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Designing a digital game platform to foster sustainability in early childhood

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Abstract

Research suggests that many digital games include violence and about half of the violent incidents have negative repercussions such as increased aggression, serious injuries or death in the "real" world (APA, 2015; Children Now, 2015; Gentile 2014). This influential nature (Bogost, 2006) of digital games calls for research on ways in which the digital games can be leveraged instead. This is especially relevant for the early childhood context when players are most malleable (Gentile, 2014; Tootell, Freeman, & Freeman, 2014). Most individuals develop their value systems, habits, and attitudes through play in these early years (Epper, Derryberry, and Jackson 2012). "Play", in today's digital age, is facilitated by technology in the form of digital games. This makes digital games a powerful means of fostering values, attitudes, and developing social and emotional learning in children (Hromek and Roffey 2009). Using design science research, this research aims to tap into the power of digital games by creating a platform for designing digital games that foster values, including sustainability principles in early childhood.

Keywords: Digital games, Values, Sustainability, Early childhood.

1   BACKGROUND AND MOTIVATION

Over the last two decades, development and research on digital games has grown exponentially (Crookall 2011). Many of these games are in the form of applications used on ubiquitous devices such as smartphones and pads, spreading their reach and range well beyond traditional entertainment. Digital games are being used for research, education, entertainment, and simulating real life scenarios; and by players of all ages. Studies show that even young children under the age of 8 years are frequent users of digital games and applications (Judge, Floyd, and Jeffs 2015).

According to a study conducted by Common Sense Media (Shuler 2009), children's applications have been the fastest growing market in the applications (mostly digital games) industry. Some key numbers from her study show that over 80% of apps in the educational category target children, and applications for toddler/preschool children are the most popular age category, exceeding apps for adults by almost 20%.

The statistics on the number of digital games being created for children raise a number of concerns. Content and media created for children is a sensitive topic not only for its pedagogical implications, but also its potential influence on children. Research shows that we begin to learn values very early on in life, initially from our families, but also from the media, peers, playgroups, carers, and our local community (Halstead and Taylor 2000). Play, facilitated by digital games today, in particular, is considered to be one of the most influential aspects in the growth and development of an individual (Bronfenbrenner 1979).

One of the controversies and recent discussions on digital games is therefore their influence on an individual's values (Bushman, Rothstein, and Anderson 2010; Ferguson and Kilburn 2010). Some researchers note that digital games may carry unintended negative values (Anderson et al. 2010) and game designers often overlook the subtle values being fostered by the game (Barab, Dodge, Thomas, Jackson, and Tuzun 2007). This is especially of concern in the context of early childhood. However, literature in the early childhood and technology domain shows a lack of conceptual models and frameworks to guide the design and implementation of effective, high-quality digital games for children (Verenikina & Harris, 2003). Analysis of research conducted in North America, Britain and Australasia, demonstrate that the early childhood dimension is under researched with respect to new technologies when compared with other age groups (Judge et al., 2015).

The aim of this research is therefore to explore the relationship between digital games and value formation in the early years, and, using design science research, to propose and implement conceptual and system artefacts to design values-based digital games in the early childhood domain.

2   VALUES AND SUSTAINABILITY

In a broad sense, values are defined as "central desires or beliefs regarding final states or desirable conducts that transcend specific situations, guide the choice and evaluation of our decisions and, therefore, of our conducts, becoming an integral part of our way of being and acting to the point of shaping our character" (Schwartz and Bilsky 1987). Similarly, Rokeach (1973) views a value as "a centrally held, enduring belief which guides actions and judgements across specific situations and beyond immediate goals to more ultimate end-states of existence". This implies that values do not change too much over time. Most personal and lasting values are fostered in the early years through family, education and surroundings. At an organisational and societal level, these individual values are the guiding North Star for multi-nationals and nations.

With problems such as depression, high rates of suicide, violence, non-sensitivity to bloodshed and war, the importance of values is increasingly important. Research in human development shows that the seeds of empathy, caring, and compassion are present from early in life (Presidents and Fellows of

Harvard College 2014). However, these values need to be nurtured in the early years to become sustainable values (Buzzelli 1992; Halstead and Taylor 2000; Kagan and Lamb 1987). There are numerous definitions and classifications of important values. Table 1 below summarises some of these.

