expectations, hackathon expectations and experiences).

Results

By combining the reasons to participate that were intrinsic (such as “to contribute to a greater cause”) or extrinsic (such as “to make a contribution recognized by others”) in nature, we observed that even before the hackathon, the majority of participants presented both intrinsic and extrinsic reasons to participate (Figure 1C left), and the proportion of those only intrinsically motivated was higher than those whose motivation was only extrinsic. This confirms Hypothesis 1 that hackathon participants are primarily intrinsically motivated.

Second, we observe an important difference in stated motivations between the pre- and the post-surveys. Notably, the proportion of those with only intrinsic motivation (dark blue bar in Figure 1C) increases significantly. This is due to the conversion of the participants who initially have either low motivation (yellow) or a mixed intrinsic and extrinsic motivation (magenta), to only intrinsic motivation to participate (blue). We also find that there is an important decrease in the proportion of participants who initially come with only extrinsic motivations to participate (Figure 1C, red bar) in the pre-hackathon survey, but convert to mixed extrinsic and intrinsic (magenta bar) in the post-hackathon survey (Figure 1D). This finding demonstrates that the SDG hackathon experience changed the participants' motivation from extrinsic and low to intrinsic.

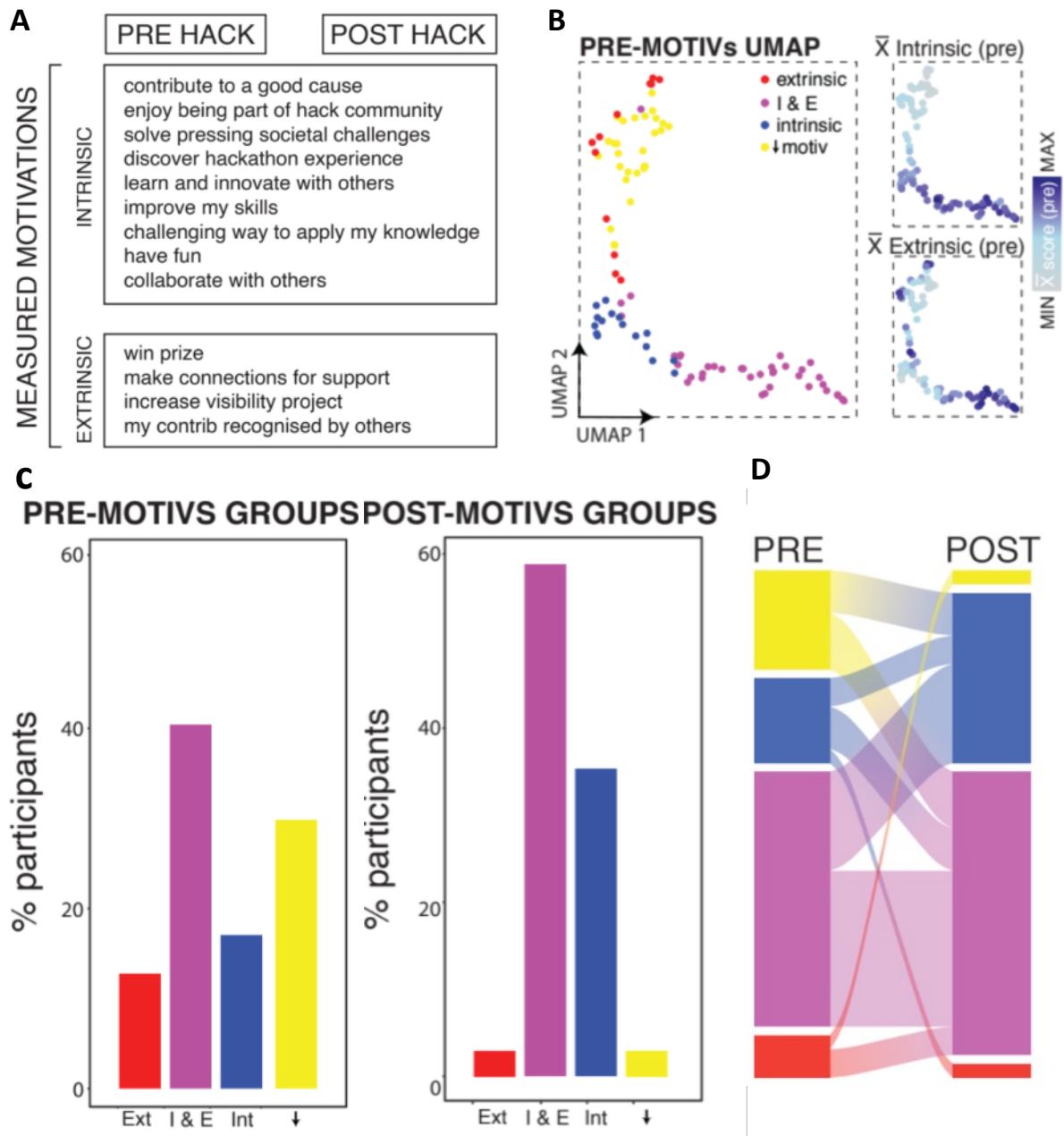


Figure 1. Hackathon participants' intrinsic and extrinsic motivations to participate. A) were evaluated using a series of survey questions. B) Unsupervised 2- dimensional transformation (UMAP) of their answers revealed four separate groups: those whose motivation is predominantly extrinsic (in red), those whose motivations are predominantly intrinsic (in dark blue), those whose motivations include both intrinsic and extrinsic reasons (in magenta), and those who were low on any motivation to participate (in yellow). C) Percentage of participants belonging to the motivation groupings change between the pre- and post-surveys. D) Alluvial plot

