Designing Analytic Serious Games: An Expert Affordance View on Privacy Decision-Making

Patrick Jost[(✉)] and Monica Divitini

Department of Computer Science, Norwegian University of Science and Technology,
Trondheim, Norway
{patrick.jost,divitini}@ntnu.no

Abstract. With advancing digitalisation and the associated ubiquitous data processing, people face frequent privacy decisions. As personal data is often collected and processed in non-transparent ways, decision-making is tedious and regularly results in unthoughtful choices that resign privacy to comfort. Serious Games (SG) could be instrumentalised to raise awareness about privacy concerns and investigate how better privacy decisions can be encouraged. However, creating a SG that can research and promote better privacy choices while providing exciting gameplay requires carefully balanced game design. In this study, we interviewed 20 international experts in privacy, psychology, education, game studies, and interaction design to elicit design suggestions for analytic Serious Games that can be applied to research and improve privacy decision-making. With a mixed-method approach, we conducted a qualitative affordance analysis and quantified the findings to determine each expert groups' perceptions of how to investigate and educate privacy decision-making with games while keeping an engaging experience for players. The findings suggest that privacy decision-making is best analysed by storytelling that extends to a real-world context and engages the player with curiosity. Decision-making investigation is suggested to either apply unobtrusive in-game monitoring with story-aligned character interrogation, switching to a meta-context or include personal data and devices from daily routines. Conclusively, design implications for analytic SG targeting privacy are synthesised from the experts' suggestions.

Keywords: Serious games · Game design · Analytic game challenges · Privacy · Decision making · Data sharing

1 Introduction

Through ubiquitous computing and the associated data-processing, people are faced with making privacy decisions practically every day. However, while the services we use generally have apparent benefits, the possibilities and threats of private data sharing and processing remain largely hidden to most users. This often results in automatic/instinctive decisions instead of thoughtful privacy decision-making [1]. A group of concern in this regard are teenagers and adolescents who are more susceptible to making less reflected privacy and information sharing decisions [2]. One way to engage this target group and

create awareness is Serious Games [3]. However, creating a Serious Game (SG) concept requires careful balancing of game design. As Dörner et al. [4] define, SGs are games that integrate at least one other goal than pure entertainment (e.g. learning). Additionally, in the case of learning about privacy, a SG may also require including research goals. For example, influences on privacy calculus (weighing risks against benefits) and privacy paradox (acting against better knowledge) such as individual risk propensity or social pressure may be investigated to improve the efficacy of the game [5, 6]. On the other hand, assessing such factors can potentially influence enjoyment by breaking an engaging game flow [7]. Similarly, cognitive factors such as reflection time when deciding about privacy can be affected by extraneous cognitive load from game interaction [8]. While there are SGs about privacy that aim to educate, for example, about social media privacy [9] and cybersecurity [10], potentials for researching privacy decisions and related influences with SGs are so far not explored.

Including the outlined different perspectives in the early stages of game design can help to create such an *analytic SG* – meaning a game that meets educational and research goals while maintaining the players' goal of having an engaging experience. Understanding the different perspectives is important not only for balancing privacy education games but also for SG design toolsets that could incorporate design suggestions for each of the involved roles. In this paper, we explore the multiperspectivity of SG design in the case of privacy to learn about different design proposals and potential design balancing strategies.

1.1 Balancing Analytic Serious Game Design

A recently developed toolset for analytic SG design took the multi-perspective view and synthesised associated affordances from literature and existing Serious Game design toolsets [11]. By taking an action affordance approach, the involved roles – *domain expert*, *player*, *educator*, *researcher*, and *interaction designer* – were used in a goal-driven analysis to identify suggestions on how to design balanced privacy decision game challenges.
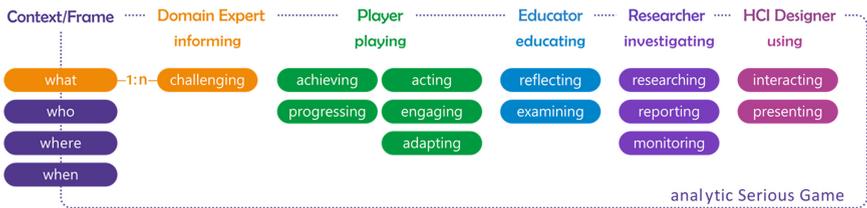

Fig. 1. Multi-perspective affordance framework for balancing analytic SGs as adapted from [11]