Sustainability refers to practices that enable the survival or preservation of existing systems or processes. The main types of sustainability are: personal – practices or beliefs that enable individuals thrive in the world; social – practices or beliefs regarding one's engagement with people in their surroundings, economic – beliefs regarding a country's survival and upkeep; cultural – practices or beliefs regarding the preservation of cultural aspects such as customs, language, dressing style; and environmental – refer to one's beliefs about maintaining and preserving the environment for the wellbeing of both the current and future generations.

The various types of sustainability are also considered values. For example, respect for nature is about promoting behaviours, attitudes and beliefs to save nature from misuse, pollution and destruction. Therefore, in the context of this research, values go beyond this traditional definition to include values related to sustainability. Table 1 maps the various values to the types of sustainability implied through them.

Important values	Sustainability category	Source
True friendship, mature love, self-respect, happiness, inner harmony, equality, freedom, pleasure, social recognition, wisdom, salvation, family security, national security, a sense of accomplishment, a world of beauty, a world at peace, a comfortable life, an exciting life.	Personal, social, cultural, environmental, and economic	Rokeach values survey items (terminal values) (Dunlap & Rokeach, 1983)
Cheerfulness, ambition, love, cleanliness, self-control, capability, courage, politeness, honesty, imagination, independence, intellect, broad-mindedness, logic, obedience, helpfulness, responsibility, forgiveness.	Personal	Rokeach values survey items (instrumental values) (Dunlap & Rokeach, 1983)
Self-direction, stimulation, hedonism, achievement, power, security, conformity, tradition, benevolence, universalism.	Personal and social	The Schwartz survey (Grunert & Juhl, 1995; Karp, 1996; Thøgersen & Grunert-Beckmann, 2001)
Cooperation, caring, honesty, love, respect, faith, beauty, trust, integrity, wisdom.	Personal, cultural, and social	(Inc. 2013)
Life, happiness, love, peace, freedom, safety, intelligence, respect, equality, justice, nature, health, reliability, peace, freedom, safety, responsibility, constitution, Integrity, human-friendliness, empathy, loyalty, justice, modesty, respect for nature, responsibility-awareness, realism, humane idealism, positive creativity, intelligence (basic natural human virtues).	Personal and social, economic, cultural, and environmental	(Hilrich 2014)
Self-respect, security, warm relationships, sense of accomplishment, self-fulfilment, well-respected, sense of belonging, fun and enjoyment.	Personal, social, and cultural	(Kahle and Kennedy 1988)

Table 1.   Important values and types of sustainability principles

The concept of values as such is complex. People and cultures might disagree about which values are important. We take the position that values related to sustainability are positive and should be encouraged.

3 DIGITAL GAMES

Digital games refer to an activity, primarily for entertainment, supported by digital media, that follows rules, and can be played by one or more people (Kramer, 2000). Digital games include mobile applications for entertainment that are easily available today through various ubiquitous devices. There are several types and categories of research on different types of games including digital learning games, serious games, game-based learning, applied games, and edutainment games (Crookall 2011; Dijk 2014). For this research, we use the general term - digital games.

Digital games are being used in a variety of contexts including research, entertainment, simulating real life scenarios, and sports training. This prevalence of digital games in various aspects of our lives has made them a persuasive force in our society (Bogost 2006). Young and Whitty (2010) find that gamers' offline behaviours tend to change in response to virtual experiences. This is because the normal human tendency is to seek psychological parity across virtual and real worlds. Digital games are therefore labelled as instrumental in moulding real world habits and values in players (Baranowski, Buday, Thompson, and Baranowski 2008). An example of an application for this is the game Energyville developed by Chevron and the Economist group. Energyville promotes sustainability and the principles of sustainable development (economic, environmental and security impacts) in a virtual city.

Digital games in learning, is central to this research. Theories of digital game based learning suggest that digital games are not only persuasive in terms of real and virtual world parity; but also a medium to foster complex values. Teaching values through games is however not as straight forward as teaching standard concepts. The subjective nature of values lends itself to the need for a game generating platform rather than a rigid inflexible game itself.

4 EARLY CHILDHOOD

According to UNESCO, early childhood refers to the years from birth to age 8; a period when remarkable brain growth takes place, laying the foundation for subsequent learning and development (UNESCO 2015).

Researchers find that children begin to absorb values early on in life (Halstead and Taylor 2000) and that we probably develop a moral sense within the first two years of life (Buzzelli 1992; Kagan and Lamb 1987). This in turn is closely linked with our emotional and social development (Dunn 1988; Kuebli 1994). Most of this learning takes place during play.

