

Evaluating the effectiveness of serious games in facilitating strategic decisions-making under COVID-19 crisis conditions

The effectiveness of serious games

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Abstract

Purpose – This research seized the COVID-19 pandemic-induced economic recession as a strategic response background to answer whether serious games (SGs) can be effectively applied to facilitate the strategic decision-making process.

Design/methodology/approach – This paper develops a conceptual model and hypotheses based on the strategic formulation and SGs literature. Virtual-gamified workshops treat four companies in a quasi-experimental framework applying an action research design approach. The data were analysed triangularly from the observations, the focus group interviews and the surveys.

Findings – A SG facilitates conveying conceptual recession management knowledge and structures the decision-making process. It incentivises creativity and motivation. Meanwhile, it is a tool to mitigate human errors due to cognitive biases. More importantly, it offers a new means to improve strategic decision-making adapted to different cases. The variety of game elements expands possibilities for different needs.

Originality/value – This paper creatively bridges the gap between strategic decision facilitation and serious gaming in a crisis. It contributes a conceptual model and provides practical insights into SGs mechanics for companies.

Keywords Strategic decision facilitation, Serious game, Action research

Paper type Research paper

1. Introduction

The ongoing COVID-19 pandemic induced a global economic recession (World Bank, 2020). Responding to the recessions and ensuring survival and competitiveness is a concern for many businesses. However, research has identified that the formulation and implementation of strategic management are often inefficient (Perry, 2001; Spillan and Ziemnowicz, 2003; Wilson and Eilertsen, 2010). Strategic decision-making during recessions remains subject to cognitive biases, motivational challenges and creativity restraints and is further compromised by a lack of procedural knowledge (Wang *et al.*, 2007; Wilson and Eilertsen, 2010; Johnston and Bate, 2013; Nikolic, 2018).

SGs promote desired behaviours in non-game contexts. Researches have shown they could inspire motivation, collaboration and knowledge exchange (Hamari *et al.*, 2014; Kalinauskas, 2014; Roth *et al.*, 2015; Wanick and Bui, 2019). However, there are also disadvantages like performance loss (in repeating the game) and a superficial impact on behaviour (Toda *et al.*, 2018).

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Although the literature exhibits exploratory and conceptual papers combining gamification and aspects of strategic management (Kim, 2013; Aldea *et al.*, 2014; Roth *et al.*, 2015; Flood *et al.*, 2018; Deterding, 2019), we have identified a lack of empirical studies on the effectiveness of SGs in strategic decision-making. Our research question is whether SGs can be effectively applied to facilitate the strategic decision-making process. We have developed four hypotheses and devised a SG in a workshop format for dealing with the COVID-induced recession. We applied a positivist quasi-experimental action research and tested the workshops with four companies from Germany, Italy, Australia and China. While the sample size is limited, our findings contribute to the strategic decision facilitation literature and strategy-making practices.

The rest of the paper is structured as follows. Section 2 develops a conceptual model and hypotheses. Section 3 illustrates the methodology and the gamified online workshop design in line with the action research method. Section 4 presents the results and discussions. Finally, section 5 concludes and offers a research and application outlook.

2. Theoretical framework and hypotheses development

Strategy formulation follows different patterns from deliberate to emergent (Mintzberg and Waters, 1985), but in the imposed strategy formulation mode of a crisis like COVID-19, there is a perceived practical need for a procedurally robust strategy formulation process (Vargo and Seville, 2011; Bansal *et al.*, 2015; Fuertes *et al.*, 2020). In practice, decision-makers tend to make decisions in small groups, limiting the strategy formulation's conceptual and procedural development.