The resulting game design toolkit consists of affordance card decks for each goal-driven perspective in an analytic SG (Fig. 1). The cards in each deck are representing design proposals for actualising the affordance generated from the literature analysis. For example, the player affordance (card deck) *engaging* includes suggestions such as competition, curiosity, and gaining awards. The *reflecting* cards of the educator include

design proposals such as journal writing or showing decision summaries. The *challenging* cards address privacy domain challenges such as sharing fake data, profiling, and tracking personal location. Additionally, the toolkit entails suggestions for setting the context of the game. These contain design proposals for the domain (*what*), target group (*who*), location (*where*), and time (*when*) the game is planned to be played. In the present study, we apply this proposed action affordance framework to analyse in-depth interviews with international expert groups. Thus, design proposals for balanced game concepts are elicited that are suitable for raising privacy awareness and analysing privacy decision-making while maintaining an engaging game flow. Disclosed design patterns can be utilised for designing analytic SG about privacy choices and adapted for SG design toolkits that consider research aims.

1.2 Research Objectives

The research conducted contributes to the SG knowledge base by eliciting design strategies for balancing engagement, reflection, and assessment in games about privacy decision-making. By taking a multiperspectivity approach, the different viewpoints of international expert groups are explored and synthesised to identify design patterns for balancing analytic SGs. Therefore, the research questions for this study were formulated as:

1. What contextual configurations concerning who, where and when are proposed by the expert groups for analytic SGs about privacy decision-making?
2. What are the preferred SG design suggestions of each expert group regarding the role-oriented affordances of domain expert, player, educator, researcher, and interaction designer?
3. Which design patterns for balancing analytic SGs about privacy emerge from the analysis of the expert interviews?

2 Method

To get a comprehensive insight into how each expert group suggests actualising/designing the affordances, we conducted 20 semi-structured interviews that focused on designing SGs that can analyse and encourage better privacy decisions while maintaining an engaging game flow. International experts regarding privacy, psychology, educational sciences, game studies and human-computer interaction were sampled by e-mail inquiry from six different European universities to conduct a *one-hour interview each.* To be included in the study, experts were required to have at least three years of experience in their respective field while preferably more (Table 1). Moreover, psychologists had to have experience in decision-making, risk-behaviour, or media use, while privacy experts, educators and HCI designers were required to have experience with game-based approaches/projects. We subsequently applied the affordance framework for analytic SGs (Fig. 1) to elicit each expert groups design suggestions from the interviews by deductive-inductive Qualitative Content Analysis (QCA) as proposed by Rädiker and Kuckartz [12, 13] and described in detail in Sect. 2.2.

2.1 Participants

Of the total interviewed experts, 10 were female and 10 were male. The mean age was 40.4 years, while the mean professional experience was 13 years. Table 1 lists the country of origin of each expert and the average years of expertise per group.

Table 1. Demographics and expertise of the interviewed experts

No.	Field of expertise	Age	Gender	Country of origin	Years of expertise	Group expertise (*Mean Years*)
1	Privacy	40	f	Norway	15	13.8
2	Privacy	44	m	Norway	12	
3	Privacy	36	f	Turkey	8	
4	Privacy	45	f	Germany	20	
5	Game studies	42	m	Austria	10	12.3
6	Game studies	32	f	Norway	10	
7	Game studies	45	m	Norway	14	
8	Game studies	36	f	Austria	15	
9	Education	24	f	Norway	3	9.0
10	Education	30	m	India	11	
11	Education	33	f	Greece	6	
12	Education	42	f	Greece	16	
13	Psychology	31	m	Italy	6	22.3
14	Psychology	57	f	Germany	26	
15	Psychology	55	m	Austria	35	
16	HCI Design	46	m	Austria	18	10.6
17	HCI Design	47	m	Switzerland	20	
18	HCI Design	28	m	Austria	6	
19	HCI Design	59	f	Austria	4	
20	HCI Design	36	m	Italy	5	
	Total Average (*Mean Years*)	40.4			13	

2.2 Data Collection and Analysis

Before proceeding to the interview, each expert was informed about the research intent, data processing and research goals. After receiving oral consent on the started recording,

