Research Through Board Game Design

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Abstract: This research presents the design of a board game that explores issues related to privacy, ethics, trust, risk, acceptability, and security within the Internet of Things (IoT). In particular, it aims to assist players in developing mental models of the increasing hybrid digital/physical spaces they inhabit in which notions of public and private are increasingly blurred. The game is based on an Heterotopical Model for Inter-Spatial Interaction, inspired by Michel Foucault's essay "Of Other Spaces", which can act as a lens for designing IoT products and services. In the game players: explore the spatial division between physical and virtual; and are rather exposed to its procedural rhetoric which highlights how notions of public and private are in constant flux and must be constantly renegotiated as they add or make connections with any new IoT devices they encounter. As the meaning of any game only emerges through play, it was developed through iterative play-testing in which player experience was evaluated against the intended rhetoric. This led to a number of fundamental re-designs and proved useful for evaluating the model itself. This discussion highlights that while game design research somewhat sits apart from more general design research it aligns closely with research through design.

Keywords: game design; board game; internet of things; philosophy; heterotopia; research through design


oT game
How to Play
Vulnerabilities Phase
Player Traits
VULNER ABILITIE S DECK
RESOLUTI ON DECK
DUNGEON
NURSE


THINGS THAT CONNECT OH MY! THINGS THAT CONNECT OH MY!
THREAT TRACKER
Redact, spend an Action
Sanity
Security
Coding
Character Traits
Vulnerabilities
Speed
Ability
Passive, You're immune to Sanity Attacks, instead you collect any Sanity damage play as tokens. You are a Primary Node, any tokens
Alliance, spend an Action and use Sanity tokens to heal other
RESOLUTION DECK
SQUARE
LIVING ROOM
GARAGE
GARDEN
gnome
Starting Hand
Sensor
Unplug spend an Act

Introduction

Whilst the discussion of the benefits of using *use of play* as an activity within the context of academic research has been covered widely (Coulton, 2015; Fullerton et al., 2004; Gobet et al., 2004; Bogost, 2007; Nacke et al., 2009; Abt, 1970; Coulton et al., 2016) what is less developed is how games can be designed to reveal the complexity of the underlying systems that can affect our lives. In particular, this research looks into the tensions of creating a board game that both delivers an underlying rhetoric, in this case related to personal data privacy, but is also still enjoyable to play. The initial research started through a consideration of how best to characterise the types of interactions in physical and virtual spaces within the context of the *Internet of Things* (IoT). The resulting model (Akmal & Coulton, 2018) utilised philosophy as a lens to view these 'spaces', and provides a tool for establishing the nature of interactions that happen within them. The aim was to assist designers in making better informed decisions when designing new IoT products and services. Given the premise of the model was highly philosophical in nature, as it used theories established by Michel Foucault to create an epistemological ground to bridge these physical and digital spaces, this presented a challenge when imagining how the model might be used in practice. The board game began as a way to address this challenge. What follows is a discussion of the tension of designing a game that meets our research goals but also functions as a stand-alone game. *Research through Design* (RtD) was utilised as a methodology as it allows constant reflection through the iterative game design and play-testing and not only acted as a way to streamline the game, but also established a number of other avenues that reinforced the initial research. This paper presents and reflects on the different decisions that had to be made in order to satisfy both elements of the challenge; a designed artefact capable of expressing research material, as well as a designed artefact that is playable as a game.

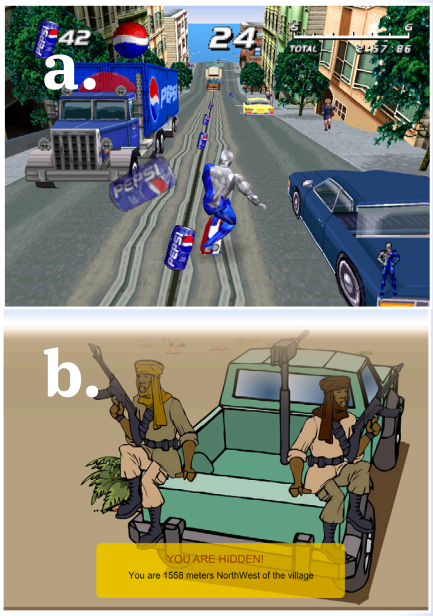


Figure 1a, b. A screenshot of Pepsi Man a game with multiple references to the Pepsi brand, followed by a screenshot of Darfur is Dying a game explaining socio-political conflicts in Sudan

Games as a medium for persuasion

Johan Huizinga presented perhaps the earliest academic studies of the role of play within society in his book *Homo Ludens* (1938) and defined the notion of the magic circle as a place "dedicated for an act apart" which acts as a metaphor for the "artificiality of the gaming situation" (Liebe, 2008). Salen and Zimmerman's popularised the notion of games creating a magic circle in *Rules of Play* (2004) and bridged the gap between the socio-psychological aspects of play presented by Huizinga and modern games which are capable of a multitude of experiences, many of which have been used as activities within research. This simulative aspect of games and game like activities to create representations within the bounds of a *'magic circle'*, have been used in multiple ways in research such as card games, video games and board games. Whilst the intended purpose behind each game may be different, such as gathering data on a particular subject or activity, what is common is that these designed artefacts have a rhetoric (Buchanan, 1985) which they convey to their players, one that stems from the research they are associated with.