A generic framework for the strategic crisis response would first integrate an assessment of internal and external factors and then conclude diverse feasible strategies and compare them while evaluating the current goals to determine its strategic pathway (Peppard and Ward, 2016; Fuertes *et al.*, 2020). It requires a broad set of knowledge like familiarity with risk assessment tools, the expertise of strategies to recessions, etc (Noy and Ellis, 2003). Recession strategies like cost reduction (Wenzel *et al.*, 2020; De Carolis *et al.*, 2009; Latham, 2009; Ndofo *et al.*, 2013), revenue generation (Hofer, 1980; Ghemawat, 2009; Srinivasan *et al.*, 2005), asset reduction (Hofer, 1980; Wenzel *et al.*, 2020; Latham, 2009), innovation (Wenzel *et al.*, 2020; Lyon and Ferrier, 2002) and exit (Argyres *et al.*, 2015; Wan *et al.*, 2015) offer opportunities and pitfalls. Without the corresponding conceptual and procedural knowledge, companies might either not consider the limits of each strategy or draw too much attention to responses that drive short-term performance and thus ignore the potential long-term impacts (Latham and Braun, 2011; Ghemawat, 2009).

Our research question investigates whether a generic framework for a strategic crisis response formulation process can be effectively facilitated in company settings in the form of a SG, and whether this SG can convey the necessary conceptual and procedural knowledge of strategy formulation (Levin, 2018).

SGs provide new patterns of communication and action (Wilkinson, 2016) and can thus support a shared strategic practice with various stakeholders that co-create value (Wilson and Jarzabkowski, 2004). Game design elements (Deterding *et al.*, 2011) are thus not just choice architectures but can evoke humanistic experiences (Deterding, 2019). They constitute rules to mediate the relationships between individuals and ease the generation of ideas. Furthermore, they foster a safe and open-minded environment that facilitates knowledge exchange (Kalinauskas, 2014) and enable participants to approach their organisational problems with a playful attitude or mode of intentionality (Statler *et al.*, 2011; Statler and Oliver, 2008). Embedded information, visualised game elements and corresponding guidance mechanisms could create an immersive environment and promote rapid learning (Agogué *et al.*, 2015). Frequently applied game design elements are points, badges, leaderboards,

levels, groups, time constraints (Seaborn and Fels, 2015) or tools like LEGO® Serious Play® (Wheeler *et al.*, 2020). Other feedback elements can be provided in multiple ways, such as chat windows, “like” buttons, comment sections, etc (Shokry *et al.*, 2019; Hamari *et al.*, 2014). Depending on the context of real-world practice, different game elements can be deliberately selected and applied. Gamification learning theory explains that learning and gamification interacts in-game characteristics, instructional content, behaviour or attitude and learning outcomes (Landers, 2014). This interaction is in line with companies’ backgrounds in making strategies for recession.

Consequently, we define our first hypothesis:

H1. A SG facilitates conveying conceptual recession management knowledge and structures the decision-making process.

Organisation settings and decision-making processes can limit and discourage creative and innovative proposals (Archibugi *et al.*, 2013). They further obstruct innovation management that is the source of organisations’ survival and growth (Miller *et al.*, 2020). SGs offer an opportunity to temporality pausing company functional requirements and pressure (Mainemelis and Ronson, 2006) and offer a safe, fun environment to allow a group of people applying expertise, skills and motivations to formulate solutions creatively towards a problem (Hargadon and Bethky, 2006). Such a dynamic environment is the driving force for organisational creativity (Sonnenburg, 2004). Furthermore, a SG offers an environment that enhances engagement, enabling participants to generate knowledge creatively (Kalinauskas, 2014). Therefore, it can be regarded as a value-added, problem-solving approach that incentivises creative exchange, which leads to our second hypothesis:

H2. A SG fosters creativity in the recession management decision-making processes.

The attitude of the decision-makers towards a strategic plan determines its elaboration (Wang *et al.*, 2007; Wilson and Eilertsen, 2010). For example, Wang *et al.* (2007) argue that instead of being economically irrational, some managers focus more on personal goals such as autonomy, independence, personal satisfaction and achievement, work flexibility and lifestyle, and contribution to society. In addition, Johnston and Bate (2013) indicate that the myopia of many managers leads them to take a quarterly view, whereby they prioritise the urgency of profit today over future business performance, losing sight of tomorrow.