depicting participant's flows on motivation groups between pre- and post- hackathons. Interestingly, all flows converge to intrinsically motivated groups in post- hackathon as compared to pre-.

Zooming in on the motivations to participate in the GE20 sample (out of 13 possibilities), we found that the increase was highest with regards to “having fun”, the hackathon being “a way to solve important societal issues”, and “learning how to co-innovate with others”. Similarly, while most important motivational goal for the participants in TH20 pre-hackathon was to “join the hackathon culture” and “co-create with others”, and “solving a pressing societal issue” was ranked 9 (out of 11), it became the number 1 motivation post-hackathon. This additionally support hypothesis 1a that the motivation to participate changes towards more philanthropic as a result of the hackathon experience and is mostly due to a sense of working for the greater good.

Next, we focused our analysis only on the behaviors related to play. We measured play behaviors within 3 different question categories in the survey (goal expectations, hackathon expectations and goal experiences). We find that above 60% of participants across the three hackathons exhibited the three play behavior motivations (Figure 2A). Specifically, the majority of the participants in the three samples (GE20, GE21 and TH20; Figure 2) expect that the hackathon will provide them with at least one of the assessed play behaviors (Figure 2B-D: a safe playground to experiment, having fun experimenting, and/or unleashing their creativity). This demonstrates that the majority of the participants come to hackathons to play and thus confirms our hypothesis on the function of hackathons as a play and work experience.