Whilst Buchanan argued all design contains a rhetoric (Ibid) it was Ian Bogost (2007) who proposed the conscious use of rhetoric in games to convey underlying processes and activities, referring to games as having a quality of persuasion which he calls a "procedural rhetoric"; in that the rhetoric is revealed through playing the game. *Advergames* are one such category of persuasive games that are designed with a purpose of promoting brands (Cauberghe & De Pelsmacker, 2010; Bogost, 2007; Jayaswal & Malati, 2017) through playing a video game. An example is **Pepsi Man** (Figure 1a), popular in the 90s in which players controlled a human embodiment of the Pepsi brand and were presented with numerous references to the Pepsi product during gameplay. Though such games were commercially driven other persuasive games, such as **Darfur is Dying** (Figure 1b) and **The Phone Story**, have been successfully used to reveal underlying systems that affect people's lives. With this in mind, it seemed appropriate to transition the philosophical derived spatial model into a game that could illustrate this complex theory in an easily understood manner.

A Philosophical Interlude

Whilst a deep discussion of the philosophical underpinnings of the board game is beyond the scope of this paper, and has been presented elsewhere (Akmal & Coulton, 2018), a discussion of the derived model is useful in understanding the design of the game. The *Internet of Things* is the name given to the phenomenon where objects or things can be connected via the Internet which allows them to be readable, recognisable, locatable, addressable, and/or controllable by computers. Where once these objects were limited to devices such as mobile phones and computers, the list of available and potential objects has increased tenfold. Locks, fridges, bags, tables, and clothing are but a few things that can now connect to the Internet to collect, share, and process data of various kinds. This influx of objects connecting with each other has created a jumble of interactions both digital and physical, which traditional approaches to designing products and services often fall short of addressing. This raised the question as how to design such that the complexities of these interactions are meaningfully addressed.

The philosophical works of Michel Foucault were identified as a possible way to make sense of these interactions. Foucault (1967) introduced a concept of the *heterotopia* in his essay *'Of Other Spaces'*, in which he explains it as "places of otherness" which have rules that define them. This concept of heterotopias worked as the foundation for the characterising of interactions within IoT; specifically, it was imagined as interactions that would occur within physical spaces that the devices occupied, such as a room, as well as within digital spaces that they also occupied, such as a mobile screen existing as a subset of that space (Figure 2).

Simply put, all interactions that happen within a physical or a digital space have to abide by that space's inherent rules. This research helped imagine how IoT creates multiple subsets of rules within physical and digital spaces where unique interactions took place. Theoretically, it was thought that designers would be able to use the model as a reference to design with more purpose and avoid unnecessary interactions and/or pitfalls.

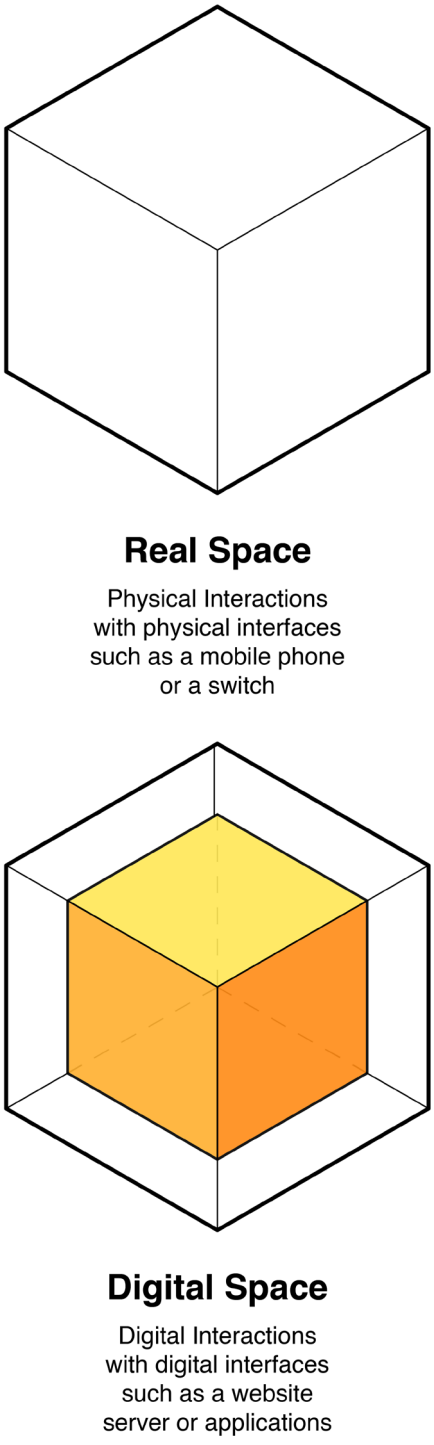


Figure 2. Digital Spaces presented as a subset of Physical Spaces

Scaffolding the Design

Before the design of the game could be conducted, it was necessary to establish a scaffold to underpin all subsequent decisions taken in the design process. The game had to incorporate philosophical underpinnings in order to convey the rhetoric of heterotopical spaces in IoT. This meant the game had to convey information that was already difficult to understand hence it also had to be done in a manner where this difficulty was alleviated.

Philosophical premises are not new in games. **The Stanley Parable** by *Galactic Cafe* is an example of a game defined by its philosophical gameplay where it has players roam a series of rooms making simple decisions along the way. The game has thoroughly been discussed (Fest, 2016) and is essentially an exercise in existentialism that encourages players to question free-will and the difference between "digital labor and play" (Fest, 2016, p.10).