SGs could achieve specific behavioural outcomes by serving motivational affordances in a pre-regulated game-like environment (Deterding *et al.*, 2011; Hamari *et al.*, 2014). They drive motivation by fulfilling the three essential psychological needs: autonomy, competence and relatedness (Ryan and Deci, 2000).

Autonomy expresses a need for receiving choices and for being granted control over actions. It refers to decision freedom under the frame and helps individuals assess the extent of control over actions (Ryan and Deci, 2000; Sailer *et al.*, 2017). Competence refers to the need to feel effective in the social environment and “for experiencing opportunities to exercise and express one’s capacities” (Ryan and Deci, 2000, p. 7). It focuses on the feeling instead of the actual abilities to fulfil the tasks (Ryan and Deci, 2000; De Croon *et al.*, 2018). Finally, relatedness refers to an individual’s need for feeling connected to a social environment or a group (Ryan and Deci, 2000; De Croon *et al.*, 2018). Therefore, our third proposition is divided into three parts:

H3a. Game design elements increase participants’ motivation in the gamified recession management workshop. Points, leaderboards, badges, “like” icons, time constraints increase participants’ motivation in the gamified recession management workshop by satisfying competence needs.

- H3b.* Game design elements related to feedback and communication increase participants' motivation in the gamified recession management workshop by satisfying relatedness needs.
- H3c.* The freedom to give comments, likes and votes increase participants' motivation in the gamified recession management workshop by satisfying autonomy needs.

The quality of the strategic decisions has decisive importance for businesses. However, the inherent mental shortcuts and limited mental capacity of human beings when making decisions under complex, risky and uncertain situations that have been recognised as cognitive biases are hard to avoid (Das and Teng, 1999; Nikolic, 2018; Menon, 2018). They could significantly violate the outcomes (Menon, 2018) and create errors in decision-making (Das and Teng, 1999; Nikolic, 2018). They are primarily identified as the anchoring effect (Hammond *et al.*, 2006; Sklad and Diekstra, 2014), the availability bias (Hammond *et al.*, 2006; Sklad and Diekstra, 2014), the groupthink bias (Sims and Sauser, 2013), representativeness (Tversky and Kahneman, 1974; Sklad and Diekstra, 2014), the status quo (Tversky and Kahneman, 1974) and overconfidence bias (Nikolic, 2018; Montibeller and von Winterfeldt, 2015). Evidence has shown that the employment of game design elements in non-game contexts can mitigate cognitive biases and facilitate cognitive capacity. For instance, Flood (2018) states that SGs allow participants to remove hierarchy tags and offer equal access for perspective expression and knowledge sharing. Mainemelis and Ronson (2006) found that game mechanics could support participants in framing problems and thinking up new alternatives. Schönbohm and Jülich (2016) revealed that some game elements could minimise cognitive biases' negative influence, thus improving decision-making in risk management.

Thus, our last hypothesis reads:

- H4.* Game design elements facilitate perspective and knowledge exchange; thus, mitigating cognitive biases in strategic analysis.

To summarise, we illustrated our conceptual model based on the above developed hypotheses (see Figure 1).

3. Methodology

We devised a gamified workshop as a quasi-experimental treatment (Mayer *et al.*, 2014) and combined it with a post-positivist action research method (Kock *et al.*, 1997; Tekin and Kotaman, 2013). We applied a mixed-method design to evaluate our treatment (Ivankova, 2018) and the hypotheses, including questionnaires, focus group interviews and