Play is defined as a fundamental "field of experience" in the early childhood phase of life (Farné 2005). Verenikina and Harris (2003) find that play is located at the heart of most curriculums today as it is seen to benefit children's psychological development. In fact, play takes the shape of a ''didactic device'', that is, our identity also depends to a major extent, on the games we played in our childhood, and on how much we played (Farné 2005). Psychoanalytic perspectives also explain the value of play in allowing children to express negative emotions that relate to situations in which they have no control in their day to day lives. Play is seen to provide a safe context for expressing these emotions and gaining a sense of control (Erikson 1963; Freud 1959; Mead 1934).

This importance of play in early childhood implies both the impact and potential of digital games as a medium of play. As a result, Verenikina and Harris (2003) propose a set of criteria by which early childhood educators may judge the developmental appropriateness of computer games for children. While this is a great tool to have, our responsibility as researchers in the information systems discipline is to focus on the root of the problem. We need to focus on exploring and designing tools and guides that may be used by digital game designers to create digital games that are developmentally appropriate for the early childhood context.

5 DESIGNING VALUES-BASED DIGITAL GAMES FOR EARLY CHILDHOOD

Digital games entail a variety of components including game mechanisms, characteristics, and narratives; each with the potential to elicit values. A handful of researchers have looked at mechanisms for a more values conscious design of digital games (Abdullah and Ismail 2015; Baranowski et al. 2008; Belman and Flanagan 2009; Belman, Nissenbaum, Flanagan, and Diamond 2011; Schrier, Gibson, and Global 2010). The most comprehensive literature on values in digital games is Flanagan and Nissenbaum's (2014) book on "Values at Play" that discuss the existence of values in every digital game. They present a framework for identifying socially recognised moral and political values in digital games, and propose a framework for identifying values embedded in specific games. While their frameworks are a starting point, there are no concrete guidelines for the design of values-based games for specific player groups such as young business leaders, early childhood, and sports teams.

Leveraging games to foster values also has some commonalities with teaching basic literacies, however, fostering values and teaching behaviour is better done through digital games. Djik's (2014) thesis demonstrates that when compared to a presentation, a digital game is more effective in demonstrating a specific set of behaviours. In the game, people experience the behaviour, while in a talk or presentation, they only gain a theoretical understanding. Models of game based learning (Garris, Ahlers, and Driskell 2002; Tan, Ling, and Ting 2007) may therefore be leveraged and improved upon to guide the design and development of values-based digital games. The various levels of learning (Presnky 2006) in games may also be explored and considered in the design of values-based digital games. Prensky (2003) explains that learning in digital games ranges from basic concepts to deep and interesting learning that is facilitated by decision points in the game. The ultimate level is where game players learn to make values-based moral decisions. This is what game designers need to consciously tap into to create values-based digital games.

Further, most of the conceptual artefacts (concepts, models, and frameworks) on values-based digital games are not supported by sufficient evidence of their implementation. For example, Belman et al. (2011) explain the use of the "grow-a-game value cards" to create values-focused designs but there is limited discussion on the system artefacts (for actual implementation) used. Similarly, Schrier et al. (2010) outline methodologies for designing ethics conscious games, but discussion on the system artefacts used is lacking.

Last, but not least, the focus of most of the existing literature on values-based design of digital games is on designing individual games versus designing a platform that can then be used to customise digital games with preferred values. This would enable designers to not only customise to the specific player group, but also take into consideration the subjective nature of values.

The objectives of this research are therefore to:

RO1: Identify problems, issues, and requirements for the design of values-based digital game platforms for the early childhood context.

RO2: Propose context specific concepts, models, processes, frameworks, and architectures that fulfil the requirements established in RO1.

RO3: Build a flexible, evolvable, and customisable values-based digital game platform for early childhood that supports the above conceptual artefacts using design science principles; and

RO4: Validate the conceptual and system artefacts using design science, qualitative and quantitative methods.

6   A PLURALISTIC RESEARCH METHOD

The requirements for the analysis and design of a values-based digital game platform for early childhood calls for a pluralistic and multi-disciplinary research method. This research builds upon different strands of literature: Information systems (design and implementation of digital games), Psychology (development and motivation), and Education (to understand how values are fostered through digital games). The philosophical assumptions guiding this research will be a combination of interpretive and critical research due to its exploratory and design nature.