In most cases though, games infuse philosophical discourse within the rhetoric of gameplay and many games can be assessed through the philosophy they depict (Figure 3): **Bioshock**

incorporates ideas of objectivism and utilitarianism; **Soma** discusses consciousness and immortality; **The Talos Principle** incorporates multiple discourses from Nietzsche's philosophies. These games utilise philosophy as a mechanic within gameplay in different degrees and don't necessarily flood players with too much of their philosophy, opting to gradually feed instead. Therefore, the first question towards understanding how to design the game presented itself: **how much of the philosophy would be infused within the rhetoric?**

For our purposes though, it was more important to present the philosophical rhetoric as the outcome of gameplay which emerged from an academic research perspective. So specific importance was placed on retaining this research aspect. This method of *game-as-research-artefact* was perhaps driven from the fact that most games within research, as expressed earlier, have been designed with functionality within research in mind. For example, card-based games like Ideo's *Method Cards* serve a specific purpose for designers and researchers to aid as a tool in the design process. Though they incorporate game-like elements they are far from the experience of an enjoyable game opting for more of a serious outlook at the task at hand with a precedence towards functionality. This presented us with our second question: **should the game remain soley as a research artefact, ergo a tool, or can it also be just a game?**

Game Design

With these questions in mind we then proceeded in designing the game. An iterative design process is the most common methodology used when developing games. Typically, the iterations involve design, play-testing, and feedback that culminates in a series of iterations of the game called versions. Digital games are often 'patched' with newer versions well after their final release, often introducing new or upgraded mechanics—as many games present large worlds for players to explore they can never be completely tested prior to launch. The goal being that each iteration is to bring the design closer to a final state that functions as desired. By logging the different changes that happened in each version designers are able to roll back on versions if they are subsequently found to introduce unwanted features. Thus, we would argue that practices developed for game design align directly with those espoused for research through design as we shall illustrate in the rest of this paper.

In the forthcoming discussions, certain commonly used game design terms are employed and to aid in understanding these are now clarified:

Mechanics: Constructs of rules or methods used within gameplay to facilitate interaction; e.g. use of dice to move

Elements: Concepts used within the confines of the game world to express certain ideologies with intentions of engagement; e.g. incorporation of chance through the use of a dice

Pieces: Tangible items used to facilitate mechanics and elements within the game interface; e.g. dice

For our game, each step of the process was evaluated with feedback coming from play-testing as well as our own critical reflections. In total there were **11 iterations** of the game (Figure 4), which fit the

Figure 3a, b, c, d.
Philosophical discourse is not a new concept for game designers. Pictured here are 4 games that utilise philosophy as a game element; The Stanley Parable (a), Bioshock (b), Soma (c), and The Talos Principle (d)