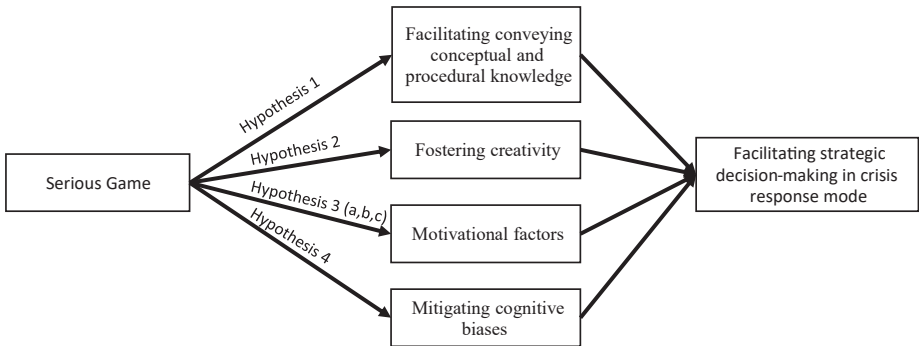


Figure 1.
Conceptual model

observations. In line with action research, each workshop was analysed and evaluated. Consequently, we adapted the workshop design to devise a more effective treatment in the next cycle with a different company. Thus, four complete action design cycles were completed allowing for reflection and improvements from a cycle of planning, action, evaluation and fact finding of the action results (Lewin, 1946).

The online format of the workshop enabled companies to join without a geographical limitation. We wilfully selected and approached international companies and offered the workshops without a fee but under the condition of using the anonymised data for our research. We performed our research according to the National Committee for Research Ethics in the Social Sciences and the Humanities (NESH) guidelines. We received written upfront consent from the participants, aware that they were participating in academic research. In total, we conducted online workshops with four companies from Germany, Italy, Australia and China. Company A is a German media company specialising in educational publishing with around 300 million Euros annual sales. Company B is a Chinese tech startup with 70 employees who serve automobile servicers and users with its application and offline services. Company C is an Australian real estate company with around 70 employees that develops residential and commercial property. Company D has eight employees and runs an international online trading platform from Italy.

A detailed workshop with the mentioned above embedded conceptual and procedural knowledge and game elements was designed to evaluate the hypotheses. To evoke an immersive workshop experience, Zoom and Miro were applied. To discover findings in a dynamic environment (van der Kooij *et al.*, 2015) and strengthening the objective standpoint from various aspects (Mayring, 2001), we applied a combination of quantitative and qualitative methods under the triangulation model. The quantitative analysis data were collected from an online survey distributed after the workshop that was answered anonymously. It entailed 19 questions. Except for the two demographic questions and one open-ended question, the rest of the 16 questions were formulated in a Likert scale that contained strongly agree, agree, neutral, disagree and strongly disagree options (questions are shown in Table 1). We calculated the Cronbach's coefficient to exam the reliability of the questionnaire with 16 participants. The alpha value of 0.901 shows an acceptable level of reliability.

We gathered qualitative data from the subsequent focus group interviews that restricted the participants' number between four to eight (Krueger and Casey, 2000) and followed a pre-defined interview guide (Dicicco-Bloom and Crabtree, 2006). The interview guide contained seven questions (1. What was your favourite part of the workshop? What was your least favourite? 2. What if there had not been any ludic elements at all? How do you think your behaviour and perception would have been different? 3. What motivated you to give feedback to others? 4. How did you like the feedback received, like comments, badges, "likes" icons and critical reflection cards? 5. How do you like the structure and the content? Are they helpful? 6. Do you think you were more creative than usual during the workshop? 7. Is there anything you would like to add or mention that has not been covered so far?), which are linked to the hypotheses as can be seen in Table 2.

The interviews were recorded and transcribed for further analysis. Combined with quantitative data, common themes were derived for action changes.

Each workshop carried at least one researcher and four participants from the company. Except for one participant from company A and one from company C, the rest of the 14 participants are decision-makers of their companies. None of the participants had experienced a gamified workshop nor had to take strategic decisions during an economic recession.