a semi-structured interview was conducted. The interview guide was developed from current research on privacy [5, 6], SG design [4, 14] and SG learning/analytics [15] and followed five basic categories: (i) privacy challenges, (ii) engaging game mechanics regarding privacy decision-making, (iii) unobtrusive scientific assessment in games, (iv) reflection and educational practices for analytic games, (v) aspects of games as adequate qualitative/quantitative research instrument. Exemplary open questions included *"What issues come to your mind when thinking about privacy and data sharing?"*, *"What would be enjoyable game goals related to privacy?"* and *"How would you scientifically assess privacy decision-making with a game?"*. The interviews were transcribed and analysed according to a codebook developed from the SG design framework displayed in Fig. 1. After initial coding of the same interview by two researchers, the codebook was refined to reach acceptable intercoder agreement. Thereby, the affordances' overlaps and ambiguities were discussed, and two modifications to the basic framework [11] were made. First, it was established that *challenging* – as representing the domain goal – is, in fact, the main affordance of the domain expert, not the player. While this role is often combined with the educator or researcher, it can also be an additional expert, as in this study, the privacy experts. Second, the researcher affordance *analysing* was adapted to *monitoring* since analysis follows monitoring in research practice. After refining the codebook, adapting coding rules and adding examples for each affordance from the transcripts, an acceptable intercoder agreement of 82% was reached, and each researcher was coding 10 transcripts in a first round. As suggested by QCA methodology [13], the coding followed a two-step process of basic and refined coding. In the first round of coding, researchers applied the context coding of who, where and when design suggestions and then progressed to code each role/perspective iteratively. Thereby they coded with the affordance-oriented questions in mind:

"How does the *(e.g. game expert)* suggest to afford *(e.g. engaging)* gameplay?". In this approach, a design suggestion could be coded with more than one affordance when, for example, the expert suggested having a real-world scenario for *engaging* and *progressing* the player. Subsequently, a second round of inductive fine coding was conducted to group and unfold experts' affordance suggestions. These synthesised suggestions on designing SGs about privacy were quantified and presented in the following findings section.

3 Findings

The following sections present the findings starting with the contextual *who*, *where* and *when* suggestions and the *challenging* affordance of the domain experts. Subsequently, the results are structured by the role/expert affordances – *playing, educating, researching,* and *using.* The design suggestions of the privacy experts (abbreviated with *P*) are thereby reported first and contrasted with the corresponding role expert proposals and agreements/disagreements from the other groups. The other reporting acronyms for each expert group are: playing – Game studies (*G*), educating – Education (*E*), researching – Psychology (*PS*) and using – Human-Computer-Interaction (*H*).
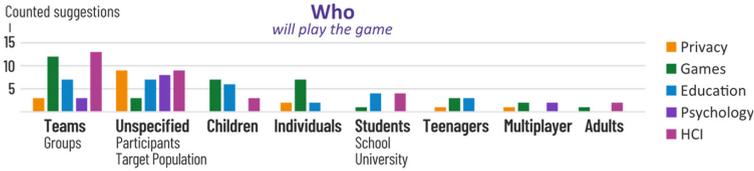
3.1 Context

Fig. 2. Counted suggestions on who to target for analytic Serious Games about privacy

Who. When first looking at targeted players for privacy game challenges (Fig. 2), privacy experts were not specifying favoured groups or individuals but would address them broadly: *"…towards everyone, towards the society…" (P-4)*. Game experts and HCI designers, on the other hand, more clearly suggested creating challenges for teams or groups: *"…a collaborative game where you have to collaborate with friends online could be an interesting way. You must decide who needs to know what and be selective about what information is passed to team members." (H-2)*. Psychologists rather referred to *"participants"*, suggesting a research focus while educators did notably not single out students as primary target group.
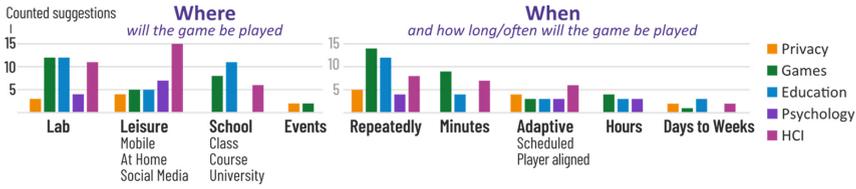
Fig. 3. Suggestions on where and when to apply analytic Serious Games about privacy

Where/When. Privacy experts did make only a few recommendations (Fig. 3) on where and when to play. However, they joined the other experts in suggesting a repeated and adaptive play. Particularly game experts and educators were promoting a recurring experience with a variability of choices/outcomes: *"Where you'd like to go back and play the game again to see if you can use what you have learned to make more informed choices and get another ending." (G-4)*. The same groups also more often suggested the lab as location of play over leisure settings primarily due to the possibility to observe the players reactions/interactions: *"Because I'm a big believer in Serious Games used in a context where it's possible to facilitate discussions and reflections afterwards." (G-4)*. HCI experts, on the other hand, proposed to play in real-world context or combined settings.