PROGRESSION OF ITERATIONS

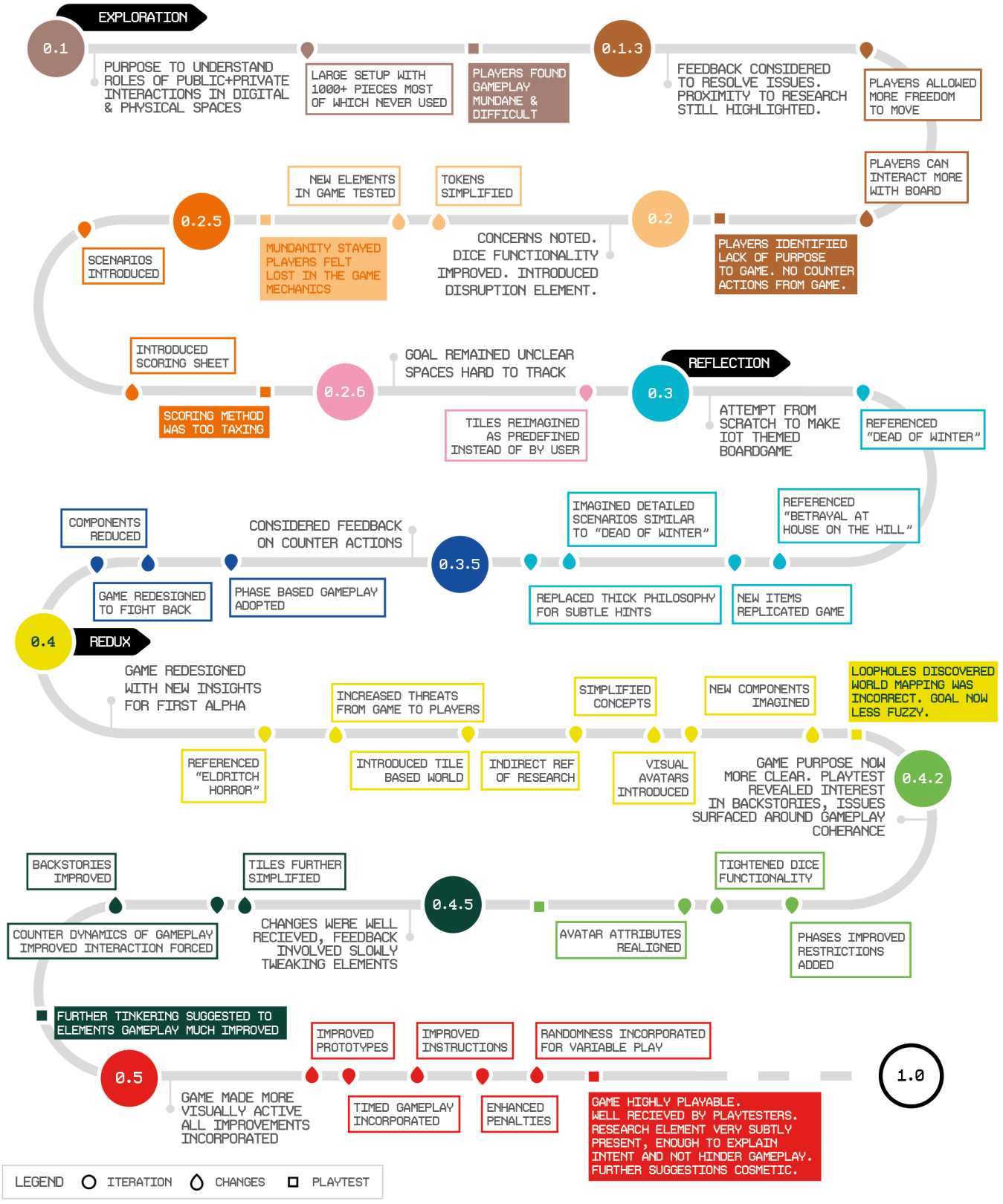


Figure 4. The design of the game was done through an iterative design process involving our three phases of development; exploration, reflection, and redux

required criteria earlier established, before a final version could beconsidered reasonably stable. Although the distinctions between iterations can often blur for clarity of discussion they are presented as three distinct phases: **exploration, reflection, and a redux.**

Exploration (v0.1 through 0.2.6)

At the start of the design process the game was kept as close to the initial research intent as possible i.e. the philosophical rhetoric would be explored through in-game actions. Variables were established for the gameplay that were taken directly from the research model, the game mechanics acted as vessels to facilitate the philosophical discourse in a raw format. Initially there was no game board, instead plain black and white cards were used in varying arrangements to simulate digital and physical spaces on a hand drawn surface; the 'spaces' were kept as such to establish a difference between either (although it was later revealed that this did nothing to aid the discussion). Players then labelled the spaces and marked them according to a game rubric which involved collectively deciding how *secure*, *social*, *private*, and *public* the spaces were. This rubric was also taken directly from the research material. Players were then allowed to choose from a collection of tokens which represented their simultaneous movements in both digital and physical spaces. The tokens were themed as spirit animals to create a metaphysical connection between real and digital spaces; another aspect of the initial design which did little to aid the rhetoric.

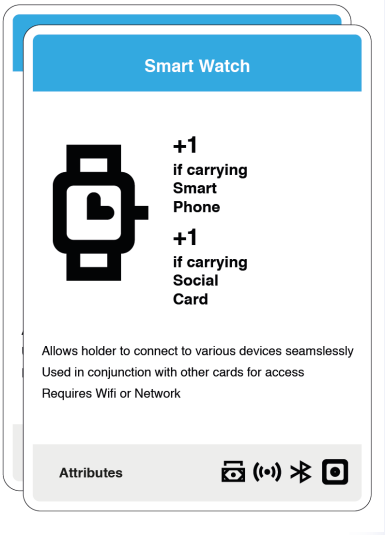
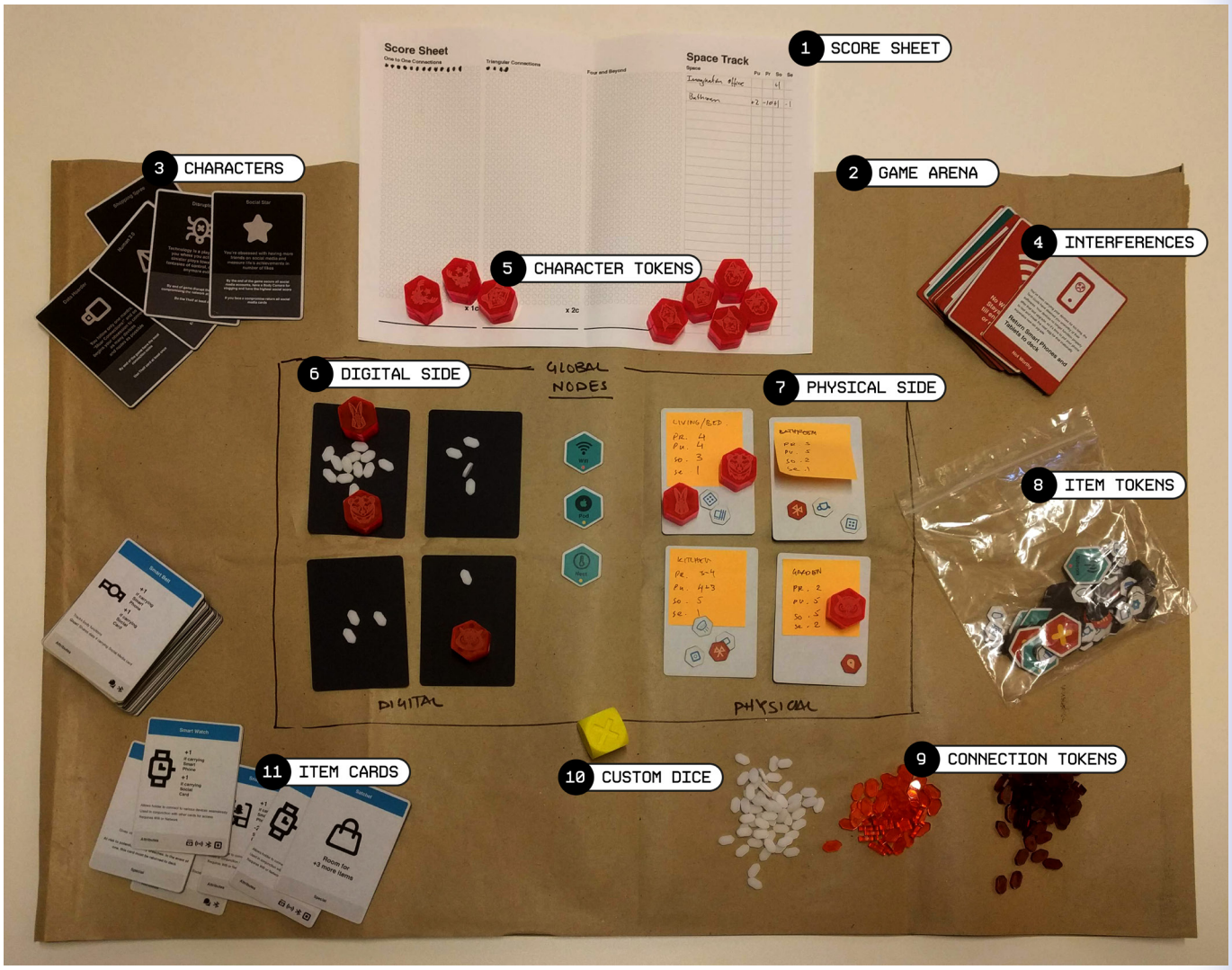