The workshops used Miro software with a predesigned structure for participants to follow. Zoom was applied for general communication. The workshops were conducted in

Hypothesis	Survey Question	Median			
		Company A <i>n</i> = 4	Company B <i>n</i> = 4	Company C <i>n</i> = 4	Company D <i>n</i> = 4
1	1. The ludic recession workshop helped to form a clear recession management structure process and convey knowledge	4	5	4.5	5
2	2. I would not have been as creative without ludic elements	5	4.5	5	5
3a	3. I would not have been as motivated as without game elements	4.5	4.5	5	5
	4. I felt motivated to bring ideas when I saw my points increasing	4	5	4.5	4
	5. I felt motivated when my position on the leaderboard moved up	4	5	4	3.5
	6. I felt motivated when I received badges or “like” icons	3.5	5	4.5	4.5
	7. Timing made me try harder to come up with ideas	5	5	5	5
3b	8. I felt connected with my colleagues when I received feedback and gave out feedback in any form	5	5	5	5
3c	9. Giving comments, likes, votes and badges allowed me to express myself	4	5	5	5
	10. I felt good because my votes to some extent, influenced the final decisions/results	4.5	4.5	5	5
4	11. The feedback and discussion helped the knowledge and perspective exchange	4	5	5	5
	12. The ludic recession workshop helped me to improve strategic decision-making with fewer biases	4.5	5	5	5
	13. The discussions in and between the groups improved the decision-making process and the decision quality	4	4.5	5	5
	14. Group battles created a positive conflict	4.5	4.5	5	4
	15. Critical input cards made me think in different ways	4.5	5	5	5
	16. Game elements like points and votes, “like” icons and badges incentivised me to give feedback	4.5	5	4.5	5

Table 1.
The survey results

English and lasted approximately 150–180 mins online, concluded with the survey and focus group interview. The researchers (one of whom has prior experience in strategic planning and workshop facilitation) served as facilitators and observers.

By completing four levels within the workshop, the participants were guided to have a structured approach to strategically respond to the COVID-19 induced recession. The related

tactical knowledge was conveyed under each level. Different mechanisms were designed to improve behavioural outcomes.

The first level was onboarding, and the participants were introduced to the workshop process, rules and digital tools. The second level was a risk and opportunity matrix analysis. The third level was an initiative exercise that concluded the five classic recession management strategies (Hofer, 1980; Latham, 2009; Argyres *et al.*, 2015; Wenzel *et al.*, 2020). The fourth level was to evaluate and structure the responses promptly within a timeframe structure. The outcome from level four was treated as companies' strategic plan for the recession.

The participants completed a series of tasks with *time constraints* that went through ideas creating, selecting, discussing, voting and refining.

Each task was associated with various *points* to be earned. It was based on the number of ideas that the other participants evaluated in the form of limited voting cards, likes and *badges*. In later configurations, participants could earn points by the number of *comment* cards given to others or lose points by not giving out *critical reflection cards*.

In levels 2 and 3, the participants were randomly divided into two groups. They were assigned teamwork first and then "team battles" with the other group later. The first "team battle" was to negotiate with another team to align the ideas. The second "team battle" was to add and polish the ideas of the other groups. Each of the outcomes was associated with points for the whole group. The complexity and difficulty of the tasks increased by the following *levels*. In between levels, points were calculated by the researchers in an Excel spreadsheet; the cumulated points were ranked on a *leaderboard*. After completing the tasks, surveys were distributed. The researchers conducted recorded focus group interviews subsequently. In total, there were 16 survey results received and four interviews conducted. However, we acknowledge that our sample size is too small for rigorous confirmatory hypotheses.

4. Results and discussion

Data were analysed through triangulating the observations, quantitative surveys and qualitative focus group interviews. Combining with qualitative data, we derived common themes for the action changes (See Table 3).

In total, we altered six design elements to enhance the experimental treatment. Considering the limited sample size, we refrained from conducting parametric tests and calculated the medians of the quantitative data to reflect the changes brought by the actions (Jamieson, 2005; Sullivan and Artino, 2013).

From the development of the answers to the relevant question, we deduct that our six altered courses of action have helped enhance the SG experience for the participants.