3.2 Challenging and Playing

Challenging/Acting. Privacy experts suggested considerably more challenges to address with decision-making games than the other groups (Fig. 4). They strongly suggested addressing the privacy/convenience trade-off and the associated habits/resignation
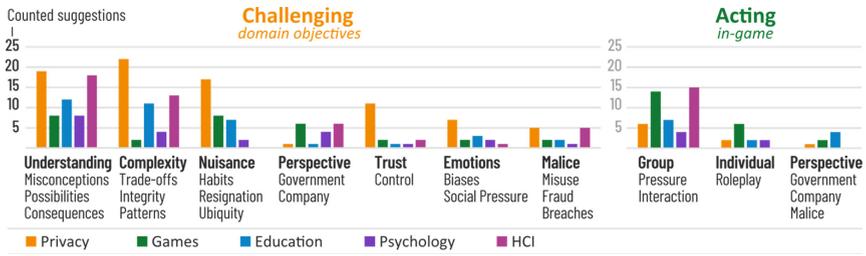
Fig. 4. Suggestions on how to afford *challenging* and *acting* in analytic SG about privacy

from ubiquitous data-processing. Moreover, as expressed by expert 3, privacy experts suggested to convey the experience of consequences: *"Their experience doesn't match the stories they are told. Because they are told a story of potential risk, but they have an experience of actual consequences which is zero very often." (P-3).* Decision complexity and trade-offs were not prominent with game experts, who had few suggestions on this issue. On the other hand, in their domain of playing, they strongly suggested that the in-game acting affords group interaction, as did their peers from HCI and most other experts.

However, while the suggestions were to investigate group decisions and social factors, many also referred to online multiplayer interaction as afforded quality: *"If players in a multiplayer game can chat with each other and collaborate in the game, then you can get exciting data." (G-4).* At the same time, privacy and game experts suggested supporting team and individual perspectives while some also proposed to include switching perspective to government or criminal acting: *"I see that group interaction is very relevant and I think it should be there. But maybe it should be separated." (P-4), "But you know, stepping a little bit into the dark side, that's what you need to create the situations where awareness becomes an issue." (G-1).*

Fig. 5. Suggestions on how to afford *achieving* in analytic Serious Games about privacy

Achieving. Concerning the game objectives, privacy experts held a broad view on suggestions except for collecting rewards, badges, or points/data (Fig. 5). While they regard creating a data-driven society as an intriguing game goal, they are joined by education, HCI and game experts in their opinions that problem-solving missions are generally a good achievement fit. Psychologists suggest evading/protecting action to achieve goals. One game expert describes his evading/resisting plot where the player is: *"…some-one*

who tries not to be discovered and then presumably leaves his privacy traces behind and gets into trouble..." (G-2). Notably, educators differ from the other experts by laying a focus on collectable achievements: *"…from my experience when children play some-thing individually, they ask each other: how much is your score?" (E-1).*
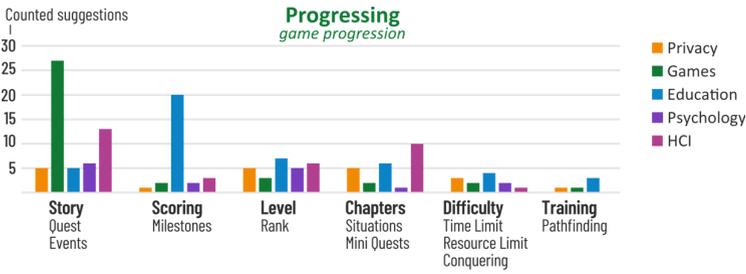

Fig. 6. Suggestions on how to afford *progressing* in analytic Serious Games about privacy

Progressing. While privacy experts commented on game progression in a broad sense with no clear preference (Fig. 6), they did not endorse classical strategies such as scoring, training, or raising difficulty. Contrarily, education experts did strongly suggest affording scoring for progressing the game challenge: *"…you get a new question then you maybe lose points if you don't answer it. So, either you can gain, or you can lose your, yeah, activity level. Because then you have another incentive to make progress." (E-4).* In contrast, game experts, as well as HCI designers and psychologists, did not recommend using a scoring mechanism for progression in a significant number but instead decidedly proposed an event-driven story/quest advancement: *"…maybe it doesn't have a win state. It's just that you read a found smartphone as you would read a novel and every step discloses more personal details about a person you didn't know…" (G-1).*
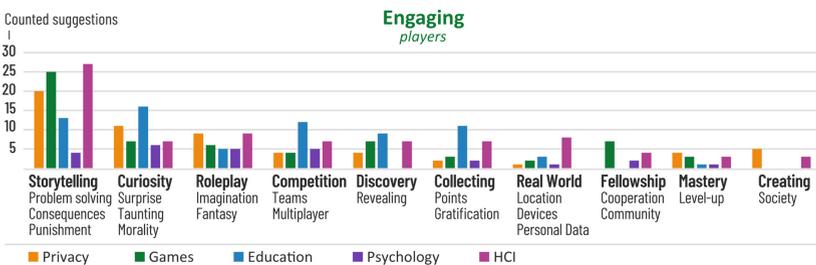