Figure 5 (top). Each item card had with it details players used to assess the rubric of the space

Figure 6 (bottom). Iterations 0.1 through till 0.2.6 utilised this configuration of play with minor adjustments along the way. All elements of the game were created through the iterative process and philosophical concepts were masked in game-like mechanics.



Play began with the rolling of a customised dice (shown in Figure 6) which allowed a fixed number of actions. The main objective was for players to move around the board in both digital/physical spaces dropping items to make *'connections'*. These acted as currency which was collected in the form of tokens. Players also dropped tokens on the cards in digital spaces to denote an interaction within specific heterotopias. This exercise was meant to simulate real life interactions within IoT. Along the way players could potentially face problems in the form of interferences that would disrupt their course of action; these interferences ranged from the loss of connectivity to security breaches. The dice facilitated all these actions including players picking up IoT enabled items on cards or unlocking further connectivity options. At the end of each round players were encouraged to discuss their actions in the game and assess whether the rubric for each space had changed through their new developments. Initial play-tests revealed that while the game mechanics excelled in visualising IoT interactions, it quickly morphed into a mundane activity that did little to keep players engaged.

The expectation of keeping track of each interaction was meant to provide a scoring mechanism but it didn't provide enough stimulus as each action ended with players dropping tokens whether they wanted to or not. Play-testing revealed key elements of gameplay such as strategy were missing from the initial design, also they conveyed that the approach at scoring was too complicated and it would be better if the game did this activity on its own or was simplified as it distracted players from the rhetoric of the game which was already hard to ascertain.

Ironically these initial iterations were an attempt to keep the rhetoric of the research intact with little compromise; the added game mechanics were to provide in playability. Whilst it provided players with an understanding of the extent of IoT interactions it did not engage them with the philosophical or provide a suitably enjoyable experience.

Alterations were made to address these issues coming from play-testing such as: fixed goals; character roles; a reduction of game pieces and elements (as there were too many to keep track of); a simplification of the scoring mechanism; the addition of counter actions or repercussions, among others. However, these proved to be insufficient as further testing revealed that the influence of the research objectives was ultimately undermining the playability of the game.

Players were continuously finding it difficult to play the game owing to weak goals of the game itself which resulted in a feeling of repetition without purpose. Players said it simply didn't stimulate them as a game but as a tool to visualise interactions in IoT it managed to convey some information. This continued on from versions 0.1 through till 0.2.6, which formed our explorations of the design process. Having explored the space, we decided to step back from the game we had produced thus far and reflect back on our aims for the game.

Reflection (v0.3 and 0.3.5)

This reflection on the earlier versions led us to determine what factors made them play out the way they did. One aspect that became apparent was that players were unable to ascertain whether they had to be competitive or cooperative with other players in the game. The scoring system made it appear as if the game was a competition for *connection tokens* rather than managing these connections. Comparing with the usage of IoT in practice, competition did not seem to be a method that fit the operation of objects within IoT as they tend to work collaboratively with other products and systems.

Zagal et al. (2006) are of the opinion that traditionally games could be categorised as either competitive or cooperative, both require players to strategise but where one pits players against one another the other has them use strategies together to achieve an individual interest. However, through play-testing a number of board games which were (Figure 7):

Dead of Winter by *Plaid Hat Games*: a zombie apocalypse game that had players work together to survive attacks in a fictional apocalyptic landscape;

Betrayal at House on the Hill by *Avalon Hill*: a collaborative game where players navigate a haunted house until one of their friends turned on them;

Eldritch Horror by *Fantasy Flight Games*: a Lovecraftian horror game of survival highly dependent on storytelling and player interactions;

We found that these were game mechanics where a games overall activity is competitive, but they can also contain collaborative elements, or vice-versa, particularly when players were able to assume alternate character roles within gameplay. These games also highlighted characteristics that could be considered prerequisites for designing engaging gameplay. Elements such as the enforcement of rules, established goals, storytelling as a world-building tool, social dilemmas, balance

of opposition, synergy between players, the presence of repercussions as well as a payoff for one's actions (Zagal et al., 2006; Grace, 2012; Rocha et al., 2008; Salen & Zimmerman, 2004).