4.1 Role of a SG in facilitating conceptual and procedural knowledge

The medians of question 1 from four companies suggest that a SG may convey conceptual recession management knowledge and facilitate strategic decision-making. We observed

Hypothesis	Theme	Question number in the Questionnaire	Question number in the Focus Group
1	Conceptual and procedural knowledge	Q1	Q5
2	Creativity	Q2	Q2, Q6
3a	Motivation, competence	Q3-7	Q2-4
3b	Motivation, relatedness	Q3, Q8-9	
3c	Motivation, autonomy	Q3, Q10	
4	Cognitive biases	Q11-16	Q2

Table 2.
The link between hypotheses, questions and focus groups

some hesitancy of the participants with the digital tools but an unequivocal acceptance of the conceptual and procedural underpinnings of the workshop. The focus group interviews further added positive perceptions like:

I think it would be much harder to refer to, what kind of ideas or strategies we came up to. And you know the gaming and the structure helped as well. (C3_P3) (concept and process)

Companies B and D had to engage in fundraising compared to companies A and C, which enjoyed stable revenues streams. The former never considered asset reduction or exit as recession strategies. Instead of proposing strategic responses, companies should assess internal and external factors as the basis for strategic formulation (Peppard and Ward, 2016; Fuertes *et al.*, 2020, Noy and Ellis, 2003). Levels were applied to present the degrees of difficulty (Seaborn and Fels, 2015). They were intended as a constructive tool to break down a complex process into clear steps.

As one participant said in the interview:

This is our sandbox, do this and this and this. And after this you have completed this level, this will probably lead to the overcoming of this hurdle, and then you can directly dive into the intellectual game. (C1_P3)

Our findings suggest that employing game mechanisms to facilitate the strategic decision process proposed by Fuertes *et al.* (2020) can support a shared strategic practice (Wilson and Jarzabkowski, 2004). When designing gamified strategic decisions facilitation processes, designers should consider gamification learning theory, define the learning outcome and expected behaviours to design game mechanisms and instructional content (Landers, 2014). The structured process led by levels could be considered to transport conceptual and procedural knowledge.

Overall, our data support H1.

4.2 SGs in incentivising creativity for the strategic decision facilitation process

The medians of question 2 from the companies indicate that the SG positively impacted creativity during the workshops. More specifically, we observed that levels involving knowledge and perspectives exchange fostered creativity.

As one participant said:

I really liked the last part with the comments on the ideas of the others and just learning how it is to understand what the ideas of others are and to receive comments from others in order to bring up a resolution for the group. (C1_P2)

We observed that group work surged the engagement levels of the participants and the speed of the idea generation. We further noticed a high level of immersion of all the participants with

Table 3.
Themes for the action
changes

Company	Theme	Intervention for the next circle
A	1.Timing 2.Functions of thumb-up icon	1. We deleted the onboarding and breaks, which were considered unnecessary 2. We changed the “thumb-up” icon that was designed for voting to the <i>direct voting function</i> of Miro
B	1. Functions of badge	3. We changed the badge (lev1) from “thumb-up icon” to voting 4. We changed the badge (lev2) to the <i>direct voting function</i> 5. We increased 50% time limits for group discussions and battles
C	1. Timing	6. We further increased 25% the time limits for group discussions and battles

a detectable level of calm and quiet during the individual working time and a vivid interaction in the discussions afterwards. The SG fostered a playful and dynamic environment that facilitated individuals exchange knowledge, expertise, skills and motivations to work collaboratively (Franke and Schönbohm, 2016; Statler *et al.*, 2011; Sonnenburg, 2004; Hargadon and Bethky, 2006). SG designers should carefully consider the proportion of knowledge dissemination, social interaction and idea evaluation in strategy formulation (Agogué *et al.*, 2015).

Our findings support H2.

