YAŞAR UNIVERSITY

INSTITUTE OF SOCIAL SCIENCES

MASTER THESIS IN ART AND DESIGN

GAME DESIGN AS A TOOL OF MORAL RESPONSIBILITY

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Thesis Advisor

Asst. Prof. İsmail OKAY

İzmir, 2017

THESIS JURY CONFIRMATION PAGE

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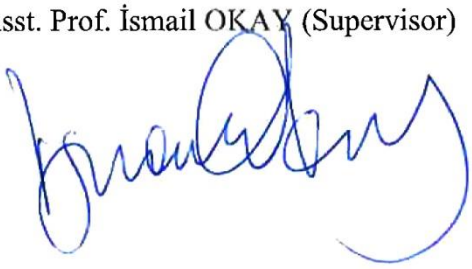

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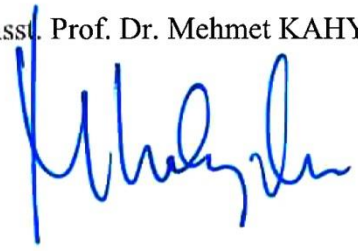

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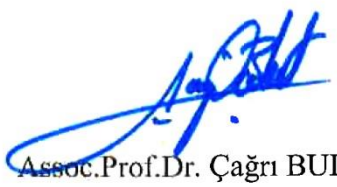

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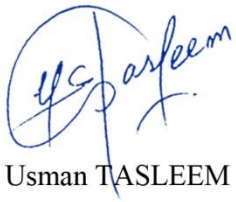
TEXT OF OATH

I declare and honestly confirm that my study, titled "Game Design as a Tool of Moral Responsibility" presented as a Master's Thesis, has been written without applying to any assistance inconsistent with scientific ethics and traditions, that all sources from which I have benefited are listed in the bibliography, and that I have benefited from these sources by means of making references.

13/01/ 2017



Usman TASLEEM

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Izmir, 2017

PREFACE

It is expected that the study will have important insights on the value of game designs as a tool for enhancing moral responsibility among users. It will reveal of how game design offers entertainment as well as educational capacity. The study will trace the history of games mainly in the cell phone market. It is an in-depth description of the gaming technologies and their ability to enlighten as well as promote social and moral responsibility.

Ideally, the use of technology for purposes entertainment is not going to end anytime soon. People are likely to continue playing games on their cell phones in fact; games are important features of the mobile phones. The study is likely to enlighten game designers understand why they should include educative features that enhance moral responsibility. Fascinating designs of games will still continue being the core marketing features of a cell phone. However, the game designers should be socially responsible individuals who should seek to enhance social and moral responsibility from the concept art to the gameplay among other features of the game design.

ABSTRACT

Master Thesis

GAME DESIGN AS A TOOL OF MORAL RESPONSIBILITY

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Art and Design

The basis of this research lies in an examination of how game design can potentially integrate with relevant learning methods in an educational spectrum to develop games that simultaneously serve educational and entertainment purposes alike. This endeavor is crucial because, the future digital technologies, computers, and games have significantly changed, and we now have greater tools at our disposal for interactive playing. In an increasingly digital age, the digital technology could contribute to creating a better, morally conscious society, but the central impediment lies in the game industry's efforts and focuses on earning maximum capital in a short time span. Therefore, it is not very surprising that the most lucrative titles in the mobile game industry are war-centric such as Clash of Clans, Game of War or the Call of Duty series. In the last two decades, mobile games have been a mass media target.

Lack of social responsibility has proved that most games do not usually support reflective thinking or create awareness. Thus, this thesis undertakes the task of presenting an educational game design prototype which supports the argument that games can not only be specifically designed for entertainment but can also be designed to raise moral awareness in their users. The experimental game model with the research examines the potential in game design as a tool for raising awareness of emerging issues such as climate change, fresh water scarcity, deforestation, population growth and endangered wildlife. This research not only scrutinizes the academic and technical aspects but also brings the author's experience of several years in the game industry to shed light on the increasing need for incorporating social responsibility and moral consciousness in future game designs.

Furthermore, during this research new knowledge about educational games and user experience has been achieved. The study also contributes to learning environmental problems by stressing on global warming. It is anticipated that this study and the experimental game model communicates and contributes to an understanding of the import of inculcating ethics in video games and pave the way for productive dialogue between players, developers, and academics.

Keywords: Mobile Games, Social Responsibility, Ethics, Environmental Problems

ÖZET

Yüksek Lisans

AHLAKI SORUMLULUK ARACI OLARAK OYUN TASARIMI

Usman Tasleem

Yaşar Üniversitesi

Sosyal Bilimler Enstitüsü

Sanat ve Tasarim

Bu araştırmanın temelinde; oyun tasarımının eğitim ve eğlence amaçlarına aynı anda hizmet eden oyunları geliştirmek için, oyun tasarımının potansiyel olarak ilgili öğrenme yöntemleriyle entegre olabileceği incelenmektedir. Bu çaba çok önemlidir, çünkü gelecekteki dijital teknolojiler, bilgisayarlar ve oyunlar belirgin bir şekilde değişti ve etkileşimli oyun için elimizde daha büyük araçlar var. Dijital çağda gittikçe artan bir şekilde, Dijital teknoloji ahlaki açıdan daha iyi, bilinçli bir toplum yaratmaya katkıda bulunabilir. Ancak merkezi engel, oyun endüstrisinin çabalarında yatmaktadır ve kısa bir süre içinde maksimum sermaye kazanmaya odaklanmaktadır. Dolayısıyla, mobil oyun endüstrisindeki en kârlı başlıkların; Clash of Clans, Game of War veya Call of Duty serisi gibi savaş ağırlıklı olması şaşırtıcı değildir. Son yirmi yılda mobil oyunlar kitlesel bir medya hedefi haline geldi.

Sosyal sorumluluk eksikliği, çoğu oyunun genellikle yansıtıcı düşünceleri desteklemediğini veya farkındalık yaratmadığını ispatladı. Bu nedenle, bu tez, oyunların sadece eğlence için özel olarak tasarlanamayacağı, ayrıca kullanıcılarında ahlak bilincini artırmak için tasarlanabileceği görüşünü destekleyen bir eğitim tasarımı prototipi sunma görevini üstlenir. Bu deneysel oyun modeli, iklim değişikliği, taze su kıtlığı, ormanların yok edilmesi, nüfus artışı ve nesli tükenmekte olan yaban hayatı gibi gelişmekte olan konuların farkındalığını artırmak için bir araç olarak oyun tasarımındaki potansiyelini inceler. Bu araştırma sadece akademik ve teknik yönleri irdelemekle kalmayıp, gelecekteki oyun tasarımlarında toplumsal sorumluluk ve ahlak bilincini geliştirme konusundaki artan ihtiyaca ışık tutacak yazarın oyun sektöründeki birkaç yıllık tecrübesini de getiriyor.

Ayrıca bu araştırmada, eğitimsel oyunlar ve kullanıcı deneyimi hakkında yeni bilgiler elde edilmiştir. Çalışma ayrıca küresel ısınmaya vurgu yaparak çevre sorunlarının ve çözümlerinin öğrenilmesine katkı sağlamaktadır. Bu çalışmanın ve deneysel oyun modelinin, video oyunlarında telkin edilen etik içeriğinin anlaşılmasına katkıda bulunması ve oyuncular, geliştiriciler ve akademisyenler arasında verimli diyaloğun yolunu açması beklenmektedir.

Anahtar Kelimeler: Mobil Oyunlar, Sosyal Sorumluluk, Etik, Çevresel Problemler.

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ABBREVIATIONS

3D	Three Dimensional
AI	Artificial Intelligence
CEO	Chief Executive Officer
EPOC	Electronic Piece of Cheese
G4C	Game for Change
GISS	Goddard Institute for Space Studies
GM	Gold Master
IBM	International Business Machines
MAC	Media Access Control
NASA	National Aeronautics and Space Administration
OS	Operating System
PC	Personal Computer
PDA	Personal Digital Assistant
RC	Release Candidate
SDK	Software Development Kit
UAT	User Acceptance Testing
WAP	Wireless Application Protocol

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INTRODUCTION

Games are valuable tools for learning and entertainment. They have a great teaching potential on moral responsibilities if they are designed appropriately well to impart social and moral values among learners.

Moral responsibility refers to the natural feeling of duty even one is unlikely to be noted for uncouth behavior by the public. Moral responsibility goes hand in hand with ethical practice. Ethic refers to the social codes of conduct that are universally accepted. Moral responsibility is more of a philosophical connotation. There has been an increasing concern over the morals that we impart on our children through teaching and entertainment tools such as games. Notably, games have become popular sources of entertainment for young children. It is unfortunate that some gaming designs do not prompt children to be morally responsible beings in the future.

Over the last few decades, there has been an emergence of many games that are designed for the purpose of education as well as entertainment mainly for young learners. Technology makes almost every aspect of life easy. The educational industry has to felt this revolution. Hence, it is important for us to take advantage of the emergent digital technologies for our welfare and that of the future generations. It is unfortunate that many technologies are designed to reap maximally through making work easier, faster and more consistent. Ideally, not every game designer has the moral aspects in mind when they create the games. Some games are mainly designed for entertainment as well as education (Bredemeier and Shields, 1986).

Cell phone games are mainly meant for entertainment. They do not prompt children to think critically and become morally responsible, In fact, that aspect is lacking in many game designs. The value of games to the learning and the entertainment industry cannot be overlooked. In fact, they have had a share of advantages mainly in the learning process among young learners who need a fascinating experience to facilitate their mastery of concepts (Dorn, 1989). It is; thus, critical for game designers to look closer into aspects of moral responsibility such as environmental conservation, drug awareness, and healthy habits. It is easier to mold the behavior and moral sense of responsibility to children when they are young. In fact, they acquire behavior at the critical stages of learning when they are enthusiastic to understand what is in their immediate environment.

Therefore, a careful design of games would go a long way in imparting important social values among them (Tüzün, Yılmaz-Soylu, Karakuş, İnal and Kızılkaya, 2009).

Game designers, educators and curriculum developers may; thus, collude together to determine the features that should be present in game designs that will foster an important sense of moral responsibility among young learners (Schell, 2014). It is a generally accepted fact that the impact of technology will continue being experienced even in the future. Technological advancements have bred a chain of solutions. Similarly, it is also to blame for some unwanted influences. If developers base their innovations on the best aspects and receive support from parents, curriculum developers, and educators, technology will find better meaning. Users and particularly children will grow up with the knowledge on how to use technology to their merit. Denying children a chance to use technology too would curtail their access to modern day trends.

Education besides moral responsibility forms the core of sustainable development in a country. Therefore, it is important to nurture children while they are still young on the reasons as to why they should be socially and morally responsible individuals. Currently, there are problems such as climate change, drug and substance abuse, sexual escapades and global warming among many others. A healthy nation is made up of socially and morally responsible citizens. However, a nation cannot foster a sense of social and moral responsibility to a population that has grown without any knowledge of its value. Concerns have been raised over the potential of games to include material that could aid children to attain a sense of social and moral responsibility. This study sought to determine what may be done to improve the utility of gaming designs to enhance their educational potential to ensure that children attain a sense of moral responsibility.

This study will define that how game designing may be changed to enhance social and moral responsibility among children and how game designers can ensure that the games which they design have appropriate content to enhance the attainment of moral values among children.

CHAPTER ONE

1. History of Mobile Game Design

Mobile games are generally referred to as the games played on handheld mobile devices such as smartphones and Personal Digital Assistants (PDAs) with wireless communication functionality (Taniar, 2007, p.185). Chapter one is a comprehensive review of related literature from other scholars and researchers. It will sample literature on smartphone, the history of mobile games, and evolution of mobile gaming technologies.

1.1. Introductions to Smartphones

The human brain is one of the most exceptional and efficient computing machine ever created. It has been producing wonders by interaction with aided technology. Advancements have been made from room filled sized computers to much more convenient portable devices on the basis of logic, reproducibility with the friendly user interface, powerful processing, and communication abilities to enhance efficient living in our daily routines. The invention of smartphone, which primarily serves as a mobile phone device but also incorporates elements of advanced electronic PDA has been helping us in doing various tasks of a computer. According to the Ilyas M., "*smartphones are optimized for voice and text communication, which enables users to access e-mail wirelessly, browse the Internet, and connect securely to corporate networks.*" (Himmelsbach, 2013, p.9).

