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Serious Games as Social Innovation: Case Hong Kong 2003-2017

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This article investigates existing digital games that are developed and used in Hong Kong to serve the local community and tackle various educational, social, and environmental issues. An online review and interviews of experts in the field found that 517 games were used and developed in Hong Kong. The games are mostly available online for free use. In this article, a categorisation of fourteen domains is proposed based on the games' general themes and learning goals. This article discusses some examples of the games in the review, and explores the existing potential of serious games as social innovation in Hong Kong.

#Social Innovation

#Serious Games

#Hong Kong

#Educational Games

#China

Introduction

Social innovation encompasses a range of practices and strategies that aim at the betterment of a society, often in respect to the less privileged. It is a loose concept that in the field of design research and practice helps to unpack how design and innovation, or perhaps *design innovation*, tackle social issues that force us to steer away from mere designs and business models not only to the end users but to larger societal concerns as well. Social innovation “usually implies a normative approach that something positive is created for the society” (Osburg 2013, 17).

Meanwhile, the concept *serious games*, which Clark C. Abt coined in 1970, covers games that address changes in player behaviour or thinking instead of serving only to entertain. In the contemporary games industry and games research, serious games are defined very similarly as “games that do not have entertainment, enjoyment, or fun as their primary purpose” (Michael and Chen 2006, 21). They merge a goal of education, motivation, and/or behavioural change with the *fun of gameplay* (Rittefeld, Cody and Vorderer 2009). While several terms—such as *applied games* or *games with a purpose*—are used to refer to this body of games, this article adopts the term *serious game* given its current popularity both in the industry and academia.

From the perspective this paper adopts, social innovation allows us to examine how a specific society addresses social issues through design innovation or through what could then be called *social design*. This article proposes a review of serious games as social innovation, or social design, and establishes the areas in which serious games tackle local problems and topics instead of merely targeting individual users in the context of Hong Kong S.A.R., China (HKSAR). It, therefore, looks at the societal potential and meaning of serious games rather than focusing on an

individual analysis or a study of their form and features. While social innovation at large covers both new solutions that address social challenges and the related means of reaching such ends (i.e. business models and market-based mechanisms) (Osburg 2013), here the focus is on the solutions only. Specifically, the article reviews the so-called serious games that are created and used in Hong Kong over the period of fifteen years from 2003 to 2017.

Serious games today typically refer to digital games, because digital software is extensively applied to build the connection between entertainment and serious needs such as education, healthcare, awareness raising, and training. Apart from serving as a relaxing and fun pastime, games serve as tools and instruments to shape people’s behaviour and to support learning of various kinds. The global revenue of these digital serious games is estimated to be more than US\$150 billion in 2017 and will rise to US\$200 billion by 2021 (Digi-Capital 2017). Not unlike the rest of the world, China and Hong Kong are part of the movement and actively seek new solutions through digital media and games. Among others, the People’s Liberation Army developed its own game for recruitment and training, *Glorious Mission* (2011), some years after *America’s Army* (2002) made game cultural success aside its recruitment goal. Similarly, regional governments apply games, particularly when addressing younger audiences, as illustrated by a massive multiuser recycling game implemented using a large outdoor screen in the city of Guangzhou (2014), or games that teach basic law in Hong Kong (2003). Understandably, the largest market of digital games in the world also contributes to, and consumes in, the realm of serious games. Hong Kong, further, is an interesting city to examine the use and development of serious games in Chinese speaking regions. Not only are Hong Kong parents the biggest spenders in the world in terms of purchasing education (Gray 2017) –

including digital applications – but the city also stands as an important innovation hub between mainland China and the Western world. Therefore, a study of serious games in Hong Kong serves to examine forthcoming interests and developments in China's software and education technology as well.

From the point of view of social design and innovation, digital games provide a case that invites three main conclusions. First, if we can establish digital games as social design or innovation, we are better off to consider social design hand-in-hand with popular culture and (commercial) creative industries. Secondly, if digital games predominantly target young adults, and the related cultural stereotypes further exaggerate this viewpoint, a question arises whether the means and techniques of social design should be generation-specific. Serious games tackle social issues of various domains that range from elderly care to rehabilitation and raising environmental awareness. Therefore, to look at serious games as social design allows us to consider the generational aspects of it without marking their design purely related to adolescence. Lastly, and perhaps most importantly, considering games as social innovation suggests that social innovation and design can be, and currently is, addressed through one of the most fundamental tendencies of the human species, our continuous interest to engage in play. As such, the *play-element*, as cultural historian Johan Huizinga (1949) called it, can be leveraged in the often serious aims of social design.