All three of the games referenced showed varying degrees of these traits with their own unique strengths and weaknesses. To start they all had cooperative and collaborative elements also being heavily thematic falling within the *Ameritrash* category of games. These kinds of games are considered to be more reliant on a connection between theme and mechanics with a strong atmosphere of conflict (Costikyan, 2011, p.179). They each utilised a rich foundation of storytelling within their unique gaming experiences, and each story was capable of reinforcing the rhetoric each game had to say.

They forced players to act together, in some situations against their will with the intent of fostering discord among players. These games had elements that created their own forms of restrictions on players which helped in altering the pace of gameplay; **Eldritch Horror** utilised an aggressive approach enforcing *Conditions* on players that hindered actions slowly making them weaker unless resolved. They each also involved an intricate array of characters that players could embody in the game. **Dead of Winter** and **Betrayal at House on the Hill** had the addition of a defector element which meant some players might either have secret agendas from the start that could hinder the play of others,

<Figure 7. Referenced board games for reflection phase; Dead of Winter (top), Betrayal at House on the Hill (middle), Eldritch Horror (bottom)

or would later turn on their fellow players. With a change in player dynamics a sudden shift in gameplay models would occur; cooperative to collaborative to competitive. They each also dealt with the concept of multiple spaces within play, either having players move around the game into and out of physical spaces such as rooms, or through metaphorical spaces such as items on hand and astral planes as is the case with **Eldritch Horror**. This spatial realignment meant that players had to think in multiple modalities and whether their actions could have ripple effects. These together with a richly visual interface made for compelling gameplay presenting a large potential for learning on how to improve our own version of the game.

It was decided to begin by dissecting the traits and mechanics found in these games and use them to establish the next versions of the game (v0.3 and 0.3.5) to see if they better conveyed the rhetoric through gameplay. Instead of designing prototypes similar to the previous version, the process was simplified to designing a new manual for play and reusing the previously designed artefacts. To start with a backstory was introduced to establish the players in a world whereby their subsequent actions made sense. Some mechanics were taken from both **Dead of Winter** and **Betrayal at House on the Hill** and passed through the new fictional backstory to develop the game manual. What this exercise did was reframe the game within a structure that made more sense for the creation of a board game rather than as a game acting purely as an academic research tool. When compared with the earlier manual which looked more like a piece of academic written material, this brought forth the objective of a playable game.

This stepping back from the design of the game itself allowed for more reflection on what was needed for the design process. We realised that the iterative process that was used for designing the previous versions, although based on the traditional approach of designing games, was insufficient for our purposes. The initial process had effectively fixed the design on the original academic research and we realised we need to be flexible on how much of the research we could effectively incorporate. Finding a comfortable compromise was now the overriding goal for the design process and was the basis of the next group of iterations.

Redux (v0.4 onwards)

This constant questioning of research rhetoric versus playability culminated in v0.4 where the findings from the reflective phase as well as those from the exploration were combined to create a stable working prototype that played well as a game. Whilst some game mechanics were borrowed from the referenced games, others came from new combinations of mechanics across the three games, or where developed during play-testing. To start with, the game world was now generative having players build the world as they moved creating an element of exploration within play. Thus movement was no longer kept to a dice roll or to move along a particular path but required choice; either travel around the existing tiled map or open up new tile spaces selected at random. Players were also given new actions they could perform. A *Vulnerabilities* mechanic was introduced which became the core mechanic of gameplay, hinting towards an aspect of the rhetoric presented within the philosophical research; the presence of consequence of making connections with IoT devices. Each tile that players revealed as they moved came with its own spatial restrictions. Some tiles allowed free movement, others less.

Tiles were made hexagonal allowing players to move across from any edge placing a new tile or moving into a previous one. Each tile also came with a number of connector points along the edges which players used to connect spaces. Players would collect items in the form of cards but would require specific combinations in order to make connections between spaces. These combinations were a requirement for play as they symbolised interactions between IoT objects and also raised risks which would ultimately have to be addressed.

As players accumulated connections on their cards and on the game board, arrangements of cards could influence the happenings of the game; ergo the more connections made, the higher the risk in game. The backstory of the game was now accompanied by a unique set of characters (Figure 10a) with their own traits that players could choose from and embody within the game. It all came also with a new game manual that was tailored to teaching the game through practice.

Prototypes for v0.4 through till v0.4.5 were done using simple card and paper as well as reusing the earlier designed artefacts (Figure 8). Most of the changes that happened after the play-testing was done by removing elements, introducing new uses of items, and rearranging the ones present in order to see how players would react to the subtle changes. Players immediately connected more with these versions of the game. The backstory brought with it a more engaging experience, as well the much needed purpose and location of their actions. The new vulnerabilities mechanic though tedious at first was streamlined in later iterations and was ultimately well received compared to the earlier attempts. The flow of the game changed considerably from the earlier versions as a phase-based gameplay was developed inspired by **Dead of Winter** and **Eldritch Horror** which staged the many different actions players had to perform in order to move forward in the game. By incorporating an *Action Phase* and a *Vulnerabilities Phase*, players were drawn into making the connection between IoT and discussions of ethics, privacy, and security.