The size of this phone is almost same as a regular business mobile phone but with an additional larger touch screen that allows multiple functions, it gets an advantage over the services provided by a standard phone. A smartphone enables it’s user to manage their emails, meetings, calendar, contacts, personal information, instant messaging functions, data synchronization, play audio and video files, a browser for the Wireless Application Protocol (WAP) and install applications of their choice. The improvement was initially introduced by Ericsson R380, the first GSM device to have used Symbian EPOC32 operating system that provides the functions which made it a smartphone (Pantanowitz, Tuthill, and Ulysses, 2012, p.31).

Smartphones are capable of running customized applications that offer personalized business data and can be programmed to manage important business

issues. It can connect to other electronic devices via wireless Bluetooth (Ilyas and Ahson, 2006, p.2-3).

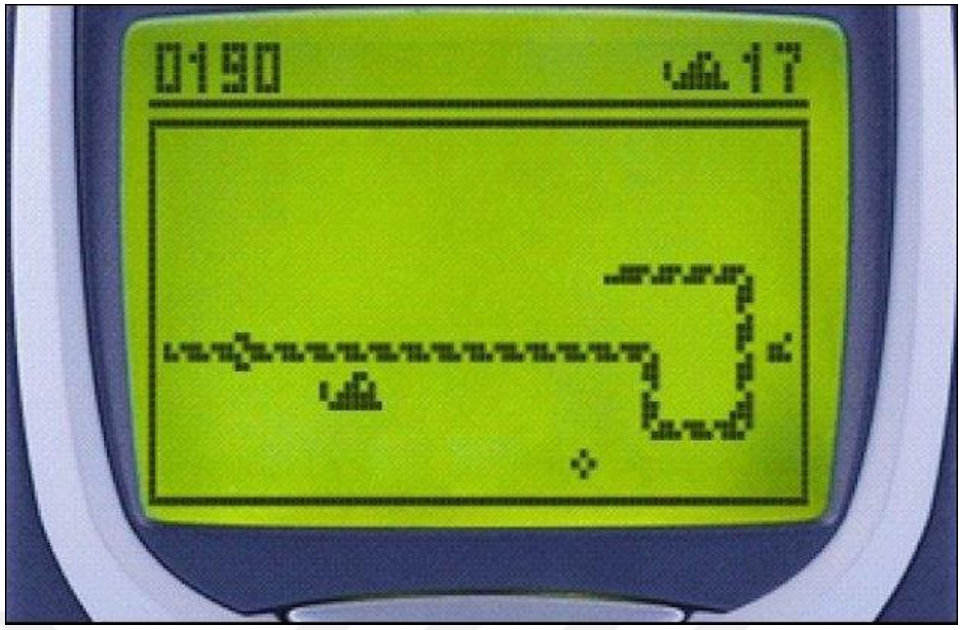
1.2. The Evolution of Mobile Gaming

The evolution of smartphones started back in 1993 by International Business Machines (IBM) called Simon (Wilcox and Aalto, 2009; p.10). Simon phone was the first original effort by the tech industry to design a phone that consolidates sound and data in one device. At the same time, IBM Simon invention performs both the functions of the mobile phone and a PDA. The PDA was first handheld devices that also known as palmtop computers. IBM Simon phone also came with a touchscreen to dial phone numbers and even worked as a fax machine (Reed, 2010).

Photograph 1. IBM Simon Phone, Date Accessed: October 22, 2016, http://www.androidauthority.com/ibm-simon-birthday-134255/

Like any other technological innovation, the smartphone has gone through a chain of improvements to make its games more powerful. The early cell phone models came with simple inbuilt games. In 1994 the first game on a cell phone Tetris was published on the Hagenuk MT-2000 device. According to official records, at least 350 million copies of the game still exist globally in some form or another (Kuorikoshi, 2015, p.48).

In 1997 Nokia Corporation invented it's very own Snake Game in its newly launched handset; Nokia-6110. The snake became world's most popular mobile game across the globe. According to the author, Ahonen Snake was one of the most-played video games of that time (Ahonen, 2008)



Photograph 2. Snake on Nokia 6110, Date Accessed: October 27, 2016, Source: http://gadgets.ndtv.com/apps/news/popular-mobile-game-snake-is-coming-back-689482

A few other mobile games were available in the mobile industry, but mobile games did not really take off until Nokia launched Snake. The success of Nokia's Snake attributed to the popularity of Nokia cell phones in the early twenty-first century. This game was inbuilt with the cell phones and one could not download or play them on their own set of preference. The embedded games on mobile phones were limited to single channel tones and monochrome dot pattern graphics. Device's keypad buttons worked as a controller. Classic Snake on the Nokia-6110 truly created a benchmark, although it was nothing more than just some black pixels moving on few green pixels that set but it was good enough to set off the beginning of a new era. However, this was before WAP technology that took mobile devices to the next level in the mobile game development. Till the year 1998, games were preloaded in the mobile phones since people lacked in the ability to download and run a discrete application with ease. Later, WAP, allowed simple client-server games to be hosted online, which was playable over a WAP browser within the device (Alex, 2011).

In 1999, NTT DoCoMo's I-Mode service launched the first downloadable mobile game in Japan. This feature was a brainchild of the NTT DoCoMo and received utmost enthusiasm by the users. However, it did demand the users to pay for the services. The downloadable capacity made the game popular around the

globe. In the wake of the new millennium when many people were seeking cell phones where they could pay and download small applications like map and games. By the year 2000, NTT DoCoMo's I-Mode service became available throughout the world wherever the handsets and advanced carrier networks were accessible (Dalmau & Sanchez-Crespo, 2003, p.25).

At the end of the 20th century, mobile phones changed the method for communication and also became modern by taking advantage of the technical advancements of the colored display, network bandwidth, fast processing, extra storage, better interfaces, and operating system components. With time it became highly commonly used thus leading towards the onset of technology competitions among the handset manufacturing companies. The inclusion of games in cellphones became a major marketing feature as people often preferred cell phones that had games in it. Therefore; manufacturers were promoted to improve their competitive capacity through including games in their handsets. Others were providing advanced gaming techniques complete with various colors just to attract buyers. In conclusion, the mobile games have become matured in a short span of time. In the new millennium, there was an emergence of power cell phones whose utility was above the ordinary. Hence, they were referred to as the smartphones which was first coined by the launch of Ericsson R380 in the year 2000 (Pantanowitz, Tuthill, and Ulysses, 2012, p.31).

Photograph 3. First Smartphone Ericsson R380, Date Accessed: October 27, 2016, Source: http://www.geek.com/hwswrev/pda/ericr380

Along with Ericsson R380, Palm, Windows Smartphone, and BlackBerry devices were the first to be called smartphones and provided larger screens, stylus-controlled and touchscreens. It was possible to use email and could even browse the web in a limited way. Until the year 2000, mobile games were produced only by the cell phone manufacturing companies. Later on as the

popularity of smartphones gained more attention due to their entertainment capacity, more parties chipped in the industry to introduce downloadable games. The new technologies provided great user interfaces that supported digital use by a third party. In 2011, games became common in Japan, United States and Europe then mobile operators started taking advantage of the most remarkable ability of download and store new applications by distributing their own games. This step pushed the mobile game development to the higher level. The wakes of the new millennium was an especially important era in the development of smartphones and particularly the gaming interface. The game has gone through a chain of improvements to make it better and more user-friendly. Eventually, games became powerful and remained no longer colorblind due to the colored screen display (Mccarty, 2011), (Reed, 2010).

By 2003, titles like Ranging from puzzle games and Virtual Pet were utilizing the camera phone technology with high-quality graphics. In the Virtual Pet by Panasonic, the pets were fed by the photos of food taken with a phone camera. Namco also released a fighting game that took the profile of the player by using the mobile camera to create a character. Furthermore, the character was able to share with another friend's mobile to challenge in the battle. With combination of entertainment and new technologies, cell phone games grabbed more attraction towards the players (Hermida, 2003).

1.2.1. Nokia's N-Gage experiment

Companies must have an effective marketing strategy to take full advantage of the possibilities in the marketplace, and it must make a sound decision about the nature of the product and ways to promote it. In the early 2000s, when there was a broad range of mobile games available in the market, arcade-style games from the past became popular on cell phones, but this time, by observing the customers the games were designed for shorter play sessions. By taking the benefit of arcade games popularity in in mobile devices, in 2003, Nokia created its unique mobile gaming platform N-Gage a mobile phone, with high-quality gaming capabilities. According to the authors Bernal and Merino *"Some mobile phones can play most 'arcade games'. In fact, the average handset comes with at least three games preinstalled. In the technological race to gain more clients, mobile phone engineers are starting to show that mobile phones can also be a convenient gaming device"* (Bernal and Merino, 2006, p.26).

Photograph 4. Nokia N-Gage Phone, Date Accessed: October 27, 2016, Source: https://www.youtube.com/watch?v=m0DCMOFC0R4

N-Gage was a new way to game that was built for hard-core gamers. Soon after the launch, Nokia shipped nearly 1 million units of N-Gage QDs around the world. In the long run, the attempt was unsuccessful due to its poor design and software support. It did not match consumers' expectations for usability and functionality. After feedback from the customer complaints, Nokia redesigned the N-Gage as the N-Gage QD with enhancement. This time Nokia modified battery for longer life, brighter screen, and better gaming controls. Paying attention to the customers' needs in the second series was beneficial in a limited way. Overall, the gaming-optimized device, N-Gage was not a big success, but to some extent it altered the mind of the mobile gamers (Parasuraman, Grewal and Krishnan, 2007, p.6).

Ilkka Raiskinen who has been working for mobile services since the early 1990s, when working with Nokia focused primarily toward the areas of games, music, and media mobile - including the Nokia N-Gage. Ilkka Raiskinen says, "it's not that difficult to create great game devices. Just need a big screen, a battery with the longer backup, and a powerful processor, and then you got to know how to set it in a mobile device. But developing the business model and making money, that's a different story." Regarding Nokia N-Gage, he admitted that "certainly, we made mistakes, and we need to improve our ability to execute." (Steinbock, 2006, p.154).

1.2.2. iPhone and App Store

Considering the future of mobile phones, it is essential to understand how fast a device can improve, and there is no solid example than Apple's iPhone. Apple's iPod, Macintosh, and iTunes were good assets, but this was not all for Apple's success. On June 29, 2007, Apple launched its first iPhone which was designed to be easily controlled by human fingers. Its smooth glass multi-touch screen, powerful audio capabilities made it more attractive to the customers. In the first 30 hours on launch weekend, Apple Inc. sold 270,000 iPhone handsets (Sakas, Konstantopoulos, 2010, p54).

Photograph 5. Apple CEO Steve Jobs Launching the First iPhone, Date Accessed: October 27, 2016, Source: http://time.com/2934526/apple-iphone-timeline/

In 2007, most people in the developed countries already owned phones but a new era of smartphones started with Apple's iPhone which ultimately turned over the mobile industry. iPhone was more than making calls, playing music and accessing the internet which was initially exciting for people earlier. In a limited span, iPhone became highly accepted worldwide due to its greater computing capacities. Certainly, there was no SDK (software development kit) available on the first iPhone released that allows designing applications for the Apple's mobile operating system. Therefore, all the iPhone applications were web based. Later in July 2008, Apple launched App Store, which featured applications for both the