In the pursuit to approach serious games as social innovation and establish their value as *social design*, this article investigates existing serious games developed and used in Hong Kong. This paper follows a liberal definition according to which “a serious game is an interactive computer application, with or without a significant hardware component, that has a challenging goal; is fun to play and/

or engaging; incorporates some concept of scoring; imparts to the user a skill, knowledge, or attitude that can be applied in the real world” (Bergeron 2006, xvii). Therefore, the development of serious games’ concerns with “applying games and simulations technology to non-entertainment domains” (Zyda 2005, 30) and thus utilise “the artistic medium of games to deliver a message, teach a lesson, or provide an experience” (Michael and Chen 2006, 23). Such an *artistic medium* includes a set of tools that range from attractive graphics, interface conventions, stories, and special effects, to music and, most fundamentally, incorporates engaging game mechanics that provide challenges as well as timely and accurate feedback to the player. The specific ways in which games motivate or engage are comprehensively discussed by James Paul Gee (2003) and Ian Bogost (2006), among others. Regarding the numerous ways in which serious games elicit positive impacts, Connolly *et al.* (2012) provide an extensive review that discusses impacts with the related empirical evidence. The study of whether any such impact results from playing the games gathered for this review is outside of its focus, however. Furthermore, while Bergeron’s definition arguably applies to entertainment games alike, serious games here are defined as those games that were created with a specific real world application in mind and whose dissemination explicitly includes an aim to provide such a useful “skill, knowledge, or attitude” to the user (Bergeron 2006, xvii).

For the research at hand, an online review and interviews of experts in the field helped to identify more than 500 games that were used and developed locally in Hong Kong between the years 2003 and 2017. The quantity is not trivial and alone serves to suggest a steady interest in the field. In what follows is a categorisation and preliminary analysis of the games, followed by a discussion about the comprehensiveness of this review. As the focus lies in social design and innovation, this study will categorise the games into areas of social importance and discuss their influence within these respective sectors.

Methods

In order to map out as many locally made and used serious games as possible, the study applied various search methods. These included: 1) online searches using Google search engine; 2) searches in App Store and Google Play; 3) direct email contacts with local developers and professionals; 4) inquiries posted on local game-related online forums and groups, such as Hong Kong Game Development Group on Facebook and Heha Game (<http://hk.hehagame.com/>); 5) searches on the websites of major research and development funding bodies (such as Innovation Technology Fund, STEFG-PolyU China Entrepreneurship Fund, and PolyU MicroFund for Innovation & Entrepreneurship); 6) searches on the websites of special schools and organisations (such as Hong Chi Association and Heep Hong Society); and 7) searches on websites for local Non-Governmental Organisation (NGO) and other organisations with a specific focus on serious games and their development (such as Hong Kong Digital Game-Based Learning Association and university departments that conduct game design and research).

In terms of search engine queries, initial searches used the following keywords both in English and in traditional Chinese (Cantonese): *serious game*, *digital game-based learning*, *learning game*, and *educational game*. These keywords were used in combination with the keyword *Hong Kong*. The vast majority of games were identified through the primary Google search and through methods # 2–7. However, as the initial search and interviews indicated specific focus areas to be of particular interest, further searches used the following keywords in both languages: *English learning*, *e-learning games*, *healthcare games*, *senior care*, *self-care*, *cultural learning*, *language learning*, *marketing games*, *advertisement games*, *autism*, and *AD/HD*. The last two searches were based on results from expert queries. We added three

further searches because we did not identify any games that belonged to these categories in the other searches. These were *corporate games*, *poverty*, and *gender equality*. All keywords were combined with additional keywords *Hong Kong* and, if applicable, *games*.

Based on the searches that were repeated twice within a six-month period, the study identified 517 games, of which 171 are for mobile devices, 298 games for web, forty-two for PC or Mac, and six that are digital installations. Some of the games utilise additional peripheral devices and technologies such as Microsoft Kinect or augmented reality tags. The majority of the games are free for download online.