These versions also saw the introduction of external research projects as elements within the fictional game world. It was decided that all elements present within the game would not be purely fictional conjecture but be based on real technologies with plausible trajectories. *The Databox* (Mortier et al., 2016) was one such element introduced. The *Databox* platform provides a unique ecology for exploiting personal data in privacy-preserving ways. For example, it might enable a media provider to utilise algorithms on data about an individual's viewing habits, and those of others in the room too, and offer up bespoke content of mutual interest without disclosing personal data to the provider. Instead of distributing personal data to remote cloud servers for processing, processing takes place *on-the-box*, which means no personal data need leave the home or be accessed by anyone else. *Databox* functionality is not limited to privacy-preserving analytics but also enables actuation of IoT devices. Players now worked together to create secure spaces within the game world in the form of these *Databoxes*. This was done by creating connections between spaces, which in turn required players to collect items such as smart phones or tablets.

Ultimately it was the later consequence of interaction choices where vulnerabilities had to be addressed where the game became more interesting for players. Players were required to do a series of r*esolution actions* to address particular vulnerabilities with the aim of being able to introduce a *Databox* within a particular space. While players could only win the game through the single scenario of deploying a set number of *Databoxes*, there were multiple ways for the game to be lost (another element that was taken from the reflective phase).

Figure 8. Play-testing was done using low-fi prototyping reusing earlier assets where possible

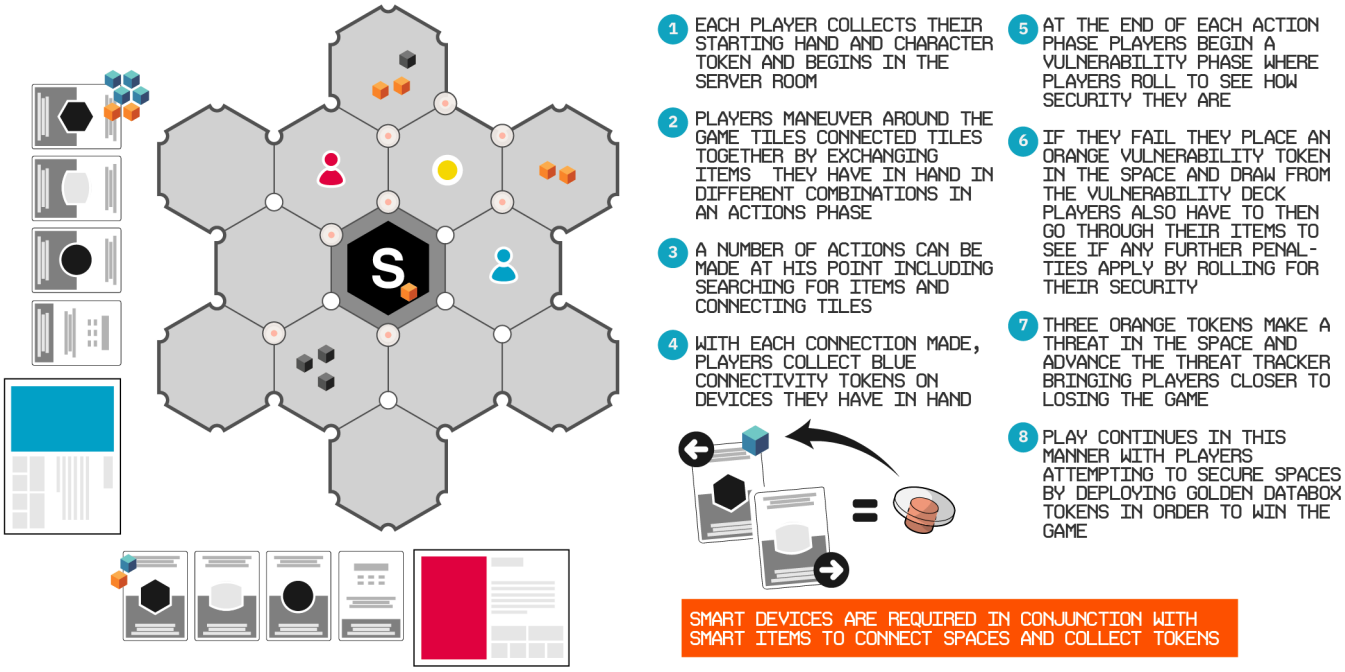


Figure 9. Snapshot of Gameplay showing how a typical round of play would be

The element of risk was found as key in the reflective phase, and it was heavily embedded in these further iterations; in order to deploy a Databox players had to collect items and make connections risking the security of the space they intend to secure. Scoring became less tedious as well as players were not required to keep track of any score in general but instead the status of the game board became the score board.

A threat tracker was introduced to represent how dangerous their actions had become in the game, giving players a heightened sense of urgency. Each player was required to select a particular character at the start of the game allowing particular actions to be available, and during the course of the game certain threats resulted in some characters becoming stronger while others weaker. This shift in character influence allowed for continuous engagement as players had to change strategies as new vulnerabilities surfaced.

Play-testing revealed that with all the new changes to the game there was still a lot of room for improvement. Loopholes were discovered by players which broke the game mechanics. These were slowly rectified in later iterations. Further limitations were also presented as if tightening the gaming experience for players forcing them to play a certain way, all without losing a fundamental aspect of enjoyment. The iterations continued till v0.5 was imagined, it came with a more concise game manual, new tiles made out of material similar to board games, clearer defined game pieces, player tokens and player sheets, all inside a custom designed game box (Figure 10b and 10c). The major changes that came to this version besides cosmetic were a structuring of the game tiles, simplification of pieces, as well as further restrictions to how characters were able to perform within the game. The dice mechanic was refined further and new kinds of threats were introduced to make players realise the veracity of their actions within the game world.