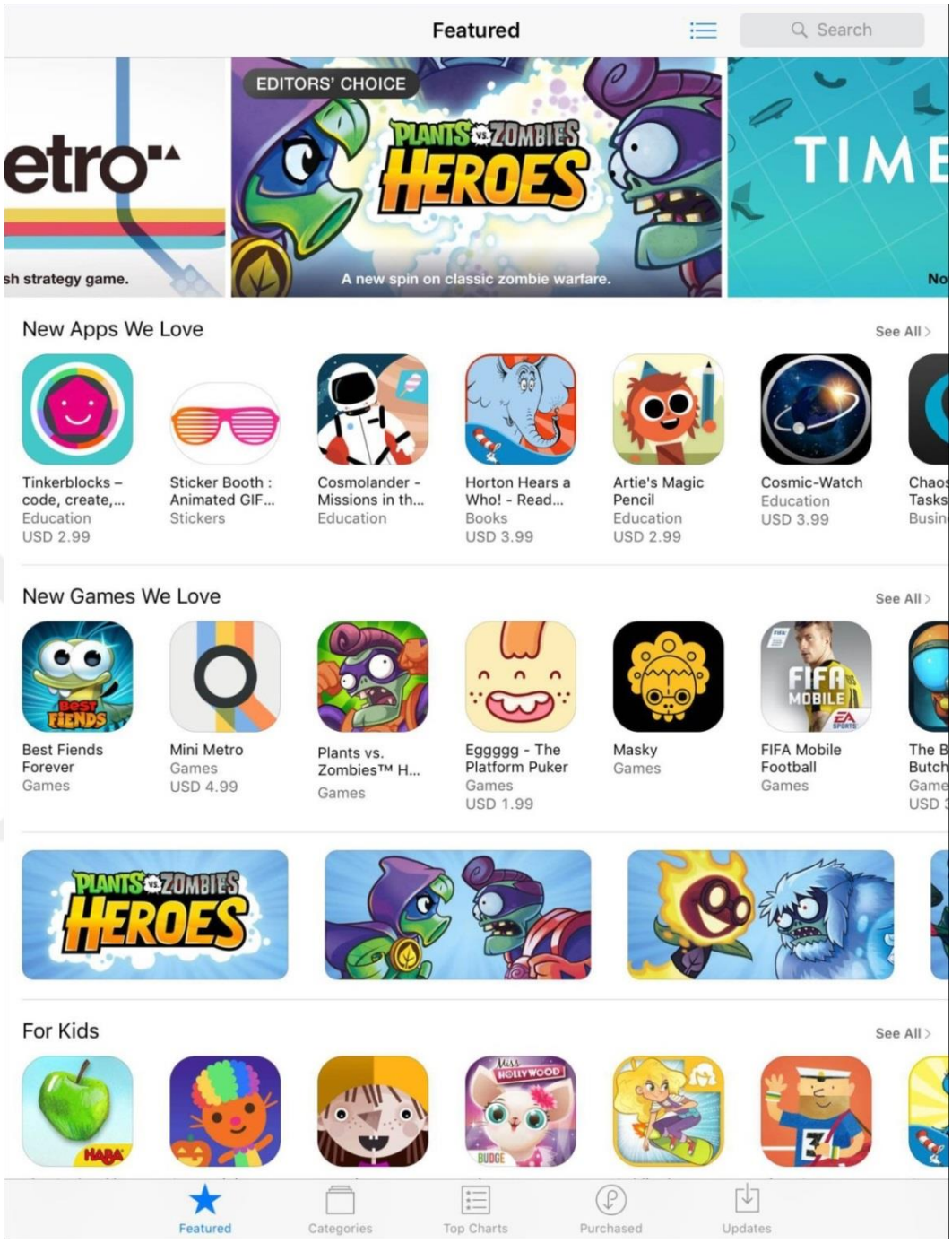
iPhone and the iPod. App Store instantly changed the market by providing the opportunity to download apps from the store to the device. Two months after launch, over 3,000 apps were available in the app store with more than 100 million app downloads. Non-Apple developers could also upload the applications directly to the App Store that gave a chance to the game developers to design more games and made mobile game development business more profitable. Shortly after the launch of App Store, the numbers of commercially hit games increased rapidly (Campbell-Kelly and Garcia-Swartz, 2015, p.187).

Numerous developers are interested in App Store but the performance of a device always remains a primary concern in the gaming industry. While running a game application, mobile phone functions as a gaming console and the processing power of a device define either game can utilize the 3D graphics and physics simulations among other technologies or not. The power of hardware is the most important subject to many game developers and iPhone proved it to be strong in this department. Due to the enhanced hardware capabilities, iphone has more features that allow the game developers to design high-quality games. Since the iPhone 3GS model, iPhone's hardware capability is exceptional due to the faster processors, more memory, and advanced 3D graphics support. iPhone has the support for all the standard game technologies, that can provide graphically rich experiences to its users with the high-quality game art and rich 3D environments (Bakhirev, Wing, and Smith, 2010, p.8).

FIFA 16 Ultimate Team, a football simulation video game by Electronic Arts is one of the examples of modern high-end graphics games. According to the App Store, Fifa 16 has the most realistic set of football features available on the App Store (Electronic Arts, 2016).

Picture 1. Fifa 16 Ultimate Team Graphics on iOS, Date Accessed: October 28, 2016), Source: http://gearnuke.com/fifa-16-ultimate-team-totw-1-revealed-features-ronaldo-payet-guarin/

Now, there is a variety of mobile games available in the market, and these games are becoming a preferred mean of spending leisure time but also a productive business for many people. According to the author Kuorikoshi, in 2015 the turnover in international mobile gaming alone has reached 13 billion dollars, and in two years it will be 22 billion. With the passage of time, it has been seen that gaming evolved from a simple beginning with Snake to now changing mobile gaming into a billion dollar industry (Kuorikoshi, 2015, p.48).



Picture 2. App Store Screenshot Taken From iPad Mini, Date Accessed: October 29, 2016.

1.3. What is an Operating System?

Currently, there is a chain of gaming software that allows children to play and learn as well. However, the issue of great concern lay in the utility levels of the digital technologies. In the beginning stages of computer evolution, there was nothing like an operating system. Without any system software support, a computer used to be programmed directly into device language. The approach was known as a "Bare Machine." In the case of electricity breakdown, these programs used to disappear and had to be started all over again which thus raised the need for a solid and multiprogramming system where more than one program could be used to be activated simultaneously. Such a method could improve the utilization of system resources and enhance the system's output. When users launch the application program on the device, that program has to go through the operating system modules for the distribution of the required sources. In response, the operating system modules provide the necessary resources in a systematic manner (Gill, 2006, p.6-18)

> According to the author Japing, *"An operating system builds a model, a system, of how to deal with the resources of a computer. Software must work with this model to access and use those resources. The model provides a lens through which users view resources such as the communication system and user interfac."* (Jipping et al., 2007, p.2).

The operating system itself is software that is used to run applications on smartphones and personal computers. It eventually loaded into a device's memory, and its instructions are executed just like any other software program. In an operating system, a device's hardware and software can work together which creates a structure to use them in the device. A good operating system allows users to execute the essential functions of a device. The operating system is manager of system resources, performing the process and memory management with the command interpretation. Eventually, an operating system is essential and without it, a device would not function (Gill, 2006, p.6-18).

1.3.1. Operating Systems for Mobile

Different optimized operating systems are available to serve the need of particular circumstances. Similar to computer operating systems a mobile operating system, also called mobile OS, is a system that is mainly designed to run on mobile devices and other handheld devices. With the mobile OS, other applications can run on mobile the devices. Laptop computers are also mobile, but the operating system is not considered mobile ones because these operating systems first designed for desktop computers that did not have specific, "mobile" features. In the mobile phone, an operating system must contain conventional system components as well as additional essential elements to mobile phones communication and interface design (Kizza, 2015, p.492).

> According to the author Adonis, *"A Mobile operating system, also known as a mobile OS is the operating system (program) that serves as the mobile device or information appliance similar in principle to an operating system such as Windows, Mac OS X, or Linux distributions that controls a desktop computer or laptop"* (Adonis, 2012, p.33).

Mobile devices that have mobile communications system such as smartphones contain two mobile operating systems. The primary user-interface extended by a second low-level exclusive real-time operating system, which handles the radio and other hardware. A real-time operating system is required to manage this capability, as it is highly timing-dependent. Notably, some older versions of mobile OS continue being out-dated with time and the new versions are much powerful probably this is the reason why there are emerging titles of mobile games designs that grace the kid entertainment industry on a regular basis (Holwerda, 2013).

In the present time, mobile operating systems have both the characteristics of a personal computer and other useful features for modern mobile systems such as a touch screen, cellular, Wi-Fi, GPS mobile navigation, Bluetooth, speech recognition, camera, video camera, voice recorder, music player, and infrared. Through touch-screen, capability operating systems also carry the functions such as swipe, tap, pinch, reverse pinch and multi-touched interface. Turning the device in three dimensions shifts the portrait and landscape mode. By shaking a phone, the inside accelerometers respond to the phone and work as an undo command, or simply locks the screen (Das, 2016, p.298).

1.3.1.1. Single and Multitasking for Gaming Technologies

Engaging in single tasking refers to concentrating on only one task until it is completed. Some gaming technologies and particularly those designed for children mainly allow them to engage in only one task. Hence, all their concentration direct towards a single function. The operating systems of gaming technologies for single tasking ensure that only one user can use it at a time. Mobile operating systems initially worked as a single user. There was no support of the third-party software at the same time, which seems inefficient if a user needs to deal with various tasks. Some mobiles allow the users to do two tasks at the same time that is why they are considered single-user, multi-tasking operating systems. Such operating systems do not have an additional user interface for a second party. Gaming technologies back in time with the only single tasking interface are ideal for younger children. They are likely to master the concept with ease, as there are no distractions. Moreover, they are likely to repeat the exercise severally until they understand how to play such games and single tasks are not only entertaining but also educative. They should have user iterates that encourage morality among children (Romer & Pinard, 2011, p.89), (Shim, 2000, p.54).

Unlike single tasking, multitasking refers to the exercise of performing more than one task at a go and doing several tasks at one time might feel more efficient and productive. Those who perform more than one task at time trust their skills and may engage in multi-tasking as a way of sharpening their skills. Modern day mobiles have state of the art operating systems, which allow users to perform more than one task at one time. Among many other important features, multitasking is arguably the most important characteristic. Multitasking on the smartphones or tablets is different from the multitasking on a PC or a MAC. Multitasking allows several applications to run and perform different tasks at the same time such as using the internet during talking on the phone is an example of multitasking. Slide over feature provides the capability to pick a secondary application to interact with it quickly. With this characteristic, users can use more than one app simultaneously, and other features like slide over, picture in picture and split view are possible as well. In the realm of gaming technologies, multitasking enhances the entertainment values of a tool. Multitasking adds further enjoyment by using other technologies such as camera, GPRS, speaker, and accelerometer sensor, that measures the orientation and tilting motion of a mobile phone. Therefore, carefully designed gaming tools and apps on smartphones provide great entertainment to children as many of them spend their

leisure time on play games on smartphones or tablets. The fact that entertainment on digital tools such as smartphones and tablets takes much of their time means that if they had appropriate educational value, children would substantially learn from them (Tomsho, 2016, p.21-32), (Shim, 2000, p.54).

It is expected that use of computers and smartphones for entertainment will not cease anytime soon. Since it is a time that game designers to use multi-tasking feature in a way to make games convenient for children and they can enhance their social and moral responsibility in the immediate society. However, the conclusions of single and multitasking in further research are supporting multitasking (Minker, Bühler and Dybkjær, p.349)

1.4. Most Common Platforms

The operating system is an important aspect in mobile technology it also plays a role in the development tools. Mobile operating systems directly affect how the user can access the mobile device. There are several mobile operating systems are already available in the market. Android and iOS are strong competitors, according to the Apple, app download between 2008 and 2013 amounted to 50 billion, averaging 800 downloads per second. Just a year later that number had grown fifty percent by reaching 75 billion downloads" (Rothchild, 2016, p.391).

> According to the author Adonis *"The current most demanding mobile operating systems are Google's Android, Apple's iOS, Microsoft's Windows Phone, RIM's BlackBerry OS, Linux Mobile, HP's webOS, Samsung Bada and Nokia's MeeGo among many others"* (Adonis, 2012, p.33).

Even after such numbers according to the Statista, "As of June 2016, Android users were able to choose between 2.2 million apps. Apple's App Store remained the second-largest app store with 2 million available apps." Google as an open and free option has developed android for the developers and its open nature encourage the developers to develop more applications for and upload on Google Play Store. While Android is the leading operating system for the mobiles, Apple's iOS is the leading operating system for the tablets worldwide (Mahalik, Tamma and Bommisetty, 2016, p.27).

1.4.1. Android

Android, Inc., later on acquired by Google on August 17, 2005, initially developed the Android OS and Google joined the smartphone market with an open source mobile and embedded device operating system. Android operating system is a favourite OS of many people because of its prominent interface, stability, and compatibility. While booting, it initializes many function modules in different partitions. The system partition mainly contains the entire operating system other than the kernel and the bootloader. Without the partitions, the phone will not able to boot (Xhafa, Patnaik and Yu, 2016, p.170)

"The first Android phone, T-Mobile G1 also known as HTC Dream, was released in October 2008, followed by the release of 12 additional android phones in 2009" (Allen, Graupera and Lundrigan, 2010, p.35).

Photograph 6. First Android Phone HTC Dream G1, Date Accessed: November 2, 2016, Source: https://www.xda-developers.com/the-history-of-flagships-part-iii-htc/

Android is Linux kernel based system very reliable OS that originally designed for touchscreen mobile devices such as smartphones and tablets computer. It based on a popular language Java, and for that reason, it is easily compatible with Java-based applications. The user interface based on direct manipulation, the actions, such as swiping, tapping and pinching to move the objects on the screen along with a virtual keyboard for text input use the touchscreen function to work. Google also developed Android Auto for cars, Android TV for televisions and Android Wear for wristwatches by using touchscreen function. Each of these systems designed with a specialized user interface. In addition to touchscreen devices, notebooks, game consoles, digital cameras, and other electronics devices can also use the variants of Android. The platform also supports multitasking of applications that is managed by structuring the application as "activities" (Rosen, 2014, p.472), (Allen, Graupera and Lundrigan, 2010, p.35).