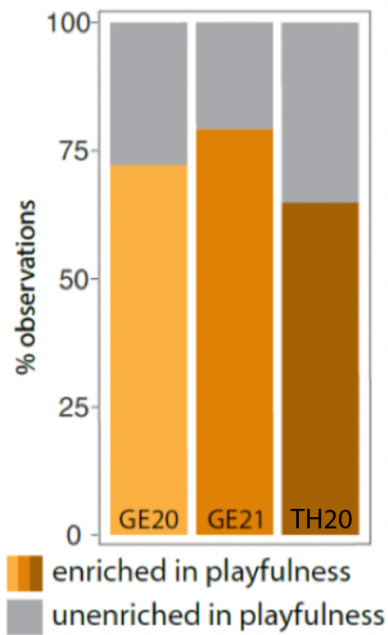
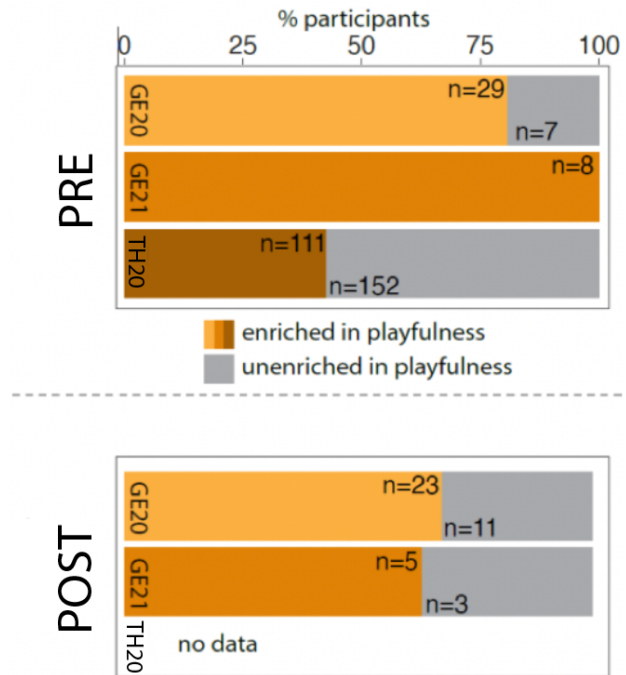
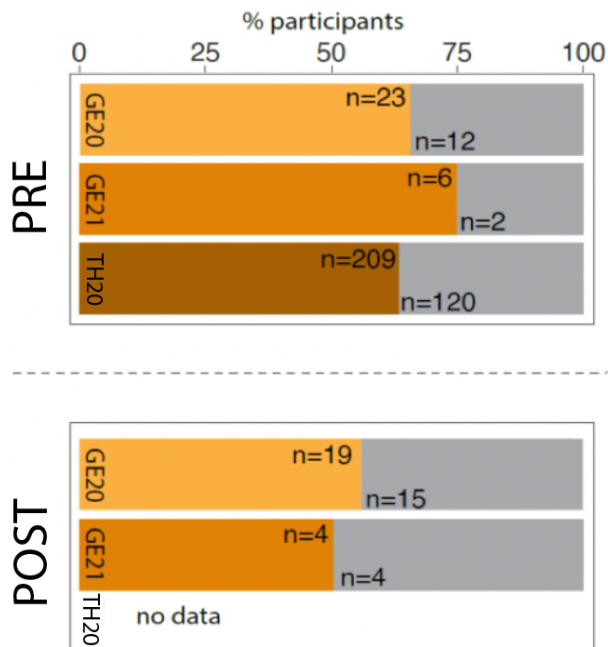
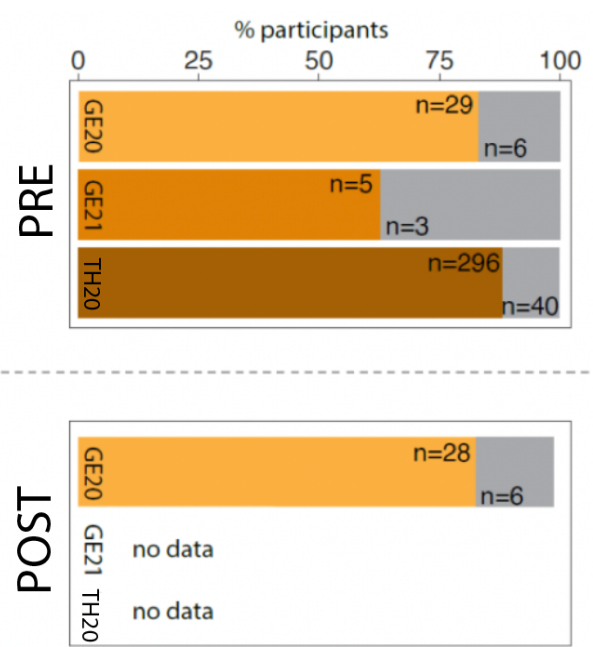
A**Play/non-play expectations
(combined)****B****Safe playground to experiment****C****Have fun experimenting****D****Unleash my creativity**

Figure 2. Play behaviors in hackathon participants' expectations and experiences pre- and post-hackathon. A): Bar plot summarizing cross-category playf enrichment. Shades of orange express the percentage of participants who reported being motivated to participate in the hackathon by play-related reasons more than by other choices, in grey those who were not motivated by play-related expectations combined for both pre- and post-survey for all three samples (GE20, GE21 and TH20, see Methods for description). B-D: Bar plots depicting category-specific play enrichments (see Methods) across samples in the pre- and post- surveys

Together, these results suggest that hackathons are a way to unite collective intelligence around a higher purpose, providing participants with a meaningful and highly positive co-innovation experience that can serve as an example of using serious play to achieve innovation by mixing play and work.

Discussion

Hackathons are very fertile environments to observe play-at-work: as mentioned, they unleash creativity, boost team-work, and are rewarding, either intrinsically or extrinsically. Considering the numerous benefits of including play at work (health and well-being, work motivation, creativity, relational bonding; Petelczyc et al., 2018) on the one hand, and the highly desired innovation outcomes that organizations are seeking (Schrage & Peters, 2002).