4.3 The motivational power of various game mechanics catering to competence needs

The results of questions 4–7 attempt to unfold that different game elements could promote participants' motivation. The medians of question 5 from all the companies indicate time restraints were effective motivators. We observed a constant consciousness of the remaining task time (facilitated by the visible countdown) and a mutually enforced sense of urgency. Our decision to increase crucial time limits by 25% led to improved medians of questions 11 and 13. This further points to the effectiveness of time pressure and the importance of the right balance. The supportive evidence was also reflected in the interviews, as one participant mentioned:

For me, time constraints, timing gave me a sense of urgency, 5 minutes and 5 minutes make my brain very active. (C2_P3)

Our results from question 3 suggest that participants positively perceived points as a motivational affordance. Regarding badges and like icons, the data from the surveys show that they had a positive impact on participants' motivation. However, during the interviews, we received mixed feedback:

The least favourite part might be the likes, I think it does not motivate me enough, well, they are bit meretricious. (C2_P1)

Personality differences might explain the phenomenon. We observed some participants paying much attention to likes and icons, even reacting emotionally, while others did not seem to care. People who have a conscientious personality tend to be constructive and looking for efficiency (Goldberg, 1992).

The perception of the motivational function of the leaderboard varied: in the surveys, six participants strongly agreed with its motivational effects, while five participants felt neutral. We observed an even more nuanced reaction towards the leaderboard from strong emotional attachment to oblivion. This variation was also reflected in the focus interviews:

The downsides I think, such as points and the leaderboard, give me a sense of oppression. (C2_P4)

By presenting the participants' performance after each level, the leaderboards promoted a goal-oriented atmosphere, which notably increased the motivation of competitive participants. Contrastingly, they were perceived as less favourable by participants with possibly lower levels of security. Therefore, an application of the leaderboard should be decided on while keeping personality types in mind.

The mentioned game design elements increased participants' motivation by fulfilling the feelings of efficient and successful interaction (Ryan and Deci, 2000; De Croon *et al.*, 2018). They could have different motivational affordances based on their personalities (Tondello *et al.*, 2016; Jia *et al.*, 2016).

Based on our results, the hypothesis H3a is only partly supported. Whereas time pressure and points were generally perceived as motivational, feedback mechanics like leaderboards and “like” icons received mixed feedback.

4.4 *The motivational power of various game mechanics catering to relatedness needs*

The collected data from questions 8 and 9 indicate that participants felt more connected with their colleagues while interacting in the workshop. It is challenging to observe bonding in an online setting. However, during and after all the workshops, we observed joking and laughter among the participants. The focus group interviews provided supportive data:

Through this game, I like the part of the collaboration. I can feel that we work together intensively to solve some problems. (C2_P1)

By catering for relatedness needs which means feeling connected to a social environment or a group, motivation can be positively affected (Ryan and Deci, 2000; De Croon *et al.*, 2018). Collaboration and meaningful interactions in a SG could serve this use (Sailer *et al.*, 2017).

Overall, our findings support hypothesis H3b.

4.5 *The motivational power of various game mechanics catering to autonomy needs*

The positive motivation regarding satisfaction on autonomy by providing the rights to give comments, likes, votes and badges is indicated by the medians of question 10. The results suggest that voting could be a direct and effective tool in a strategic decision facilitation context. The augmented medians of question 10 suggest that enhanced voting sections increased the autonomy level of the participants, which further contributed to advancing motivation. When voting replaced the badge, the medians of questions 3, 16 increased. It suggests a badge is less effective compared to voting. We observed mixed reactions to the possibility to express opinions using badges. Some participants wanted more badges, while other participants wanted less of them. As far as the voting for decisions is concerned, it might have been deviance from hierarchical company cultures, but all groups well-accepted it.

As some participants stated:

So, do you also agree that the gamification kind of gives you an opportunity to express yourself? (A1)
“Yes, exactly, and I feel the chart and votes, you know. these elements and the overall atmosphere made me express myself easier.” (C4_P3)

The voting mechanics provided a framework allowing freedom of expression and influence on decisions. This supposedly created a feeling of autonomy, thus promoting motivation (Ryan and Deci, 2000; Sailer *et al.*, 2017).