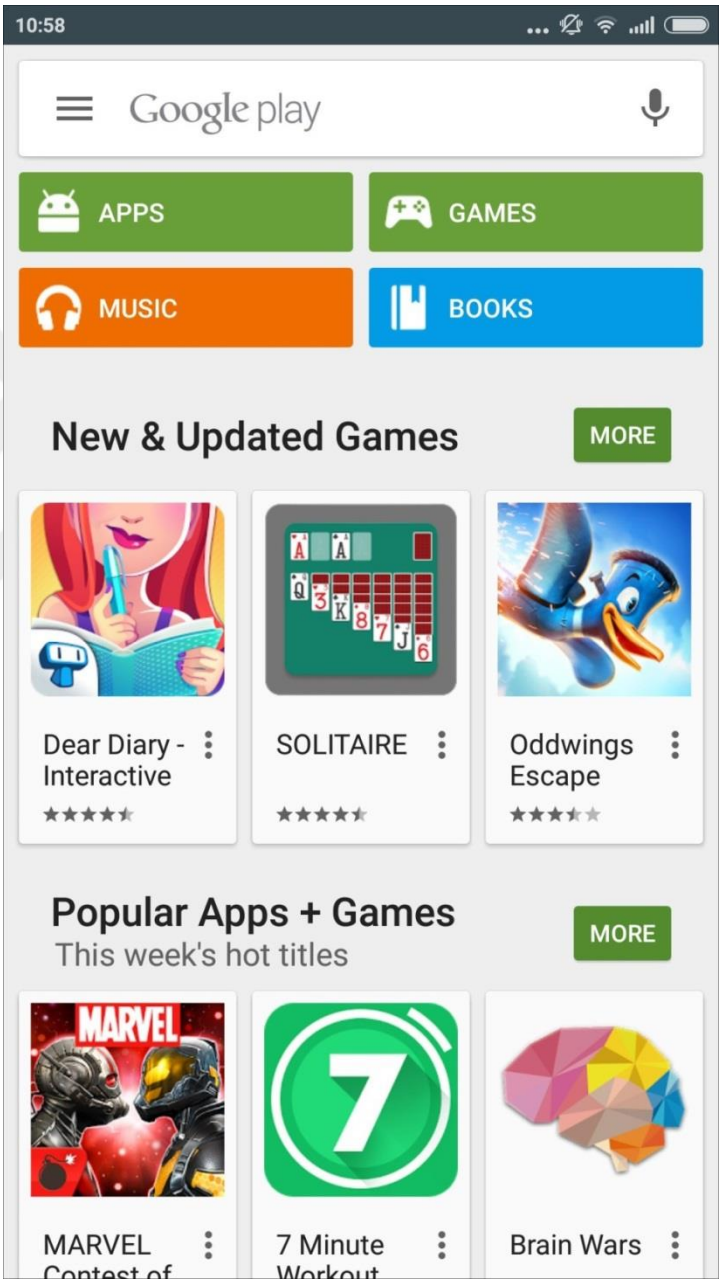
Without the legal limitations or copyrights concerns, Google allows this flexible and upgradable platform to the handset makers and carriers to develop applications for mobile devices, and this is one of the reasons that Android OS is one of the most popular operating systems for mobile phones and mobile operators around the world. Today, the Android operating system is a world bestseller smartphones' platform (Papajorgji, 2015, p.20).

1.4.1.1: Google Play Store

Google Play is a digital distribution service, containing a digital media store. Google Play Store developed by Google, originally launched in 2008 as Android Market. In March 2012, Google replaced Android Market with Google Play to offer consumers a broad spectrum of content including books, music, movies and mobile apps. Under the one brand marketing, was a significant transformation in the Google's digital distribution strategy (Ang and Steinfield, 2015, p.612).

Play Store works for Android operating system as an official app store where users can download applications that published through Google. Some applications are free of charge and directly downloadable to an Android device through the Google Play Store mobile app, or by connecting the device to the Google Play website. Android is popular with those businesses that require a customizable operating system for their devices. Android's friendly nature is the

key to its success. Its user friendliness helped many developers to use the open-source code as a base for their projects. Through Google Play Store developers can send new updates of their apps more frequent than any other mobile platform. The Google Play developer console gives the power to publish the app to 1 billion active Android users while it is easy to register and publish through Google Play Store. Google Play returned more than seven billion dollars to developers in 2014, which is growing 250 percent every year (Inc, G. 2015, p.12-146).



Picture 3. Google Play Store, Date Accessed: November 4, 2016, Source: http://news.softpedia.com/news/google-planning-affiliate-program-for-google-play-store-much-in-the-vein-of-apple-itunes-488985.shtml#sgal_0

1.4.2. iOS

There are debates in the technology world that divide the choice of mobile operating system. Where Google's Android claims itself the best because of its user-friendliness and customizability, Apple's iOS is well known as a bright ecosystem and data security. The software update in Android gets its users to struggle, but on the other hand, the iOS update is something that everyone can get it with a simple download (Williams R., 2015)

At first, CEO of Apple Inc. Steve Jobs declared, "iPhone runs Mac OS X" and runs "desktop applications." Due to technical specifications, iPhone could not run OS X software unless it ported to the different operating system. Initially, iPhone did not support the third-party application. It was frustrated that Apple is not openly supporting third parties to develop their applications for the iPhone. Steve Jobs suggest to the developers build web applications that run like the native application on the iPhone. Steve Jobs exposed the first iPhone with iOS in January 2007 at the Macworld Conference and Expo. Later in June 2007, Apple Inc. finally released its first iPhone with the first iOS previously known as iPhone OS. Easy-to-use and lightweight foundation makes iOS one of the most common mobile operating systems (Put, 2013, p.18).

Photograph 7. First iPhone iOS Interface, Date Accessed: November 6, 2016, Source: http://www.mac-forums.com/blog/ios-and-the-state-of-innovation

The first iOS was just for the iPhone later on Apple extends the support to its other devices including the iPod touch in September 2007, and iPad in January 2010. In June 2010, Apple introduced Multitasking with the release of iOS 4.0 with the iPhone 4. Just the iPhone 4, iPhone 3GS, and iPod Touch 3rd generation were able to use multitasking. Later on, in November 2010 iPad get this feature with the release of iOS 4.2.1. Now, all the Apple devices support the multitasking (Picchi, 2011, p.23).

> According to the author Jiyou *"The user interface of iOS is based on the concept direct manipulation, using multi-touch gestures. Interface control elements consist of sliders, switches, and buttons"* (Jiyou, 2014, p.237).

Since the launching of Apple's iOS system, smartphone business has grown significantly. Moreover, Apple's App Store has contributed a substantial economic boost to the development of millions of applications for iOS. Apple's App Store is the only point where users can install the applications on iPhone, iPod and iPad. Usually, users can access the App Store through the iTunes, from where they can download the app, and save it as a .ipa file extension in the zip archive of the device (KIRDA, Egele, Kruegel, EURECOM, & Vigna, 2011, p.5)

1.4.2.1. Game Center

An online multiplayer social gaming network, "Game Center" originally released on April 8, 2010, by Apple Inc. Through Game Center users can invite their friends to start a multiplayer game with them and follow their performances, and compare their best scores on a leader board (Baek, Ko, and Marsh, 2014, p.30).

The first Game Center was unveiled with the iOS 4 with the support of profile photos. Introducing social gaming network was a successful step that gives a boost to the app store as well. According to the Statista "Apple's App Store is remained the second-largest app store with 2 million available apps". According to the Apple, app download between 2008 and 2013 amounted to 50 billion, averaging 800 downloads per second and one year later the numbers had grown by fifty percent reaching 75 billion downloads" (Rothchild, 2016, p.391).

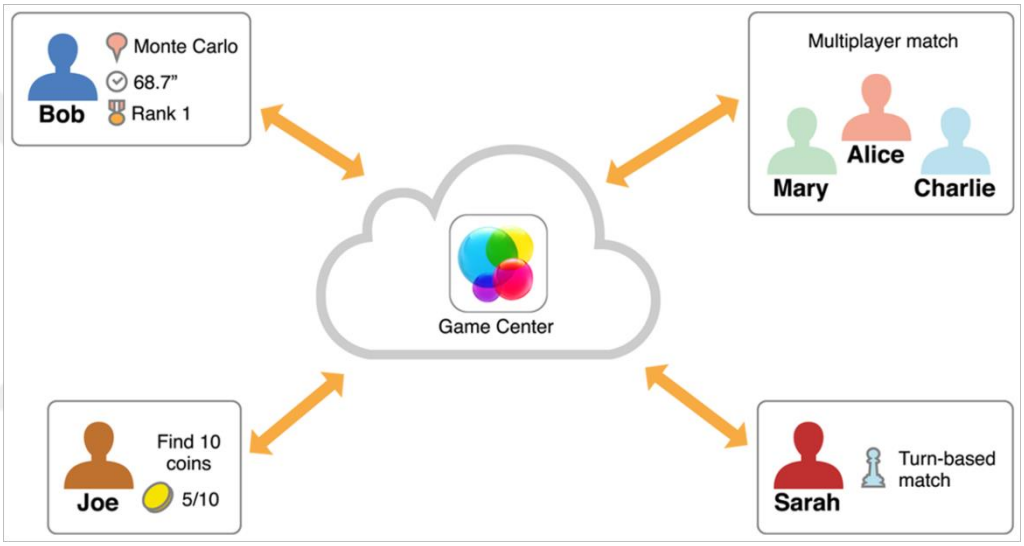
From iOS 10, Game Center App will no longer to be a part of Apple devices as a standalone dedicated application. Previously, the Game Center application has always been preinstalled on devices for years. Apple is not just

adding it to the list of stock iOS apps where users cannot delete if they want. However, the app is not pre-installed on iOS 10, but Game Center settings will be available in the App Settings of iOS 10. With a new option of screen recording, Game Center is still a part of iOS 10. Therefore, Game Center is accessible but just not available for the home screen (Minute Help Guides, 2016, p.112).

Picture 4. Game Center New Position in iOS 10, Date Accessed: November 6, 2016, Source: http://appletoolbox.com/2016/09/where-is-game-center-app-ios10

In iOS 10; once a user received Game Center invitation in Messages, by tapping on a link will take the user straight into the game. If the device couldn't find the particular game installed, the link will instead open the game on the iOS App Store for downloading. Game Center is an important technology that makes easier for Apple to take care of the server infrastructure for the users. Apple also provides a framework for the iOS developers called Game Kit to integrate the Game Center into the iOS Apps (Nahavandipoor, 2011, p.1).

Apple announced Game Kit in March 2009 and available starting iOS 4.1 and OS X v10.8. Game Kit can be described into three different parts, Networking, Game Center and Voice Chat. All three services work together to provide a single seamless environment. Networking in Game Kit supports user to send and receive data between players. Game Kit networking also connects local clients on user's Wi-Fi network or Bluetooth. Therefore, Game Center provides a centralized app that players use to access Game Center's features and Voice Chat provides an in-game audio connection between two peers at a time. With the Voice Chat there is no need to open a different application such as Skype or iChat to hear the reaction of the opponent while playing (Richter, 2011, p.2).



Picture 5. Players Interacting With Game Center, Date Accessed: November 3, 2016, Source: https://developer.apple.com/library/content/documentation/NetworkingInternet/Conceptual/GameKit_Guide

iOS games took advantage of Game Center's feature that provides smooth multiplayer functionality. The impact of the biggest third-party social gaming network was high that drives people to download more games where it was easy to challenge their friends and also compete online with unknown players. Users can send the "buy now" link to their friends so that they install and play the game. This functionality automatically advertises the product for the developers (Richter, 2011, p.93).

1.5. Advantages of Mobile Games

In the modern wireless age of digital media communications, mobile games with the advantages of convenience, cost, creativity, and community have shown the highest growth rate in the world game market these days. It is predicted that in coming ten years' time, mobile games will be one of the most leading platforms in the world game industry (Yan, 2015, p.454).

Video games are becoming a part of daily lives. It becomes a mandatory item for life as mostly young people play games on handheld devices globally. Online gaming has widened the experience and potential of games by providing real-time head to head competition. The numbers of “hard-core” gamers are growing with the acceleration of mobile technology as they are spending more money on video games (Wyman, 2010).