In the present research, we examine the motivations of individuals to engage in three hackathons for Sustainable Development Goals and whether among the main reasons for participating play was a predominant factor. Here, we report the preliminary results from a study on open innovation hackathons organized by not-for-profit universities on issues related to sustainable development. We consider a hackathon as a successful example of how to organize time and space for play to harness collective intelligence for innovation, that reaps the benefits of play and (sometimes) bears the fruit of innovative work. Thus, we tackle the characteristics that render these participatory events special by testing the question: Do participants come to hackathons to play? Our results demonstrate that play, as well as other intrinsic motivations, are the primary reasons for participation explicitly reported *before* the hackathon, and that the post-hackathon experience evaluation exhibits all the characteristics of true play.

We observe that a hackathon is a successful form of mixing play and work specifically because, unlike company-sponsored fun that many employees find inauthentic (Fleming, 2005), it happens in a context detached from regular work activities (*chronos*), both physically and socially, where participants can play egalitarian roles of co-creators, thus avoiding the tensions between managerial control and employee autonomy. Our results show that hackathons are inclusive time-spaces for meeting new people where people come to play and experiment, motivated to solve a bigger societal issue. Our further data analysis will focus on the following question: What can organizations learn from hackathons to humanize play at work?

First, for participants who filled both the pre- and the post-hackathon survey, we observed that those with low and extrinsic motivation shift towards intrinsic motivation after living the hackathon experience (Figure 1D). In the future data analysis, we will specifically investigate the philanthropic motivations, focusing on the reason to “solve a pressing societal issue” and a sense of “contributing to a greater cause”. With that and further analyses we expect to find out whether SDG hackathons render the participants more philanthropic.

To summarize, we propose that hackathons are successful formats for innovation and creativity potentially because they generate the feeling of play providing a safe space for experimentation that rewards, and does not punish, new ideas and failure; and a socially inclusive *kairos* (Orlikowski & Yates, 2002) – a time-constrained space where people can meet and engage with an alternative reality (Winnicott, 1991).

Theoretical implications

People’s motivation for innovation and collective intelligence has to change to get this world to tackle the sustainability challenges, and we need to activate our intrinsic motivation for greater good. Managerial games and extrinsic rewards will not work as well as a sense of purpose – the intrinsic motivation with a goal. Hackathons for SDGs we studied not only attracted people with such motivation but change the motivations of those who came in with expectations of extrinsic rewards.

Thus, we offer hackathon as an emergent form of organization that is not a game but true play and its purpose is to motivate, engage and provide a frame for collective intelligence and emergent innovation to happen. With grand challenges, we should see more similar forms of human organization emerge and their success will depend on the satisfaction of the expectations

and motivations of the participants – to play, to give and receive support, to learn and to contribute to the greater good, and the profound relational experience of being in play with others - as revealed in our study. Importantly, this experience happens naturally in a setting that is not designed as a game. Games have not been too successful in making work more fun because of the often imposed character of the rules and limitation of autonomy. Attempting to masquerade work as play in a game often backfires (Mollick & Rothbard, 2014). Perhaps it is these borderline differences between a hackathon and a game that make the former more successful at producing play and creative outcomes (innovation)?

In contrast to a game that aims to steer human behavior in the desired direction – as is done through work organisations that use managerial control for the same purpose – hackathons do not impose any rules on behavior. In fact, it has been demonstrated, that self-organizing teams are more creative under pressure when they do not follow an organizational control script (Lifschitz-Asaf, 2020). Preserving autonomy means preserving intrinsic motivation and this is – in our view – the key ingredient to maintaining mobilization for play-work.

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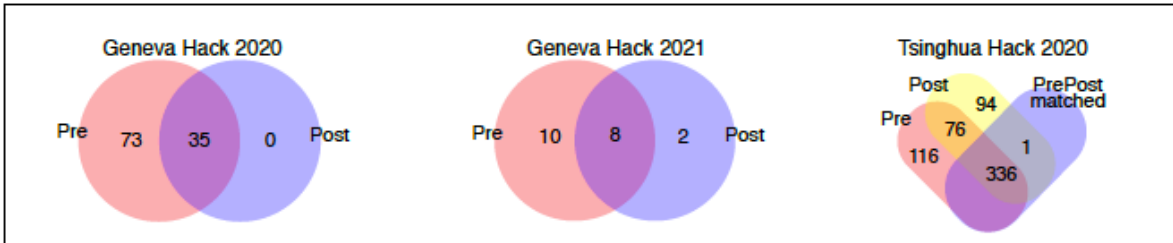
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Appendix