Each mechanic that was introduced or reintroduced was done so in a way that they fortified the rhetoric of the philosophical research. Each space had its predefined rules similar to the heterotopias of Foucault. Each space was now able to connect with other spaces and further affect them with the rules of the items players had on them, similar to how devices alter spatial rules in the real world. Players were instructed to think about security and privacy through the different vulnerability and resolution cards. The inclusion of the vulnerability phase in the game had players visualise the lack of control in IoT. Ultimately the game had players question current methods of IoT usage, painting a picture very close to the rhetoric of our philosophical paper. In the end, one play-testers remarks sums up the efforts well *"It plays a lot like a game now"*.

Figure 10a, b, c. The custom gamebox comes with an assortment of items including visually rich characters with elaborate backstories, multiple arrays of spaces as tiles to play with, and improved tokens.

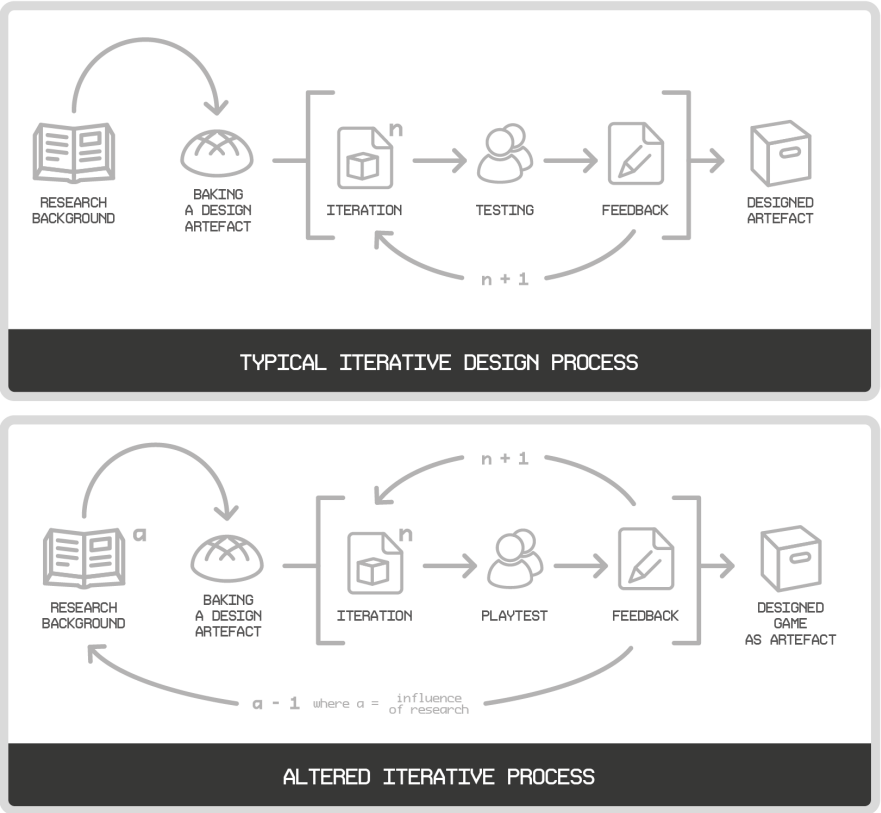


Figure 11. The traditional iterative design approach had to be reconsidered for our purposes with our research intent being also modifed in later iterations.

Conclusion

The iterative approach of continuous reflection during research through designing helped in clearly navigating a way through the complexity of representing philosophical theories within a game designed for a general audience. Systematically questioning the research intent throughout the design process allowed us to achieve an artefact that not only functioned as a tool to express our research concept, but also as a game that is enjoyable to play (Figure 11). The earlier identified issues with mundanity, confusion, and frustrations were replaced with cooperative attempts at achieving set goals, a competitiveness against the game itself, and a sense of relief when being able to succeed. The underlying rhetoric itself for the most part remained unchanged but what did change was how it was conveyed through the board game. Rather than use direct references to the heterotopic model which led to players feeling weighed down in jargon, it was presented in a more human-friendly and game-friendly language that became more intriguing the more the game was played. The levels of feedback from the play-tests expressed the breadth of change that happened through the different iterations. Our approach to board game design thus aligned us with Gaver's (2012) view where RtD is "generative" focusing more on the process rather than the outcome. By creating a designed artefact in the form of a game out of a philosophical paper is as Gaver puts it an "embodiment [of] the myriad choices made by the designers"; one that cannot be expressed solely or adequately in a written account. It is through playing the game that our rhetoric of security, trust, and risk in IoT seen through the lens of philosophy is experienced. Our decision to use game design as a medium to fortify concepts around IoT that are hard to express aligns with Coulton et al's. (2016) proposition that games can allow participants to consider the societal impacts of potential futures driven by technology. This came out in post-game discussions whereby players indicated it has caused them to rethink their understandings of IoT.

As researchers our aim was to test the philosophical tools we had created in our research in a real-world context and in choosing a game we were not driven simply by the idea that a game would make the complex philosophy more palatable, but that games offer unique experiences in which complex rhetorics can be explored in a meaningful way.

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