> According to the Statista *"App revenues, which were just $8 billion in 2011, grew to an estimated $45 billion in 2015 – an increase of over 500%. And according to these projections, app store gross revenue could hit $77 billion in 2017."*

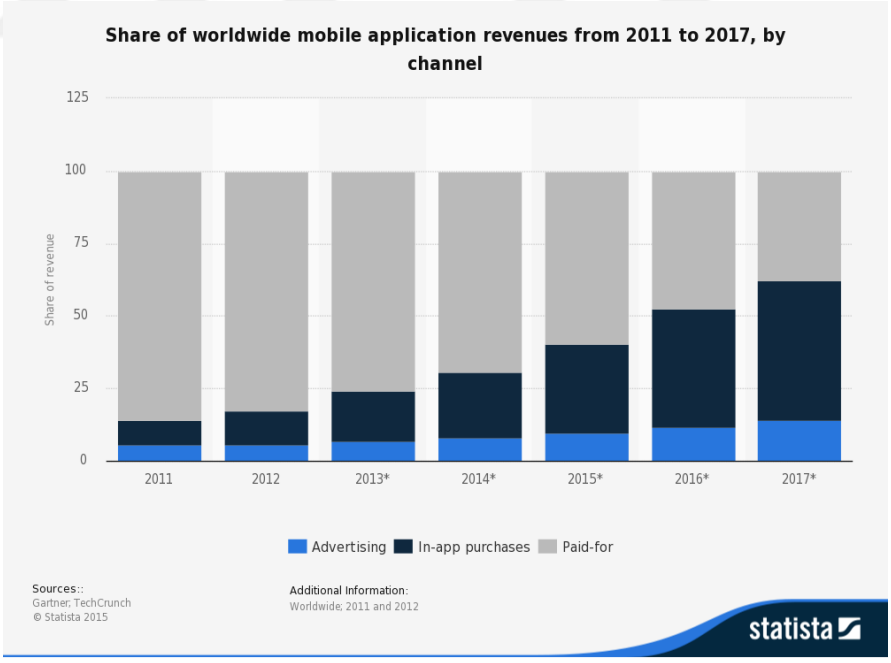


Diagram 1. The Gross Revenue of Android and App Store in the Market, Date Accessed: November 10, 2016, Source: https://www.statista.com/statistics/273120/share-of-worldwide-mobile-app-revenues-by-channel

Therefore, mobile phone gaming has become a multi-billion dollar industry. Now many leading game development companies have dedicated departments for only mobile gaming. Mobile games have drawn an entirely new devoted prospect into the fold. The growing percentage of young mobile phone users has many distinct advantages that help mobile-phone games to become such profitable business in the entertainment industry. According to a survey by Aaron Smith in 2015, younger Americans own more smartphones among older. Sixty-four percent of American adults now have a smartphone of different brands which is increasing from thirty-five percent in the year 2011 (Smith, 2015, p.2).

Originally mobile phones were meant for the communication, though it has numerous unique advantages that put the mobile game as a core feature in cell phones. Following are a few key benefits of mobile games.

1.5.1. Convenience

Instead of just satisfying the need of business, smartphones are also used as a tool of entertainment. Most modern cell phones provide the facility of listening music, watching videos and gaming which means customers do not need to carry separate devices with them. The small sizes of mobile phones have the convenience to take them wherever, which is providing entertainment to everyone, everywhere, at any time. As mobile phones and tablets provide easy access to the video games, therefore, people play games at home, at school, on the train, and at work. There is a variety of simple games that take a short amount of time such as cards, puzzle, or word games. It attracts those people who like to play easy games in spare time. Game applications run directly from the mobile phone's memory without an internet connection or phone signals (Taniar, 2007, p.186).

1.5.2. Cost

Mobile games are much economical as the cost of mobile game development is significantly lower than the console games. The low cost of mobile games save money and allow the user to try more games which makes mobile games more accessible. Therefore sixty six percent of all App Store applications are free (Fields, 2014, p.36).

According to the KGDI (2005),"The development of a PC or console game usually takes at least two years to develop with more than 20 trained people and about $3 million. But in mobile games, about three to six months are spent with five people and less than $150,000."

As of June 2016, more than twenty three percent of all available apps are gaming apps. Cost wise, most mobile games are just a few dollars which are not more than $20 which makes them quite affordable than console games which are usually $50 or more. Due to the low cost of development, the game developers can take more risk of trying out new concept or ideas. In results, mobile games are creative as whole and have diversity in the market. Users do not hesitate to try something new that is less than a dollar (Kittmer, 2016).

The statistic in figure 13 shows the average cost for apps in the Apple App Store as of June 2016.

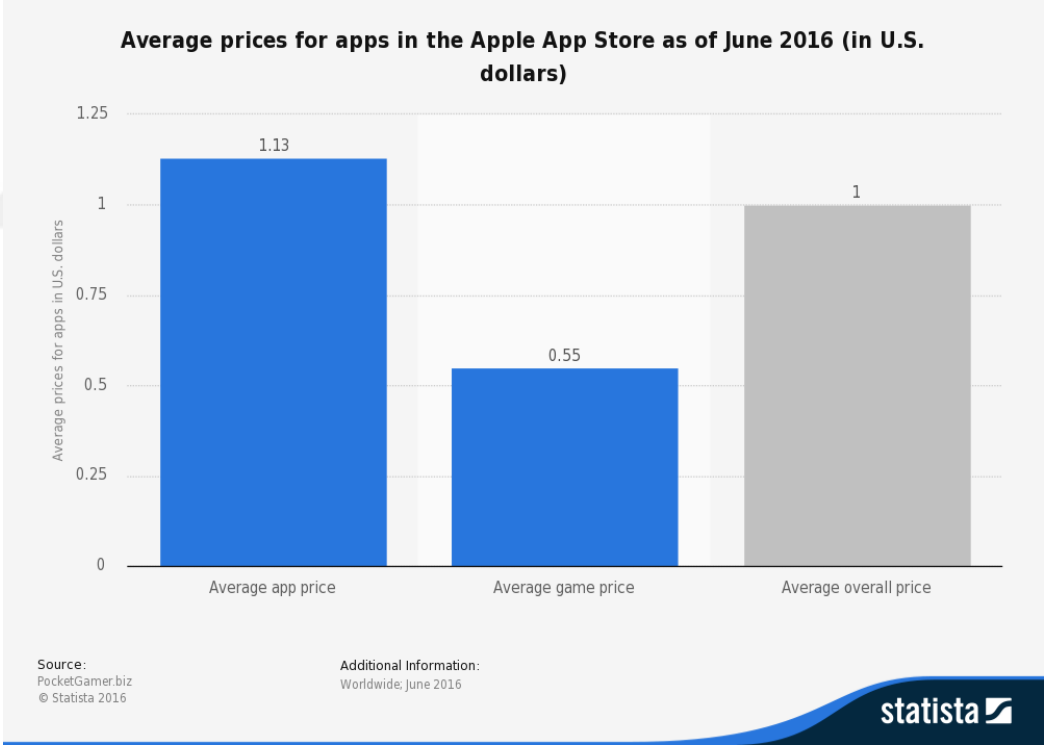


Diagram 2. Average Price for Apps in the Apple App Store as of June 2016, Date Accessed: November 25, 2016, Source: https://www.statista.com/statistics/267346/average-apple-app-store-price-app

1.5.3. Creativity

Modern mobiles have high-quality graphic load capabilities that give developers a chance to show their creativity in a more attractive way. Tilting and motion sensor technology allow interacting in different forms. The changing innovations from time to time, mobile games development brought a rise in the field of entertainment and media. Mobile gaming is also a powerful tool for merchants to reach the consumers. Playing game required users' attention, so the users keep their eye on the foreground as well as on the backgrounds elements in the game's surrounding. If the brand name or logo is visible enough, then it stays in the memory of the player that fulfills the plan of developing a game specifically for marketing purpose. According to the authors, Marketing through the games does not require a huge amount of money as compared to regular ways of advertising like radio and TV (Afshar, Banerjee, and Jones, 2004, p.82).

1.5.4. Community

Mobile phones have changed people's communication practices. The social life has drastically changed with the introduction of smartphones and thanks to the innovative discovery of social gaming network that enhances the gaming experiences by empowering people to play with or against others. Mostly people use social gaming network either to make friends or play with their friends. Playing with friends is a way of communication that most humans enjoy which makes social gaming platform attractive. Social gaming platforms provide something to talk about what both users like to speak. The players can find new friends and get exceptional support from them. Now many games have multiplayer features where users can play directly against or with their friends. With the facility of online leaderboards, users can compare progress furthermore via chat room they can send messages to other players during the play (Kittmer, 2016) (Dugdale, Masclet, Grasso, Boujut and Hassanaly, 2012, p.197).

Accordingly, having various advantages mobile video games became a huge and rising share of the entertainment industry. Investing money in gaming business is going to bring a vital payback in the years to come. There is a common belief that mobile games are only for children. In fact, children are not the only market for these games, everyone passing from teenagers to grown-ups play mobile games. Due to the greater audience, embedding social and moral cause into the games can have a massive impact on society. As a blend of art and

commerce, video games are the compound of culture, economics, politics, and even philosophy that can perform a significant role to create a morally well aware sustainable environment (Wyman, 2010, p.XI).

CHAPTER TWO

2. Producing Mobile Games for Learning

Nowadays there is a strong push to transform learning habits from the formal education system to an innovative method. Chapter two examines that how a game design can potentially combine knowledge and entertainment together for good.

2.1. Process of Game Development

Many factors need consideration before starting a game development. Just a good idea is not sufficient in the gaming business since without an appropriate outline mostly best ideas never see the light of day. A framework required turning a good idea into reality in the form of a video game. Many organizations and developers contribute their significant efforts to create the appropriate process for game development. A basic structure of game development process is out there, but every game development company has somewhat different workflow according to their expertise as well as keeping the nature of the project in mind. The author Ham in his book describes the game development process *"In the video game company, "game development" refers to the entire process of creating a new game and "game developer" is anyone involved in making it"* (Ham, 2015, p.44).

The game development process is a detailed plan of action that analyse all the future possibilities and difficulties of the project. It may take enough time and effort before the project starts, but it is very crucial for the high-quality commercial PC and console games that take several years to develop. In the world of video games, high quality titles known as Triple-A games. Usually, AAA games required higher expectations to be in the year's best selling. AAA games developers need significant investment that usually funded by publishers. Other are independent video games is also known as "indie game" take less time to develop and can be produced by individuals without a huge investment. With the presence of Android and iOS in the mobile game market, the indie game industry has accelerated in recent years. As shown in the figure 19, the video games mainly developed in three phases such as Pre-Production, Production and Post-Production (Zackariasson and Wilson, 2012, p.105).

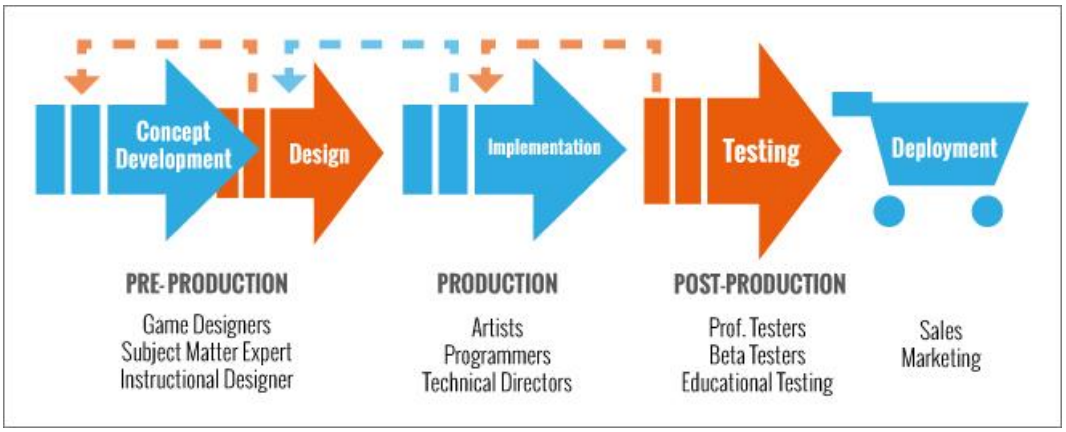


Diagram 3. Three Main Phases in Game Development Process, Date Accessed: November 28, 2016, Source: https://www.ibm.com/blogs/bluemix/2016/10/how-do-top-mobile-game-developers-test/

2.1.1. Pre-Production

Video games become more and more advanced in both their storytelling and gameplay mechanics. During the development phase, to streamline the development workflow a close communication required between the designers and programmers. Through the game development process, developers can point out potential amendments for the game before they start working on it. The first phase of game development process is a critical step. First, it may consume time, but it saves the energy throughout the further development. The first segment is Pre-Production, and at this point, the companies formed a team according to the idea for their new game. A clear picture of the project helps to select a better team. The team examines what kind of technology and art assets are required to produce the game that will make the game fun and playable with the best graphics. The story is also an important part of the first segment as it helps to define the style of game assets such as environments, sounds, and characters (Eng, 2015, p.129-130)

During the Pre-Production, the team defines the concept and create a game plan for further development. Before entering into the second phase of the production, game designers plan all of the details and works on a quick prototype, along with the game design document. A good game design document provides a clear picture to the development team of how the project will proceed (Eng, 2015, p.129-130), (Chandler, 2013, p.358).