After identifying the games, we played each game (if available), collected basic information (such as the game's developer, year of release, language, and platform), and identified any related tags. Through several iterations, the study established serious game categories based on the games' suggested serious goals and themes, and the already listed tags. The goals and themes were derived from the related online material or from the game's description. The categorisation is solely based on each game's domain area, not the target audience or the type of (learning) activity (i.e. problem-solving or physical exercise) in the game. Since this article does not discuss how successful the games were in changing the player's knowledge, perspective, or behaviour, the study conducted no further analysis at this stage. Instead, the focus of the paper is to provide an understanding of the pervasiveness of serious games development in Hong Kong, of the prominent areas of interest, as well as the organisations behind the games.

Such coding resulted in the clustering of games. Variations of the categorisation were created throughout the process. The final categorisation aimed to provide domains that are both mutually

exclusive and inclusive enough to have more than a few games out of the total 517 under each. The process followed strict partitioning clustering so that each game belongs to one category and to none of the others.

Categorisation

The identified games were divided into fourteen categories. These include a wide range of domain areas from health and special needs to public security and civil engineering. The majority of identified games, nearly 50%, fall under three main categories: Health and Medical; Language; and Law and Politics as they relate to one another. The focus being in social design and innovation, it is worth mentioning that a large proportion of the games are related to awareness raising and training. In order to focus on the games that specifically address public and societal issues (i.e. social innovation) this article discusses games in seven selected categories: Energy and Environment; Health and Medical; Law and Politics; Personal and Public Safety; Public Services; Special Education; and Values and Ethics.

Serious games designed for energy and environment

Given the growing global and local interest in environmental protection, many groups and non-profit organisations have taken measures to raise people's awareness through novel means. Out of total 517 games, thirty-eight games focus on energy-saving, environmental protection, and animal care. A majority of these are created by two government departments: Electrical and Mechanical Services Department (HKSAR) and Environmental Protection Department

(HKSAR). Among others, *PBS Charging* (2015) is developed by the Environmental Protection Department of the Government and aims to enhance the public's understanding of charging money for plastic shopping bags and its exemption arrangement. The category further includes several games that tackle ways to save energy. *Switch-Off After Use To Save* (2011) and *Voluntary Energy Efficiency Labelling Scheme* (2011) are examples of energy-saving games that are available for use through an Internet browser.

In respect to nature protection, games produced by Hong Kong Wetland Park come with a special local focus. The wetland park itself is recognised as an internationally significant wetland, and one of the major stops for up to 100,000 migratory birds. However, it is severely threatened by air and traffic pollution. A series of games including *Sumibear* (2011; 2014), *Migration Challenge* (2010), *Track It Down* (2010), and *Nature's Concerto* (2010) aim to enhance teenagers' awareness of nature conservation. Hagao Studio, a local start-up company also developed a mobile game, *Featherman* (2015), that aims to attract people's attention about wetland conservation protection.

Carbon Raider (2014), which combines exercise with environmental education, *Feed4Life* (2012), which concerns food waste, and *GreenXity* (2012), which helps to understand one's carbon footprint, all address environmental protection and were created by XNT Limited. As such, they stand out as some of the few commercial games in this survey.

Serious games designed for health and medical

The study found that fifty-nine games addressed health or medical care as a topic. Games in this category address senior citizen wellbeing, family planning and sex education, mental health, and physical rehabilitation. Also included in this category are games about healthy lifestyle and healthy eating, as well as those that address obesity. Most games in this category were developed or commissioned by government departments such as Leisure and Cultural Services Department, or societies such as the Hong Kong Society for the Aged or Hong Kong Alzheimer's Disease Association.

To provide some examples, the mobile game '1069 試帶樂' ("1069 Testing," 2011) developed by the Red Ribbon Centre of the Department of Health, provides information on local access to free condoms and HIV testing. Eight games by the Family Planning Association of Hong Kong focus on different aspects of sex education, such as sexual protection, consent, and sexual health.

Several games in this category focus on healthy lifestyle. *Student weight for height check and Lose weight—slimming!* (2016) encourages users to exercise. More specialised domains, such as *Professor Gooley & The Flame of Mind* (2012) focuses on mental wellbeing and mutual communication and was developed by the Hong Kong Jockey Club Center for Suicide Research and Prevention in collaboration with the University of Hong Kong.