A multi-methodological approach is best suited for the outlined research objectives and multi-disciplinary nature of this research. The development of a system points towards the multi-methodological approach proposed by Nunamaker, Chen, and Purdin (1991) as it is open to various combinations of methodologies. The specific research methodologies applicable to this study are design science research (Hevner, March, Park, & Ram, 2004) supplemented by qualitative research (Myers, 1997). Figure 2 illustrates an adaptation of Nunamaker et al.'s (1991) multi-methodological approach relevant to this research.
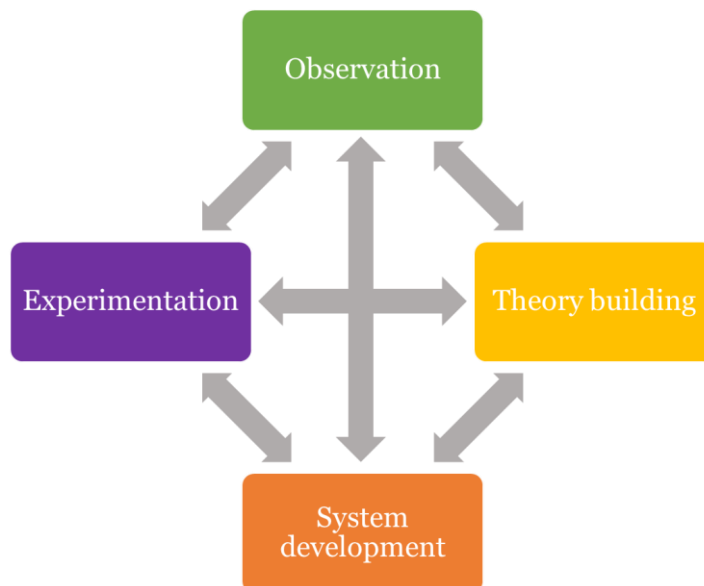

Figure 1.   Multi-methodological framework (Adapted from Nunamaker et al. 1991).

The first objective of this research is to identify problems, issues, and requirements for the design of values-based digital game platforms. This involves a comprehensive literature review under the observation phase of the research methodology to establish the gaps and foundations to build this research on. The second objective is to propose concepts, models, processes, frameworks, and architectures that fulfil the requirements established in RO1. This will take place in the theory building phase of the research methodology. The third objective is to build a flexible, evolvable, and customisable values-based digital game platform that supports the above conceptual artefacts using design science principles. This will be done under the system development phase and experimentation phase where the application of the artefacts will be assessed. The fourth objective is to validate the conceptual and system artefacts using design science, qualitative and quantitative methods. This will involve a reflection of the literature review (observation), testing the artefacts (experimentation) and revision of the conceptual and system artefacts i.e. further theory building and system development.

7 LIMITATIONS AND FUTURE RESEARCH

This research agenda is fairly novel in the IS discipline, and one that is rather subjective as it involves values. A major limitation of this research is that it involves children. This will make it challenging to test any design prototypes and collect feedback on the effectiveness of the design. In terms of future research, the vision of this research goes beyond the early childhood context. The aim is to extend the design platform created to build a variety of digital games for different contexts.

The next steps in this research are to continue gathering literature on the topic to synthesise conceptual artefacts such as models and frameworks. These artefacts will then be used to guide the design of relevant system artefacts. The system artefacts and conceptual artefacts will continue to be revised and improved as the research progresses. The artefacts will eventually be validated by creating a values-based digital game platform as well as games.

Future researchers and designers may test and validate the efficacy of the design platform as this goes beyond the objectives and design science methodology to be used in this research. Researches can also use the findings of this research to extend both the literature and tools for the creation of values-based digital games in other contexts. Some examples of important contexts include communicating organisational values to young business leaders, sports teams, diverse organisational teams, and university student groups.

8 CONCLUSION

This multi-disciplinary research aims to design, implement and validate a framework and system platform for creating values-based digital games for the early childhood context. The research will address the issues of the lack of research on values-based design of digital games in the early childhood context, and the lack of artefacts for actual design and implementation of values-based digital games for early childhood.

The research will therefore contribute to new knowledge in the area of digital game design and implementation, proposing various conceptual artefacts that may be leveraged by future researchers. In terms of practical contribution, the research will provide the ground work for creating a rigorous platform that allows users to design and implement simple digital game scenarios that teach complex topics of sustainability and values in the early childhood context.

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