2.1.2. Production

Production is the second phase where the full-scale development begins when developers receive the funding from the publisher. The Production phase involves a team of multiple resources, such as artists, designers, and programmers to create graphic assets and writing the game's code. At this stage, the team understands that what exactly required during the game development and when each task needs to be finished. Nevertheless, there are different types of obstacles that a team probably encountered during the second phase. The artists and programmers work together to develop the structure of a game through the user interface, environment, characters, and basic artificial intelligence on this stage (Chandler and Chandler, 2011, p.104).

In the case of big productions, the second phase takes several months of specialized experts. Programmers establish the functionality in the game engine such as using weapons and power-ups to add extra abilities to the game character among many other features. After having sufficient assets, level designers, and coders integrate them into a functional game by keeping the limitations of a gaming engine in mind (Edwards, 2006).

2.1.3. Post-Production

After securing the individual game assets in the third phase, developers combine everything and begin with the testing long before the project released. The testing results provide details on which elements are working correctly and which part required more work. Often companies divide the testing in four releases, Alpha, Beta, RC and Gold testing. These steps help to conclude the project and maintain the high quality (Newman, 2013, p.51).

2.1.3.1. Pre-Alpha

Pre-Alpha describes as all actions conduct throughout the software development process before formal testing, debugging and release stages. It is initial and informal testing that programmers do while writing the code. Pre-Alpha is usually the lengthiest part of a game development that requires effort from the entire team such as artists, programmers, and testing unit. In general, the Pre-Alpha state progress until the game is more or less complete and able to test from start to finish (Thorn, 2013, p.52).

2.1.3.2. Alpha

The Alpha phase is the first step of the release cycle. At this point for the first time, a game emerges in a complete-enough form for the in-house testing purpose. The entire team works together to produce an alpha version of the game. The alpha version release among the team members and it contains all core elements for a playable game except fine-tuning and polishing (Nielsen, Smith, and Tosca, 2016, p.25-26).

The internal version only used to test for technological errors and playability. Alpha testers play the game and give a detail report to the development team to continue with the process of debugging. During Alpha testing, only in-house developers check the software by using primarily white-box and secondarily black-box testing methods. In the white-box approach, programmers examine the internal coding and infrastructure of the project as opposed to its functionality. The black-box symbolise, the testing approach of the product with an external or end user's perspective without looking into the internal operations of the software. Alpha testing is a useful approach to collect data and tweak project functionality before final released in public otherwise an incomplete game leaves bad publicity to the project. After making sure that, each element of the project is fully integrated and working accurately, the developers can move to the Beta level (Thorn, 2013, p.52-54).

2.1.3.3. Beta

After fixing the issues from Alpha version Beta version is used for real world testing among the target audience to get their feedback or suggestions. The Beta testing does the same job as Alpha testing but on an almost complete project. The Beta version allows free download. Through Beta testing, developers and programmers get the list of precise issues and produce the new version or patches for the software, so that Beta testers can test it again (Thorn, 2013, p.53).

> According to the author Bethke *"Beta testing is testing performed by unpaid volunteer fans who want a first peek at an upcoming title and who are excited by the opportunity to improve a game before its release"* (Bethke, 2003; p.54).

In few cases, in-house testing is suitable. Due to the cost of the project, some publishers prefer to spend more time on internal testing and do not want to release the free version that eventually affects the sale of the final released. Another reason is the security risk, and completion of the project; generally, organizations do not want any product information to get public. Big enterprises can get some sufficient internal feedback from those employees who are not directly involved in the production process of the product (Fine, 2002, p.18).

2.1.3.4. Release Candidate

Just like Alpha and Beta versions RC (Release Candidate) version is released for the potential clients to evaluate the product. The difference between the partially functioning Alpha and Beta, RC released contain all product features. Developers find and fix all the issues at the Alpha and Beta stages, but it does not mean that the Release Candidate version is flawless, it probably still have unresolved glitches. If the issues are small enough and not critical, often companies accept the RC version for the final release (Shrimpton, 2006, p.698).

> *A Release Candidate (RC) is an advanced form of a Beta testing version that has all the possibilities to be a final product unless a vital error arises.* According to the author Berkun S. *"The first build of a project that has met all exit criteria is called the release candidate"* (Berkun, 2008, p.323).

2.1.3.5. Release to Manufacturing: Gold Release

The Release Candidate issued for the user acceptance testing (UAT), and after user acceptance testing Release Candidate becomes the Release to Manufacturing (RTM) also refers to the final version of the game. Release to Manufacturing also known as Gold Master (GM) that make a final push for more accurate testing by the intended audience before the bulk copies (Shrimpton, 2006, p.698).

Gold Master ensures that the game meets the expected quality and is ready for the distribution. Indeed in some game development companies, Gold Master refers to the final version of the game. Generally, mature companies have a well-defined process in their pipeline and even their entire quality assurance (QA) department work to verify that the game has reached Golden Master (Iuppa and Borst, 2012, p.92).

2.1.4. Deployment

Only the quality cannot make the game a success title. Due to the lack of solid marketing, many inventive games could not become the center of attraction among the public. With the better selling plan, even an ordinary video game can do extremely well in the competitive market. An impressive campaign can create more awareness and curiosity that increase review scores and excitement for the upcoming product (Cohen and Bustamante, 2012, p.22-23).

After the complete testing process, a publisher promotes the game. The publisher makes sure either the game meeting the technical requirements and usability standards or not. Publisher looks at the quality one last time before promoting the game through a marketing campaign. Game development process completes with the approval of the publisher (Iuppa and Borst, 2012, p.322).

2.1.5. Post Release

According to the author Bethke, *"All games require post-release support; even the most financially healthy and successful developers support their games after release"* (Bethke, 2003, p.281).

The above statement points that the job is not yet done. Even after the final release of the game, there are possibilities to improve the product in the case of bugs or to add new features. Most gamers like to get extra functionality after having paid for a game. The new content is usually free of charge and motivates the player to achieve new missions in the game which keeps the game alive for the longer time (Bethke, 2003, p.8). There are many games available to download from the Internet through Apple's app store for the iPhone and iPad and the Google Play Store for Android-based devices (Norshidah, 2015, p.7).

With the ease of the Internet today, all game can be modified quickly after publishing. More often post-released period is utilized for the development of new missions and levels in the game. The new level goes through the similar phases of Pre-Production, Production, and Post-Production but on a much smaller scale (Bond, 2014, p.103).

2.2. Job Roles in the Game Development

Several areas of skills require achieving a massive goal particularly in the designing of a large-scale game. There are several specialized roles in the game development process such as Game Designer, Scriptwriter, Programmer, Artist/Animator, Audio Engineer and Tester. Different game development companies use different titles for the same functions. Any game development corporation required such a skill set to create video games and each of these roles can be further divided into more specific uses (Eng, 2015, p.1).

2.2.1. Game Designer

A game designer is an important part of a comprehensive team who designs the core elements and gameplay mechanics of a new video game. Along with designing characters, levels, puzzles, art, and animation the key role of a game designer is also writing the code using computer programming languages. It is a core part of a game designer's duty to make sure that both the artistic and technical processes comply with the game design (Eng, 2015, p.1).

In the big projects, other designers participate in the production such as interface designer who manages the user interface; level designer's job is to create complete levels in the game (Nielsen, Smith, and Tosca, 2016, p.25-26).

2.2.2. Scriptwriter

A scriptwriter is someone who helps to create the written form of scenarios and dialogues based on the storyline in-game cinematic set by the game designer. A good script writer emerges the player into the game world through the art of storytelling and exceptional wordings (Eng, 2015, p.1).

Film and television industries are well aware of the importance of a good story. The script is the most critical part of a movie, and a good story-writing can make a film successful. A similar approach requires in game development. A remarkable interactive gameplay together with the great story increases the level of entertainment to the player (Newman, 2013, p.65).

In 2013, Naughty Dogs developed "The Last of Us" that known for its powerful story. The best-selling and critically admired game attracts the player all around the world with an exciting story and engaging game play (Editions & Dog, 2014).

Picture 6. Storyboard of "The Last of Us" With the Help of Script, Source: Druckmann N. and Hicks F.E. (2013), The Last of Us: American Dreams, Dark Horse Comics, USA

2.2.3. Programmer/Engineer

Programmer/Engineer creates the structure of the game by putting all the assets together and shapes the individual pieces into a playable game. They develop video games related software that controls the game, such as game development tools. The game programmer knows all the logics behind the game and helps the team by adding new features to power up the core game engine. Some of the specialized roles of a game programmer are a gameplay programmer that handled the artificial intelligence and general physics of the game including simulating object movement, and collisions. Others are toolkit programmer, network programmer and most important are graphics programmers who manage graphical content such as model and texture by utilization the memory limitations of the graphics engine. The networking programmers are responsible for adding multiplayer functionality along with online game performance and data security (Nielsen, Smith, and Tosca, 2016, p.27) (Eng, 2015, p.2).

Due to the entertaining experience, the game programming is different from the other business software engineering. To understand the uniqueness of the medium game programmers usually has the passion for the games (Chandler, 2013, p.25).

Artificial Intelligence (AI) is an important part of video games. Through AI objects and characters in the game perform the tasks normally requiring human intellect. According to the Champandard, computer game AI is an artificial version of human abilities in the non-playable characters. The artificial intelligence programmer sets the behavior of game characters and creatures placed in the simulated environment. AI programmers give the different combinations of skills and abilities to the non-playable bodies and objects to interact accordingly to the player's actions (Champandard, 2003).

2.2.4. Artist/Animator

A creative person who designs and creates original art assets for the games is called a game artist. Game artists are responsible for all kind of the visual art in the game such as concept arts, 3D models, textures, sprite sheets, particle effects, and so on. Some artists are trained in three-dimensional while others focus on the two-dimensional art. The game artists usually belong to the art background and have in-depth knowledge of the game industry. The Art Director is a top artist

who collects the artwork from the different team members and ensures that everything looks under the same style. The concept artists start with the sketching characters and the environments for the further production (Nielsen, Smith, and Tosca, 2016, p.27), (Eng, 2015, p.2).

A game animator is an artist who specializes in creating animations for the game characters as well as in-game cinematic. Animators create multiple images, known as frames and when these frames played in a rapid sequence they give an illusion of movement called animation. The artistic style of an animator determined the flow of the characters in an animation such as running, walking, leaping, shooting and fighting, etc. (Kennedy, 2013, p.13).

Picture 7. From Key Art Sketch (Left) to a Detailed Colored Concept (Right), Source: Kennedy S.R. (2013), How to Become a Video Game Artist: The Insider's Guide to Landing a Job in the Gaming World, Potter/TenSpeed/Harmony, USA, 18-19p.

2.2.5. Audio Engineer

According to the author Marks A., in the new virtual world, the sound will be as valuable as eyesight. In the fully sound surrounded environment gameplay relies on the sense of hearing and with the interactive sounds, the audio engineers make a video game more like experiencing a movie (Marks, 2013, p.6).

An audio engineer creates the soundtrack for a game and also records the sound and manipulates the recordings by using the equalizer and electronic effects. Audio engineers also produce game music, sound effects, character voices, and ambient effects. A good audio engineer can get the feel of the atmosphere of the game and create suitable music accordingly (Eng, 2015, p.2).

2.2.6. Tester

Game testing is a critical part of game development process it is a software testing process for quality control of a video game. Examining interactive entertainment software is a specialized job of the game testers. Through the Pre-Alpha, Alpha, Beta, RC and Gold testing phases a game tester is capable of checking the game and ensures that it is free of software defects (aka bugs). The game testers also make sure the game is easy to use, fun to play and meet the expectations of the game designer and requirements given by the publisher. There are many subsections in game development job roles such as a Level Editor who build the further stages in the game and Lighting Artist, etc. Only big gaming studios can hire such professionals for the specialized roles to ensure that the quality in every aspect of their game is at its best. Smaller game development companies mostly developed Indie Games (independent games) where an individual team member can handle multiple roles to divide the workload (Eng, 2015, p.2).