Fig. 7. Suggestions on how to afford *engaging* in analytic Serious Games about privacy

Engaging. When it comes to engaging the player, the experts have made numerous suggestions (Fig. 7). Privacy, game and HCI experts strongly agreed on storytelling with problem-solving activity that entails conveying consequences as most engaging and

fitting to privacy decisions: *"So, I would think, that for this kind of game, a solid narrative, relevant choices and branching storylines which will show you different consequences of your actions would be the way to go." (G-4).* Together with the second and third frequent proposals for engagement, curiosity/surprise, and roleplay, it is easily conceivable why several experts from different groups suggested a detective/crime themed narrative that allows for revealing secrets or exposing someone – another suggestion for affording engagement: *"…when it comes to security, often people find it fun to take the role of the bad guy." (P-1),* *"I could imagine it more in this agent, detective genre, where you naturally take on a concrete role." (G-2).* Different from the other groups, educators also see competition and collecting points as valuable for engagement.

Fig. 8. Suggestions on how to afford *adapting* in analytic Serious Games about privacy

Adapting. Although essential for maintaining an engaging flow experience, experts made few comments about adapting to growing player skills (Fig. 8). Privacy and HCI experts were suggesting changing perspective and extending context for adaption. Thereby, they also often suggested extending to meaningful real-world settings explicitly. *"…if you switch to what if your mother looks at your SMS conversations. Then suddenly it feels more real." (P-3).* Game experts were more suggesting stories that adapt by decision-making: *"…with different branches and choices that you would have to make judgments at relevant points in the game. And then based on the choices the outcome would be very different." (G-4).*

3.3 Educating

Reflecting. The educator affordance of reflecting was commented on quite frequently and in a wide variety by the groups. Suggestions can be classified in in-game and contextual reflection affordances (Fig. 9). Privacy experts were emphasising morality and emotional impact for inducing more reflective choice-making in analytic decision games: *"…you as the player can misuse information that you have available. And then you will think how that feels…let's try for some empathy for the victim." (P-3).* Also, they put forward to clearly visualise judgements for reflection: *"…a visual indicator of how nice you are. And you can see how some people don't care about it and how some people do care." (P-3).* Game and HCI experts, as well as psychologists, however, were recommending more unobtrusive in-game triggering of reflection by plot characters: *"You could have a character that asks questions that make them reflect upon choices that they make." (G-2).*
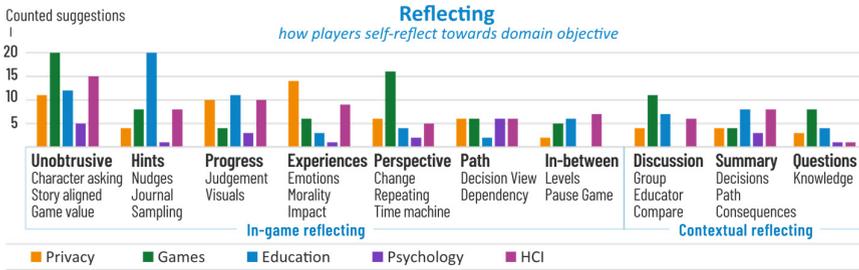
Fig. 9. Suggestions on how to afford *reflecting* in analytic Serious Games about privacy

Game experts also suggested three further strategies. First, combining in-game reflection with contextual interviews in groups or by the educator: *"…you can get some of the data what they think in the moment and then have follow-up interviews later to ask if that influenced their decision-making" (G-4).* Second, similar to the proposal of privacy experts on adapting by switching or extending to a real-world context, game experts suggested adapting in-game interactions to real-world scenarios: *"…that it's playfully integrated. Where you sit virtually in front of a computer and write an e-mail to someone. You have to type it in and enter something that fits a question accordingly." (G-2).* Third, they also suggested switching perspective by using time-machine like repetition: *"…after you played it once, you can just rewind the track to decide on different choices and experience different outcomes." (G-4).* Educators additionally recommend a more interface-oriented reflection by applying subtle decision hints at decision-time: *"…you show them this is important; you should think about it. And then the question should pop up." (E-1).*
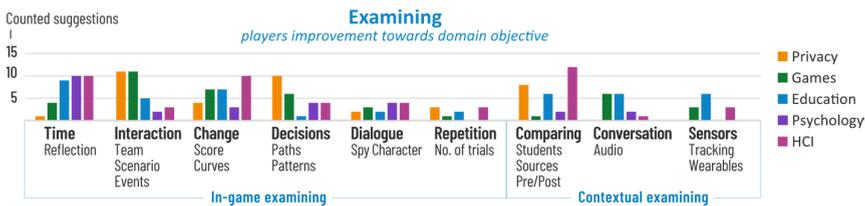