As examples of rehabilitation games, *Cockroach Invasion* (2012), *Good View Hunting* (2012) and *Hong Kong Chef* (2012) utilise the Microsoft Kinect platform to offer upper limb, lower limb, and trunk balance training and support multi-play. Cognitive stimulation is the theme of *Six Art Fun App* (2011), a mobile game developed by Hong Kong Alzheimer's

Disease Association. The game utilises the six traditional Chinese art elements as a basis for game design.

We can conclude from the above review that existing health-related games that are developed in Hong Kong target both the general public and a range of specialised audiences. These games range from rehabilitation and personal development to awareness raising and youth education. Furthermore, they were developed by government departments, universities, and associations that serve a single, underprivileged minority.

Serious games designed for law and politics

HKSAR law and legal matters and larger political considerations are the main domain of seventy-four games in this review. Independent Commission Against Corruption (Hong Kong) is behind more than fifty of these, and it aims to promote corruption-awareness among children and teenagers. In these games, players are encouraged to take on various roles, from evidence-gathering and field investigation to arresting criminals. All of them are web-based.

Another major sub-category in this domain includes games about Hong Kong legislation. These games are mainly produced by the Legislative Council of the Hong Kong Special Administrative Region of the People's Republic of China and The Constitutional and Mainland Affairs Bureau (HKSAR). *Basic Law Game* is a series of web games with sequels that are announced annually. While the game mechanics follow simple quiz structure, these games incorporate external coupon rewards and community functions. As such, they are some of the most advanced and extensive games included in this review. Interestingly, the oldest games

in this review belong to this category and were created by the HKSAR government. *Quiz on Article 23* (2003) and ‘國家安全考考你’ (“National Security Examines You,” 2003) both focus on the controversial and highly protested Hong Kong Basic Law Article 23, which discusses enacting laws that “prohibit any act of treason, secession, sedition, subversion against the Central People’s Government” (Hong Kong Basic Law), and is therefore closely linked with national security.

The category of serious games for law and politics also includes one protest game, *Yellow Umbrella* (2014), which addresses a specific moment in Hong Kong’s recent history. It portrays a clash between protestors and the police force during a series of sit-in street protests that took place in 2014. The game is available for smartphones that run Android or iOS.

Serious games designed for personal and public safety

Fire safety, road safety, gas safety, electrical safety, escalator safety, amusement park safety, construction site safety, and slope safety are all covered by serious games developed in Hong Kong. As games in other categories, many of these games result from government initiation and reinforce knowledge around specific policies and guidelines that target the general public. These games build general preparedness and teach how to act in case of an emergency. Among others, *Stay Calm & Collected* (2014) focuses on fire safety and *Safe Rider Game—Safe Use of Lifts and Escalators* (2011) teaches how to travel safely using lifts and escalators.

Serious games designed for public services

Six games share themes related to Hong Kong public services, including postal services, building maintenance, public transport and tunnel services. *Which Address is Correct?* (2015) helps users to properly format postal addresses, *Railway Builder* (2012) allows players to excavate tunnels, and *PARKnFUN* (2008) allows users to practice steering a bus into a correct parking space.

Serious games designed for special education

Games for special needs are among those that receive significant government funding and interest NGOs. For example, Hong Chi Association released a series of mobile and web-based games to provide proper training related to emotional development, language skills, and interpersonal communication for children with attention deficit hyperactivity disorder (ADHD). Hong Kong Jockey Club Project C-REHAB provides a range of games, such as ‘普通話區’ (“Putonghua District,” 2014), that address language disabilities and intellectual disabilities. This category also includes several games for children with visual impairment produced by the Ebenezer School & Home for the Visually Impaired. Heep Hong Society has produced one fourth of the games in this category, including games to support speech therapy (*Games to Discriminate Sounds*, 2009), to train executive functions (*The ADHD Hero*, 2014), and games for children with autism spectrum disorder (*LetSTalk*, 2012). This category includes forty-five games.

Serious games designed for values and ethics

The domain area of values and ethics encompasses thirty-six games that teach youth positivity, honesty, fairness, sportsmanship, perseverance, business ethics, and courtesy, among others. The Hong Kong Independent Commission Against Corruption (ICAC) is responsible for most of the games in this group and the games are all web-based. “All for Integrity”—*Gee-dor-dor Party on Fairness* (2015) is about sharing with friends, while *Fight against corruption in school* (2014) presents a story about how corruption could take place in school settings. *Courtesy Bus Journey* (2008) is a game developed by the major local bus company, Citybus Limited & New World First Bus Services Limited, to teach about proper behaviour when traveling by bus.