Overall, our findings support hypothesis H3c.

4.6 *The power of various game mechanics to mitigate cognitive biases*

The results of question 11 and question 12 indicate the mitigation power of various game mechanics for cognitive biases. Overall, we observed differences in opinion and commitment to empathise with contradicting opinions and reflect on original positions. Company A and C were particularly impressed by the dialectical and constructive interaction between colleagues to formulate strategies.

This was also reflected in the focus group interviews:

Besides that, it corrects my narrow sense of understanding of the situation and the strategies of our company by, for example, the communication and discussion with my colleagues. It is my first time trying this kind of form. I think it is beneficial. (C2_P2)

The results from questions 13 to 16 indicate that both grouping and critical cards could be powerful tools to facilitate perspective and knowledge exchange.

I think negative feedback; constructive negative feedback is much more valuable than any likes that can be put somewhere. (C1_P3)

Debiasing methods like being open minded (Nikolic, 2018) and counter opinions (Montibeller and von Winterfeldt, 2015; Sims and Sauser, 2013) could address anchoring, availability bias, group thinking and overconfidence bias. The critical reflection cards and group battles fulfilled this purpose. Meanwhile, the game elements like points, votes, “like” icons and badges could facilitate feedback exchange and mitigate biases.

Overall, our findings support hypothesis H3c.

5. Implications and conclusion

This paper attempts to bridge the research gaps between strategic decision facilitation and SGs by answering whether SGs can be effectively applied to facilitate the strategic decision-making process. Based on the literature, we developed a conceptual model and four distinct hypotheses. The gamified workshop followed the basic strategy formulation process integrating conceptual and procedural knowledge while applying game mechanics. To our knowledge, it is the first time to test the hypotheses in the strategic decision-making facilitation process by devising a gamified workshop employing an action research method.

Although the result supports most of the hypotheses, the representativeness of this study is limited. While four iterations of the SG are extensive for action research and focus group interviews (Krueger and Casey, 2000), a total sample size of 16 participants is small for quantitative analysis. We argue that the triangulation of observations, quantitative and qualitative data can partly compensate for this. The lack of validated scales is a weakness of our approach. Thus, the results should, in effect, be treated as the results of a pilot study. Nonetheless, we added detailed findings of the effectiveness of various games mechanics for special purposes like creativity, competence, relatedness and autonomy, which could provide pathways for detailed research. Finally, one might contend that the COVID-19 situation posed a particularly emotional setting for the participants, limiting the replicability of our study. We argue that strategic decision-making cannot avoid emotional involvement.

As practical contributions, we suggest that SGs can be seen as an auxiliary design to practical decision-makings. The SG design should allow interactions of various stakeholders to support a shared strategic practice (Wilson and Jarzabkowski, 2004) and permit participants to remove hierarchy tags and offer equal access for perspective expression and knowledge sharing (Flood *et al.*, 2018). Completing the evaluation of ideas and obtain timely, critical feedback are crucial parts of the system (Agogu   *et al.*, 2015). The game elements like points, votes, “like” icons, comments, critical cards, group battles and leaderboards should be practical tools for these purposes. The mixed feedback on leaderboards and badges might prove beneficial for future serious game designers in a business setting. Under the coordination of the game mechanics, voting did not generate negative pressure on decision-makers. Instead, our results suggest it could increase the autonomy level of the participants and enhanced motivation. Therefore, it could be a direct and effective tool. Time limits are an adequate tool for effective communication.

Future research may include a larger sample size that allows for more representative findings. Although the findings suggested different effects of some game elements, controlled experiments could contribute to a more precise definition.

The results of this study provide implications for the application of SGs in strategic decision-making. There are opportunities to extend the application into the whole strategic management process that could cover formulation, implementation and evaluation to improve overall decision-making. Moreover, the online workshop could be further developed into an intelligent application that does not require a facilitator and allows customising the game elements.

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