Fig. 10. Suggestions on how to afford *examining* in analytic Serious Games about privacy

Examining. For examining player progress/learning toward the domain goal privacy awareness, privacy and game experts mainly advised to analyse decision paths/patterns and team interaction (Fig. 10): *"…which decision path is he or she following? You could then apply collaborative filtering to find users with similar behaviour." (P-4).*

Conversely, psychologists, educators and HCI designers are emphasising reflection time as in-game examination of progress: *"… you can always analyse the time they took to think about a decision." (H-2).* A further recommendation shared by HCI experts and educators is to examine learning progress by the underlying competency model: *"If the score is a good reflection of learning, then you can use the learning curve itself." (E-3).*
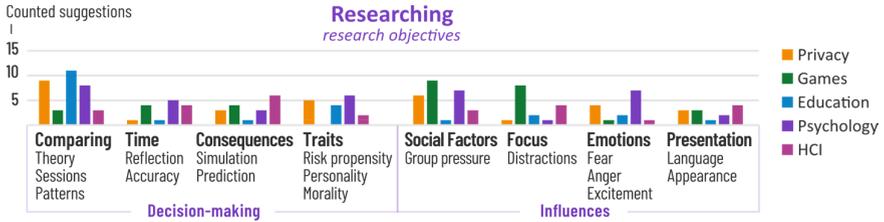
3.4 Investigating

Fig. 11. Suggestions on objectives for *researching* privacy decisions with analytic SG

Researching. Affordance analysis of researching has revealed that suitable research objectives are grouped in researching decision-making and the secondary influences that potentially influence the decision outcome (Fig. 11). Psychologists and privacy experts suggested primarily focusing on comparing decision patterns/situations with dependent secondary variables: *"…could be the time pressure, social factors or discomfort associated with a predicted outcome. And how would I assess for a decision-making game is having different versions of the game in which some of these parameters vary." (PS-1).*

Psychologists and privacy experts also suggested that traits/risk propensity can be a research aim with implemented scales such as cognitive reflection test (CRT) [16] or the balloon analogue risk task [17] in a quest structure: *"For example with the CRT you could make it as you are playing and you meet in the game and you need to sort out a quest." (PS-1).*
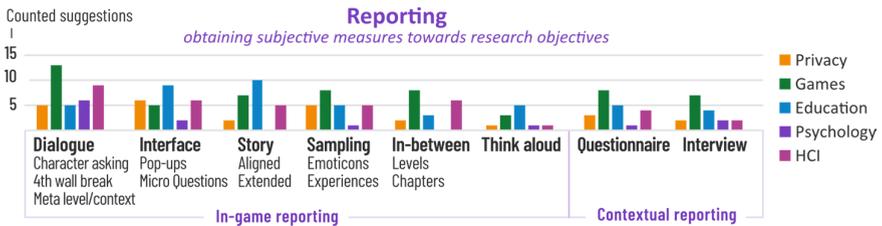

Fig. 12. Suggestions on how to afford *reporting* in analytic Serious Games about privacy

Reporting. For assessing subjective measures towards the research objectives while controlling for game activity, most experts agree on having aligned in-game dialogue for questioning players (Fig. 12): *"…someone else will ask the players advice in the game…" (G-1), "…or there is a character that simply asks you why you did that." (P-3).* Besides having dialogue-like asking, experts also had two further suggestions to control for confounding influences from gameplay. First, game experts suggested introducing a meta-level aligned on the narrative to set the interrogation context – or breaking the 4th

wall – from the in-game role to the actual real-world person for questioning: *"…in this meta-level, where someone explains, hey, it's cool you have taken part in our experiment so far…" (G-2).* Second, as G-4 exemplary suggested, extend the context to the real-world by using personal data/devices: *"…on a cell phone that mimics the environment that you are usually on when you're browsing the internet and it uses your selfies.".* A third approach was suggested by HCI experts/educators by utilising the interface layer for micro questions aligned on game action: *"…integrate some low-threshold questions that ask for my mood, my feelings, my assessment of certain topics." (H-1).*
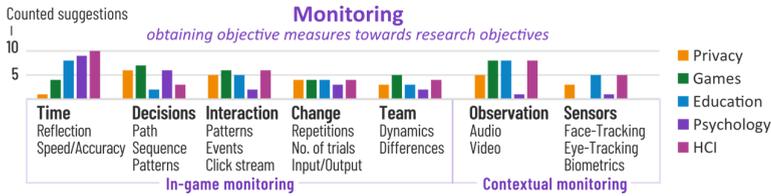