2.3. Game Base Learning

Today information and communication technology is a fundamental part of human life. There is a good reason to presume that video game technology has the capability to satisfy basic educational needs. Therefore, this research deals with the digital learning with entertainment. More specifically, this study is about educational gaming and developing a digital educational game for mobile devices. The commitment of educational games is to encourage players by direct

experience as the key to success of game base learning system. Learning through communication technology has modernized much since the first designed learning materials such as Matrix Algebra were introduced in 1994 (Pohjolainen, Multisilta, and Antchev, 1996, p.123-141).

Despite the fact that modern learning environments support collaboration, but still mostly learning material is not utilizing the possibilities that new technology provides. Mainly educational material looks like the books that just converted into digital formats. It is crucial to engage students in the learning and web-based courses to provide information. Games are the new medium that created a new learning culture to achieve student's attention. In 1997, author Denise D. Nessel compiled the research in his book, "Awakening Young Minds: Perspectives on Education" and quoted that the best way of learning is the learning through games. *"The best way to learn about the parallel processes in a football game is to play it or second-best, to simulate playing it by following it through in imagination"* (Boocock, Schild, 1968), (Nessel, 1997, p.119).

Serious games have become a great teaching tool that can provide considerable information with the ability to have interactive communication. According to the author Felicia, serious games are now being designed for multiple purposes with the objectives of providing training and educational assistance. The nature of digital gaming solely focuses on the impact they produce on our society as a therapeutic intervention for improving the idea of learning to bring significant change in the lives of individuals (Felicia 2009, p.6).

2.3.1. Edutainment

Education is an ultimate process through which knowledge helps a person to become a valuable member of society, and the society grows in the positive direction. The education always is used appropriately to get improvements in individuals and as well as in the nations (Rao, 2013, p.3).

Video games are an important part of the entertainment market. Edutainment is a blend of education and entertainment that usually contains the elements of play. "*Edutainment is a process by which interactive technology is used to both entertain and educate*" (Cartwright, Peterson, and Gartner, 2013, p.319).

Sesame Street is a non-profit educational organization that active in more than 150 countries. Sesame Street creates healthy activities to help kids to grow stronger and kinder. With a fun, educational television series Sesame Street and several workshops and games the organization links many cultural and pedagogical gaps (sesamestreet.org).

Photograph 8. Painting Session in the TV Series Sesame Street, Date Accessed: December 20, 2016, Source: http://www.tvguide.com/ne-ws/sesame-street-premiere-date-hbo

2.3.2. Concept of Serious Gaming

From a study point of view, the most important game research field is utility games also referred to as serious games. It is an advanced term of edutainment that designed according to the real world settings for all age groups. According to the author Michael and Chen, Serious Game is a game that designed originally for the educational objective other than just entertainment, but it does not mean that serious games are not entertaining *"Serious games are games for which the primary purpose is not entertainment but where entertainment serves to reinforce the learning experience"* (Michael and Chen, 2005, p.153).

The term "Serious Games" seems rather fresh but in fact, the idea of designing video games to deal with serious affairs is old. Originally, the term "Serious" was used to refer to video games used for health care, emergency management, innovation and scientific research. The same idea works with simulations as well, including flight simulation and medical simulation, but an element of gaming adds the value of fun and competition in education. Through the education games, children studied, as well as they adopt the new technologies. In 1970, Abt introduced the first formal definition of the Serious Games. According to Abt, learning through simulations and games can enhance the educational capacity as well as provide entertainment. These games allow the players to not only learn, but also apply the experience what they got from the game. In his book, he explained Serious Games as an idea of connecting knowledge and technologies through video games (Abt, 1970, p.6-14).

Serious games serve the appropriate learning experiences for different businesses. As far as teaching is concerned, it does not have to be a tedious task, and there must be a space for fun in the education. Fun is an essential component of gameplay. Without the reinforcement of being entertained, serious games would not be used for learning purposes. Instead, it is challenging for a serious game designer to add fun to the education in serious games that can inspire users and facilitate learning. The whole idea of serious gaming is to make learning an entertainment. According to the researchers Michael and Chen, more than 80 percent answerers agreed that the fun element in serious games is very important. Games have the potential to educate, train and inform. Serious Game designers can play their role to use people's interest in video games to grab their attention to the emerging issues (Michael and Chen, 2006, p.40).

2.3.2.1. Rex Ronan-Experimental Surgeon: Example

Getting knowledge and practicing again and again through the game converts acquired information into persistent daily life habits. The positive learning thus helps young learners to play better roles in the real world. According to the author Abt students play the similar role in their real life as they play in games *"The role-playing that students undertake in games that simulate life is excellent preparation for the real roles, they will play in society in later life"* (Abt, 1970, p.14).

However, learning-based games deign aims at convincing players to change their attitudes or behaviors in positive ways. For example, Health-Hero video games are designed to persuade players to develop good health habits. In the interactive simulation Health-Hero, players must make self-management decisions and perform a role of a hero to learn real-life health related skills in a virtual demonstrating environment. Rex Ronan-Experimental Surgeon is also an early example of the game base learning system. Health Hero's Rex Ronan-Experimental Surgeon is an educational action video game for the Super Nintendo Entertainment System, announced in 1994. These games create awareness to the players about the negative attitudes towards the use of tobacco and demonstrate the disastrous result of smoking by taking players on a tour of a smoker's body that encourages them not to start smoking (Richard. Street, Gold, and Manning, 2013, p.104-105).

Picture 8. Microscopic Surgeon is Cleaning Jake's Teeth, Date Accessed: November 27, 2016, Source: http://www.giantbomb.com/rex-ronan-experimental-surgeon/3030-8948/images/

2.4. Ethics in Video Games

Whatever people do they want the reward for their determination and this is one of reasons they like to participate in games. Certainly, they suppose they would get similar level of rewards from learning activities as well. In the modern world, the requirements and the expectations of students are different than the formal teaching method which is why games have been gaining popularity as greater tools for learning now (Felicia, 2009, p.6).

The researchers are in favor that digital technology including video games has massive influence in our daily lives. Video games are the most innovative idea to engage people with the experience of digital learning as it is pushing the impact of technology in essential lifecycle of children and teenagers (Kringiel, 2012, p.633-646).

All sort of video game and its simulated people are involved eventually in teaching one thing or another to the players. The concept of learning from video games is based on learning with entertainment and for that a game must have entertaining elements to attract the player. Just adding educational content in the games does not assure that the game will be fun too. Without the motivational experience, the game will not meet the learning objectives or be successful in the market (Gunter, Kenny & Vick, 2008, p.513).

The fun element has to be in the sphere of ethics to make distinctions between right and wrong. The game either developed for consoles, computers or smartphones has to be ethically genuine in application to every platform. While playing video games, the players are fantasizing to be somebody else as they play different roles and characters to disguise their identities. On the basis of the nature of the game characters, players interact with the game world and with other people. According to the author Reynolds, *"By participating in simulations of excessive, indulgent and wrongful acts, we are cultivating the wrong sort of character"* (Reynolds, 2011, p. 286).

According to the author Sicart, the game designer defines ethics and character of a player in video games through the game design and virtual ethic approach. Sicart explains the ethics of games as

> *"The ethics of the game as a system of rules that creates a game world, which is experienced by a moral agent with creative and participatory capacities, and who develops through time the capacity to apply a set of player virtues"* (Sicart, 2011, p.226).

The game designer and players are socially set moral agents in the real world. Different people can have different ethical standards, and according to their own individual perspectives, normative ethics that can be generalized in the whole world to be right are used. In the games, moral issues find attention when the designer forces players to move further than they conveniently would prefer to go (Bartle, 2015, p.193-194).

A Game designer takes ethics in account while structuring new games. Considering the impact of game base learning, the game designs with healthy intentions have potential to lead the society in the right direction. According to the authors Verbeek and Morris, the game concept is directly relevant to ethics and there are many ways to use it with the moral philosophy (Verbeek and Morris, 2004).

2.4.1. America's Army: Example

The aim of sending children to the school is to prepare them to know the values, knowledge, and skills that they can apply further in creative ways. An educational game fulfills both the requirements of learning and practice simultaneously. Serious games are effective tool in education and it has been discussed that because of the larger audience, mobile and computer games are a unique medium that has the capacity for reaching out more people to learn about the meaningful activities. Video games can present valuable opportunities for learning by including particular characteristic in gameplay (Shaffer, 2006, p.128).

America's Army, the U.S. Army's first-person shooter game is an example of an ethical gameplay. The game was published in 2002 by US Army, and the idea of engaging people with the virtual soldier was very entertaining yet informative at the same time. The game was free of cost and had the primary intention of recruiting young men and women into the military. To maintain values of the army, the developers intentionally limited some of the player's actions such as killing the civilians and their own troops. Also, the player could not choose terrorist as a playable character because no army wants to recruit and train such kind of a person. Realistic gameplay like this one taught that the players

are not superheroes because one bullet could kill them. *“America's Army is the story of the all-volunteer force, from the draft protests and policy proposals of the 1960s through the Iraq War”* (Bailey, 2009, p.X).

Picture 9. Screenshot of America's Army: Special Forces Mission (2002), Date Accessed: December 2, 2016, Source: http://serious.gameclassification.com-/EN/games/758-Americas-Army/index.html

Relating to the level of detail, US Army set different specifications than the other games in market. Author Lunenfeld describes the requirements as:

> *"That the game be played absolutely straight, as an honest representation of the service especially regarding ethics, codes of conduct, and professional expectation, and extending to accurate depiction of hierarchy, missions, weapons, equipment, uniforms, settings, discipline, tactics, procedure —in short this was to be a game a platoon sergeant could play without wincing."* (Lunenfeld, 2003, p.269).

US Army released several sequels of the critically acclaimed game America’s Army for example "America's Army 2 in the year 2003 and America's Army 3 in 2008. The mobile game version "America's Army: Special Operations" was released in 2007 collectively by Gameloft and the U.S. Army. The fourth in the America's Army series is America's Army: Proving Grounds (2012) was released with the new features of improved look and feel (americasarmy.com).

Picture 10. Screenshot of America's Army: Proving Grounds (2012), Date Accessed: December 2, 2016, Source: https://www.americasarmy.com/aapg

2.5. Does Games Cause Violence?

It is discussed earlier that video games have the potential to transfer information or behaviors which have been displayed in video games as they it serves them as a model of replicating actions. According to Dewey's theory, Dewey focuses on realizing the significance of seeing knowledge as a tool, and he noted when people learn about a tool they learn what it is and as to when and how to use it (Dewey, 2008, p.1-4).

According to a survey by the Kaiser Foundation, 8-18 years old American children play an average of 8 hours of video games every week. Between 1999 and 2004, the total video game playing time has increased approximately 24 minutes from 00:49 to 1:13, and the additional 20 minutes of that comes from cell phones and other handheld video game players (Rideout, Ulla, Foehr, & Roberts, 2009, p.3).

More than 60% of children reported that they played longer than they intended to play (Buchman and Funk, 1996). The kids, who play video games excessively, are also much more likely to be playing violent games (Krahé & Möller, 2004). Video game addiction is a serious subject among psychological disorder which has been gaining rapid growth in a very less period of time. A study explains that children who are obsessed with video games their addiction

leads them to physical or mental disease level that causes damage to the family, social, school or psychological functioning (Anderson, 2012).

It is difficult to draw the line between the question if games cause violence or not. Some psychological reports demonstrate the findings that due to specific features such as interactivity, repetition of actions and actual acting as an aggressive person in the violent video games, it leaves a strong influence on the player which could lead towards learning the displayed behavior in a much more realistic setting with higher intensities (Anderson, and Bushman, 2001, p.69).

Researchers Buchman and Funk examined electronic game-playing habits of 900 children and noted that watching and playing violent video games increased the level of aggression in children. The authors explained, through a potent combination of learning and practice along with entertainment, violent video games teach that destruction is fun and has no adverse outcomes (Buchman and Funk, 1996, p.12–16).

The game designers encourage the idea of making fun games that people can enjoy but their intention of making it entertaining is not to create a product for wrong purposes. Video games have proved itself to be capable enough of not just producing negative outcomes on children by using weapons in the game but also violence or killing the civilians in video games raises a question on embracement of socially unacceptable moral values. These games use their storyline as a mean of communicating values to the players like also said by Squire how interactive storytelling might be one way of "anchoring instructions" (Squire, 2003, p.9).