PARTICIPANTS



VARIABLES

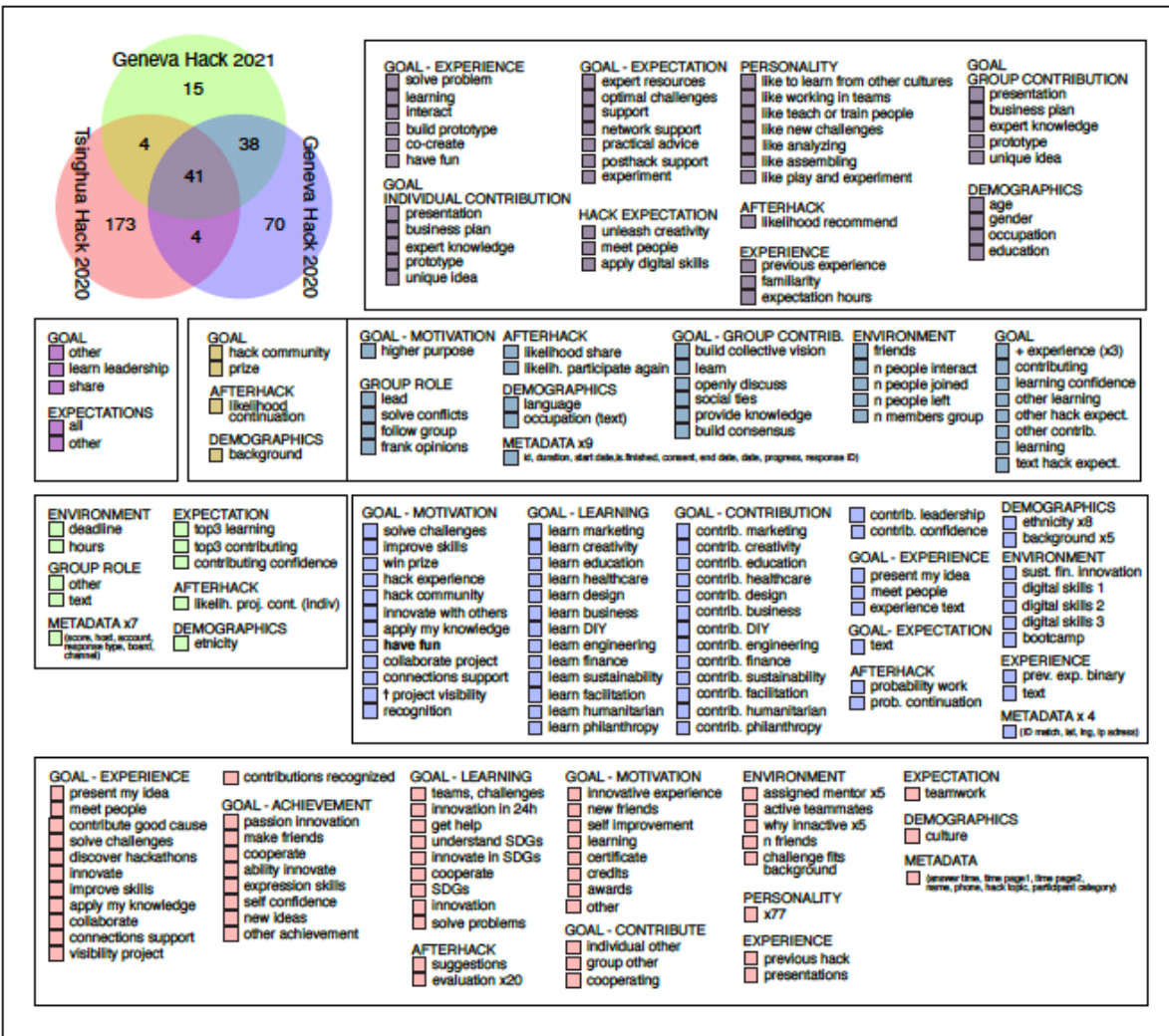


Figure S1. Data description. Three independent survey-datasets were collected describing participants experiences pre- and post- hackathon. Participants panel details how many people participated in pre-, post- or both pre- and post- hack surveys. Variables panel describes variable-theme groupings as well as which variables are specific to one survey or shared across surveys.