Fig. 13. Suggestions on how to afford *monitoring* in analytic Serious Games about privacy

Monitoring. Unobtrusive in-game monitoring towards the research objectives of privacy decision-making was strongly suggested by HCI experts and psychologists (Fig. 13). The propositions included in-game monitoring of reflection time, decision/interaction paths/patterns and decision outcome changes over time. In contrast to psychologists, the other expert groups were also encouraging in-game and contextual monitoring by observation. The proposed focus was on conversation analysis of intra-team decisions and team differences: *"...record both the screen and the people playing the game, record their social interactions and the dialog." (G-4).*
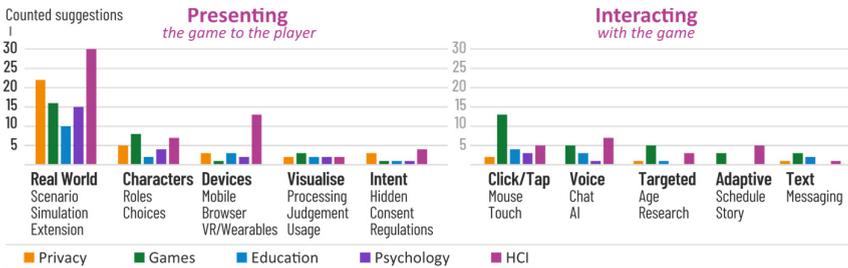
3.5   Using

Fig. 14. Suggestions on how to afford *presenting/interacting* with analytic SG about privacy

Presenting/Interacting. Real-world alignment and extension were frequently suggested for presenting analytic SG about privacy (Fig. 14). One HCI expert commented on both design strategies. The first suggestion refers to aligning to a real-world setting by simulating interaction processes in-game: *"…and then I meet persons in the game or find interaction terminals where I can simply indicate my current emotional state via emoticons, or I can give feedback on a certain question via visual analogue scales." (H-1).* The second suggestion extends further and connects privacy decision-making to the real world by following the player adaptively: *"Well, ultimately it could be a game that is seamlessly integrated into my everyday life through different channels, different media, different locations." (H-1).* Aside from this adaptive presenting/interacting scenario, experts mostly suggested addressing the mobile platform as the device with the greatest ubiquity and interaction designs with conventional click/touch interaction.

4   Discussion

The analysis of the international experts' suggestions revealed a broad array of design suggestions for the integrated goals of an analytic SG.

When looking at the findings to answer the *first research question* on the *contextual who, where and when* of gameplay, an emphasis on children, teenagers and students as players becomes apparent. While game and HCI experts also emphasise a group focus, the other experts were not showing a clear preference between group and individual play. Both approaches can be seen as equivalent in answering the question of *who* should be targeted, as privacy decisions are often made at an individual level but can also potentially be influenced by peer pressure and thus require group gameplay.

As regards *where* and *when* to apply games about privacy, the suggestions revolved around lab research, school and leisure focus associated with mobile phones and social media. Interestingly, both privacy experts and psychologists were not targeting the school scenario. Eventually, the research objective can act as a detailing factor in determining which context is best to address. The experts strongly agreed on game designs that afford repeated play in any case. This is further mirrored in the suggestions for *examining* and *researching*, where comparing of sessions, reflection time, change over time and repetition as progress/engagement metric were suggested throughout all expert groups.

Regarding the *second and third research questions,* the analysis further revealed expert group preferences for the role-oriented design parts that allow for *several design implications.* Creators of analytic SGs aimed at promoting better privacy decisions can refer to the following insights to maintain an engaging game flow while integrating educational and researching qualities:

First, privacy games are suggested to include challenging goals that transmit tangible, real-world oriented consequences of privacy decisions. Thereby, they should aim to counteract carelessness in trade-offs and resigning to universal data sharing. This becomes apparent when looking at the *challenging* objective where the privacy experts strongly recommended making consequences palpable and revealing the personal downsides of skipping privacy calculus. Biases, misuse, breaches, and fraud, on the other hand, were considered secondary challenges by the experts in terms of privacy decision-making.