Conclusions

This article presented a review of serious games made and used in Hong Kong during the past fifteen years and identified more than 500 games that were divided into categories based on their domain area. The review serves to suggest that digital games are taken as a worthwhile tool for education, training, and awareness raising in Hong Kong. They therefore contribute locally to social design and innovation. A large number of such games are produced by the local government, but commercial companies as well as schools, societies, and organisations actively create or commission serious games as well. The review also shows that even though very few games gain wider public visibility, the range of available games and interested parties is wide. Games are developed to make a contribution to the local society in all sectors. Platforms used for the games vary and games are typically available for free use years after their launch. In a closer study it would be important to study the use of these games, as well as the actual motivations

and interest behind their creation. It is justified to say that public funding is used to develop a lot of serious games in Hong Kong, and local funding bodies believe in their potential. As games are often created during specific campaigns and multiple games are the result of individual projects, some years stand out from the review. However, based on this review, there has been a steady supply of locally created serious games between years 2003 and 2017, and there is no particular reason to suspect the trend is likely to fade away any time soon given the global growth of the industry.

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Bio

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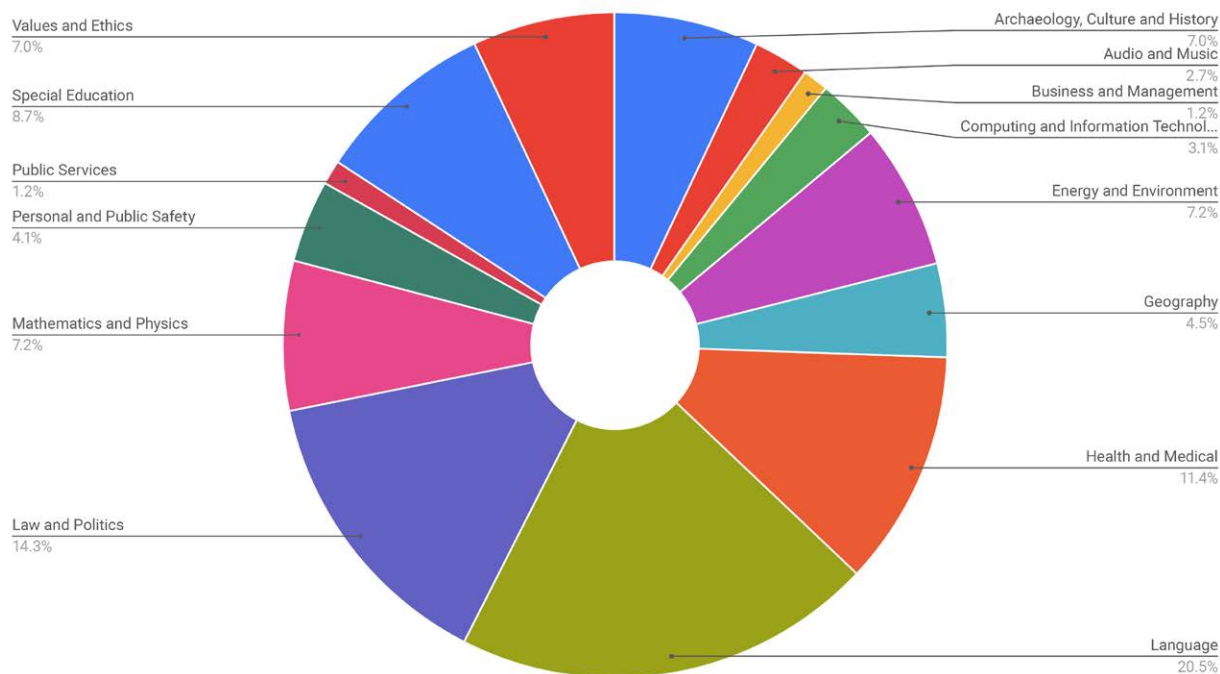


Chart 1 (this page, top): Domain Categorisation, Serious games domain categories. Source: *Author*.

Chart 2 (this page, bottom): Purposes, serious games purpose categories. Source: *Authors*.