Second, engaging gameplay and decision-making analysis may both be supported by team and group playing modes that also allow investigating emotional and social factors. Considering the game experts' proposals on how to design *acting* in the game, a preference for multiplayer/group acting was apparent and supported by the other experts. This design also allows researching peer influences on privacy decision-making as suggested by privacy experts and psychologists and team competition as an *engaging* quality frequently recommended by the educators in this study. However, privacy and game experts have suggested a complementary single-acting perspective, especially in combination with switching to government or criminal acting to demonstrate consequences.

Third, privacy SG designs could integrate storytelling, curiosity, and roleplay in real-world oriented scenarios for game progression through meaningful decision-making. Consequently, allowing more authentic insight into decision influences and motives. In this study, educators favoured scoring/collectable rewarding and competition as designs for engaging the player, progressing the gameplay, and *achieving* game goals. As Chou [14] puts it, this refers to people's inner drive to progress by developing skills to overcome challenges and the widely known strategy of rewarding with points and badges. Privacy experts instead, in accordance with the other groups, preferred design patterns that engage with curiosity and avoidance, which are two other core drivers in Chou's framework [14]. Progression through problem-solving, evasion/resistance and achievements by mission-oriented storytelling, including optimisation or balancing tasks, form the main design pattern for analytical SGs about privacy found in this study.

Competitive games with a scoring mechanism have advantages from an educator viewpoint as they are easily explained in teaching scenarios and quantifiable for comparative evaluation of learning progress. However, scoring as artificial in-game rewarding influences decision-making through game mechanics. Engaging the player through curiosity and progressing through problem-solving to achieve real-world/story-oriented missions characterises a design that, on the other hand, can provide a more authentic insight into decision-making processes and related strategies to encourage reflection. This holds particularly true when also considering the next design implication.

Fourth, the authenticity of in-game decisions can be supported by mapping game interaction to familiar real-world situations, connecting/integrating real, physical devices of daily routine to the gameplay or introducing a metareference. Change of context or alignment to real-world processes were general design patterns that emerged from the experts' suggestions. Game experts proposed to align in-game activities to similar real-world activities, such as writing text messages to peers in the game to encourage reflection. Privacy and HCI experts suggested the same contextual change for adapting to improving player skills while stating it enhances the authenticity of threats. These suggestions to include a reality reference were further emphasised in the design proposals stated for *presenting* the SG. All expert groups strongly suggested including real-world aspects in the game representation with either simulating certain processes or extending the context of play to reality where devices of daily use such as the smartphone get connected to the gameplay. In addition to alignment or extension, a third design proposal to increase the authenticity of decision-making suggested by game experts was to introduce a meta context that breaks the fourth wall when players are asked to state their decision-making motives. Notably, introducing meta-reflection can also contribute to learning

gain, as shown by previous research [18]. Thus, the reality and meta references represent balancing design patterns that support the authenticity of players' decision-making while they can also help reflection through context extension/adaption.

Fifth, unobtrusive in-game logging of reflection time, decision paths and team/world interaction allows investigating decision-making improvements while maintaining game flow. Privacy and game experts most frequently suggested *monitoring* decision paths to research decision-making and record interaction between teams/scenarios for *examining* learning progress. Psychologists, educators, and HCI experts proposed more to monitor reflection time to investigate privacy decisions and examine improvements concerning making better choices. The underlying design pattern of recording these parameters unobtrusively in the game can thus be used as a stealth analytics strategy [15] to balance educational and research objectives without interrupting the game's flow.

Finally, in-game questions aligned to the game's story and asked in a dialogue by non-playing characters can help reflection and investigation of privacy decisions. When looking at *reporting* motives behind decisions, psychologists, game and HCI experts suggested most to align questioning to the game story with characters. Similarly, reflecting about decisions was proposed to be integrated with character dialogues as well. While educators showed a preference for questions/hints presented on the game interface, previous studies have shown that dialogic interrogation can be applied for researching decision motives while keeping an engaging game flow [2]. The design pattern can thus help balance a SG to meet the goals of research, teaching, and exciting play.

5   Conclusion

The multi-perspective lens proved valuable for exploring design patterns to balance an analytical SG aimed at privacy decision-making. By qualitative content analysis of the twenty expert interviews, several strategies were uncovered for designing SGs that are engaging while promoting reflection and supporting authentic decision-making research. SG creators can adapt these suggestions to avoid gameplay disruption through assessment or distorted insights into decision reasoning and motives through inappropriate game mechanics. Further research is encouraged to employ the discovered design patterns to create analytic SG about privacy and validate their educational and researching effectiveness as well as their engagement qualities in the field. Ultimately, the elicited design suggestions of each expert group can be integrated into design toolkits that allow non-experts to balance concepts for analytic SGs.

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