In order to reduce the high prevalence of aggression in youth it has become essential to ponder over the subject of coming up with either new alternate behaviors to substitute the negative ones or fabricate the medium which spreads negativity in the first place. Several scientific studies indicate that experience of antisocial and violent games increases the possibility of risky outcomes. Also according to the research conducted in the US, violent electronic games are potentially harmful and enhance the probability of aggressive behavior. (Dill and Dill, 1998) but lives of children and teenagers can be improved by playing constructive and pro-social games (Anderson and Warburton, 2012, p.56).

In the video games, players play the role of their preferred character which has a stronger influence than movies or television as they project the idea of their

identity in a modified version of their ideal self. Top selling games such as Killer Instinct and Mortal Kombat allows the player to select their favorite character among many others that have distinct characteristic such as individual fighting strengths, particular sex, race and personality type. While playing a video game player is playing a role of elected hero with whom they like to be associated. The relationship between player and the hero makes player emotionally attached to the character and player may behave emotionally as he might feel some sort of loyalty towards the character thus leading towards ultimately adopting the displayed aggressive approach (Dill and Dill, 1998, p.413).

The growing sale of violent video games positively correlates to the increased number of school shooting incidents. Following are the few shooting killing incidents among many others that related back to the teenagers who obsessively play violent video games as shooter.

2.5.1. Columbine High School Massacre

On April 20, 1999, tragic incident happened at the Columbine High School when shooters Eric Harris and Dylan Klcbold turned their guns towards their classmates and killed twelve students and one teacher. According to psychologists Craig Anderson and Karen Dill

> *"One possible contributing factor is violent video games. Harris and Klebold enjoyed playing the bloody shoot-eat-up video game Doom, a game licensed by the US. Army to train soldiers to effectively kill"* (Anderson and Dill, 2000; p.772).

2.5.2. Washington, D.C. or Beltway Sniper Attacks

In October 2002, ten people were killed and three critically injured in different places of Washington, D.C. and Maryland, Virginia. The Young sniper, Lee Boyd Malvo, claimed that he learned to kill people by playing a military first-person shooter video game Halo on his Xbox. He practices shooting human bodies to make himself less insensitive (Kutner and Olson, 2008; p.6) (Carlisle, 2009, p.235).

2.5.3. Virginia Tech Shooting

On April 16, 2007, Virginia Tech shooting happened on the campus of State University in Blacksburg, and Virginia Polytechnic Institute. Twenty-three years old, Seung-Hui Cho committed suicide shortly after the killing 32 people and 17 injured with two semi-automatic pistols. At the time of occurrence, it was the most violent shooting incident by a single gunman in the history of United States (Crowe, 2012, p.80).

In an interview with Fox News lawyer and anti-game activist, Jack Thompson criticized the video game industry. He told that Chao was obsessed with a team-based tactical shooting game Counter-Strike in high school which seems to have influenced his thinking to the extent of externalizing the fantasy play (Kutner and Olson, 2008, p.197), (Carlisle, 2009, p.235).

2.5.4. Norway Attacks

The 32-year-old male, Anders Behring Breivik behind the bombing government buildings in Oslo and after shooting massacre on Utoya Island on 22 July 2011 said, he usually preferred fantasy role-playing games. According to the author Borchgrevink, Brevik killed and injured 100 people, and police believed that he had fired a total of 297 shots: 176 with the rifle and 121 with the pistol (Borchgrevink and Puzey, 2013, p.227).

Anders Behring Breivik describes the fact in his 1500-page manifesto published online just before the killing that playing the violent video games Modern Warfare 2 and World of Warcraft helped him in planning and executing the attacks. Breivik named Modern Warfare 2 to have helped him with target-practice and playing World of Warcraft in providing sufficient cover for preparatory activities (Shah, 2011), (Moses, 2011).

The Norwegian government said Breivik committed the murders not because he played violent video games but because there is something clearly wrong with his psychological state of mind. After the controversy, Australian Christian Lobby announced to ban all the video games that allow unnecessary violence as he addressed that Modern Warfare 2 was ideal for purpose training and preparation (Moses, 2011).

However one of Norway's biggest retailers, Coop Norway, expanded the ban from one game to a number of violence producing video games (Narcisse, 2011).

Picture 11. The Controversial Mission from Modern Warfare 2 in Which Players Slaughter Civilians in an Airport, Date Accessed: December 5, 2016, Source: http://www.smh.com.au/digital-life/games/from-fantasy-to-lethal-reality-breivik-trained-on-modern-warfare-game-20110725-1hw41

There are already few experiments performed on this subject such as Cooper and Mackie observed the fifth-grade girls, and they found aggression in their behavior after playing a violent game, and the aggressiveness was slightly reduced after playing the less offensive game. The present findings show that the violent video games effects quite well as it stimulates aggressiveness in the players in the short run and later in life. Further development needs to overcome the harmful effects of violent video games. The serious games that are designed with the concept of moral responsibility have potential to form a better world with nonexistence of violent actions in video games ultimately reducing the risk factors for aggressive behavior in teenagers (Cooper and Mackie, 1986, p.16, 726-744).

2.5.5. Gaming for Social Good

Among thousands of games, there are proofs that the games designed for the particular purpose can contribute to behavior change. According to the authors, Antle, Tanenbaum, Macaranas and Robinson *"Games for Change are*

digital games that purport to change people's opinions, attitudes, or behaviors around specific issues" (Nijholt, 2014, p.163, p.180).

According to the Schank, humans learn more efficiently through active learning instead of passive learning which explains how in video games learning has been done implicitly rather than explicitly (Schank, 1995). Video games have changed the education methods by introducing practical application of knowledge not just in the proper way but also at the proper time. Serious gaming also has potential of delivering complex social aspects. Therefore game designers can minimize the medium for negative influences and rather utilize the possibilities of gaming technology to have a positive effect in the world (Swain, 2007, p.809).

For an effecting positive social change, a non-profit organization "Game for Change" also called G4C is supporting individuals and groups by making serious video games. (gamesforchange.org). According to the author Shaffer, some commercial games can help players in the classroom, and they can learn to think in innovative ways about important issues and situations. *"One such game is A Force More Powerful, which was designed as a teaching tool for nonviolent activists"* (Shaffer, 2007, p.133).

Another example is "Food Force" that published by the United Nations World Food Programme in the year 2005. The game teaches about world hunger by taking on player's mission to distribute food in a famine-affected country. Along with the experience of both fun and social messages, Food Force helps players to learn what they should do for the recovery (Despres, 2011, p.478).

After a detailed analysis on the social productivity of games in terms of their context, it can be concluded that games play a major role in influencing an individual's psychological state of mind as it is a way of protecting our ideal selves in a fantasy play. Accomplishment of fantasies in the game reinforces the emotion of elation felt after achieving but it also increases the strive to get more of it thus individuals start depicting the behavior in real lives to achieve higher level of satisfactions. This, if used negatively for embedding violence or other unethical values would cause distress in the society but if used for the right purposes to make this world a better place with good moral values in the upcoming generation can cause the society to flourish towards a healthy state of living.

Chapter Three

3. Environmental Concerns

Global warming is one of the most sensitive cases in the world, every day there is something in the news about environmental issues. Global warming is a serious matter because it will eventually determine the people's choice of lifestyle in the 21st century. Erath may face many unfortunate situations such as Tsunami, earthquake, melting glaciers, sea level rise, tropical cyclones and several more.

Among many other factors, the burning of fossil fuels is one of the leading causes of global warming as it generates carbon dioxide in the environment. The significant amount of carbon dioxide comes from energy production, industrial processes, and transport. Deforestation also accelerates climate change as trees help to maintain the water cycle by returning the water back into the air and control the temperature throughout the day. As the environmental problems are affecting the living beings, thus it became a moral concern. The new climate change policy helps identify possibilities for making better use of existing natural resources. To bring the effective change, the individuals need to choose environmental friendly activities and motivate others to do the same. In short new ethical principles are required to transform the society.

In the presence of such a threat, it is necessary to realize that what causes the global warming. In the history, it took too much time to understand this problem. The lack of global environmental awareness was the barrier between common people to identify the issue? It is crucial to bring awareness in the society towards the better use of natural resources. It is the time to educate individuals about the value of planting new trees since it is a practical approach to creating the balance between greenhouse gasses in the air. The consequences of burning coal or natural gasses will be serious so it should be banned or restricted to the limited usage to avoid the greenhouse gasses in the air. Natural ways of producing energy such as solar panels and windmills should be encouraged. Polythene should be banned, and recycling process has to be promoted to prevent the consumption of limited natural resources.

According to the research by NASA’s Goddard Institute for Space Studies, the ten warmest years since 1881 have occurred since the year 2000 and 2015 rated as the warmest year in the records. Though, mostly people are informed of

this disaster of Global Warming but still only a few of them are taking it seriously. Personal viewpoint will determine the future of Earth, and individual efforts can stop Global Warming and bring the positive change.

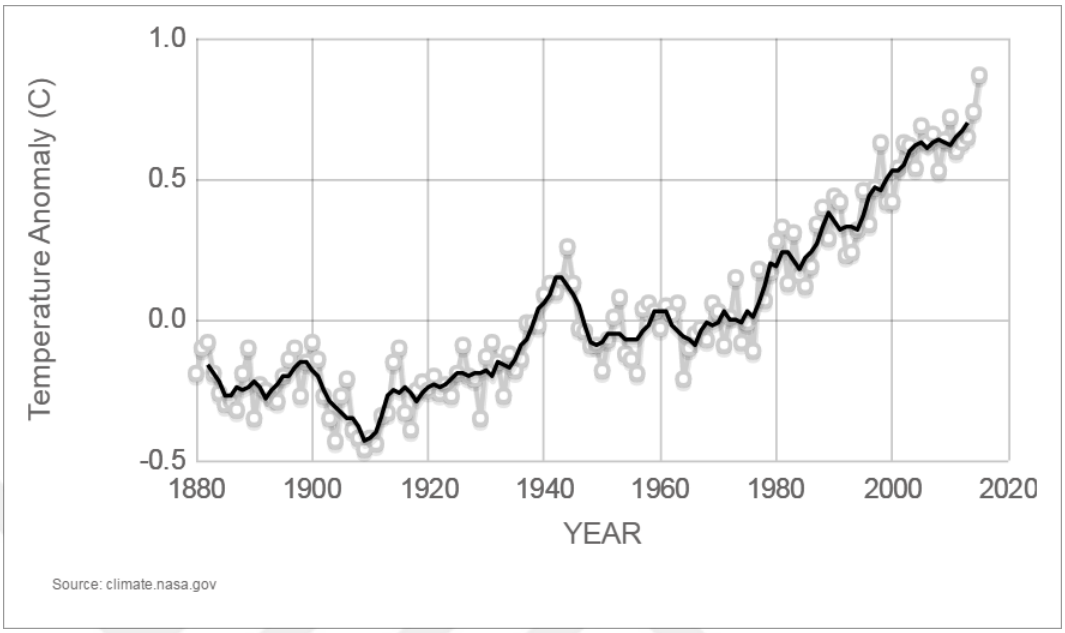


Diagram 4: Global Land-Ocean Temperature Index Data, Source: NASA's Goddard Institute for Space Studies (GISS). Credit: NASA/GISS, http://climate.nasa.gov/vital-signs/global-temperature/

In this thesis, the central aspect lies in game design as a tool for raising the awareness of the global issues. The thesis covers aspects to show how serious the problems are and shows an entertaining and fun way to create awareness regarding global warming. Besides the research, as a practice of awareness through entertainment and fun a realistic and entertaining board game has designed within this thesis that leads toward the isometric artwork for the mobile and tablet based games. The prototype board game demonstrates that the games can and should be used not only for amusement, but they can serve serious concerns too.

3.1. Prototype Board Game

The thesis calls for attention on gaming design as a tool to enhance moral responsibility in youth. Notably, children love games. Some of them and particularly those who live in urban areas have computers and mobile games as their main source of entertainment. It seeks to create awareness over the reasons why games should be designed in such a manner that they do not offer entertainment only but also education on the major social issues of the twenty-first century. They ought to impart a sense of corporate social responsibility among learners. In the twenty-first century, there is a chain of social issues that need attention from socially and morally responsible individuals. Some of them include road carnage, drug and substance abuse, pollution, unhealthy feeding habits, modern day healthcare menaces. Therefore, the study seeks to inform game designers on important prototypes to impart social and moral responsibilities among the target groups who are expected to use games for learning and entertainment (Kakabadse, Rozuel, Lee-Davies, 2005).

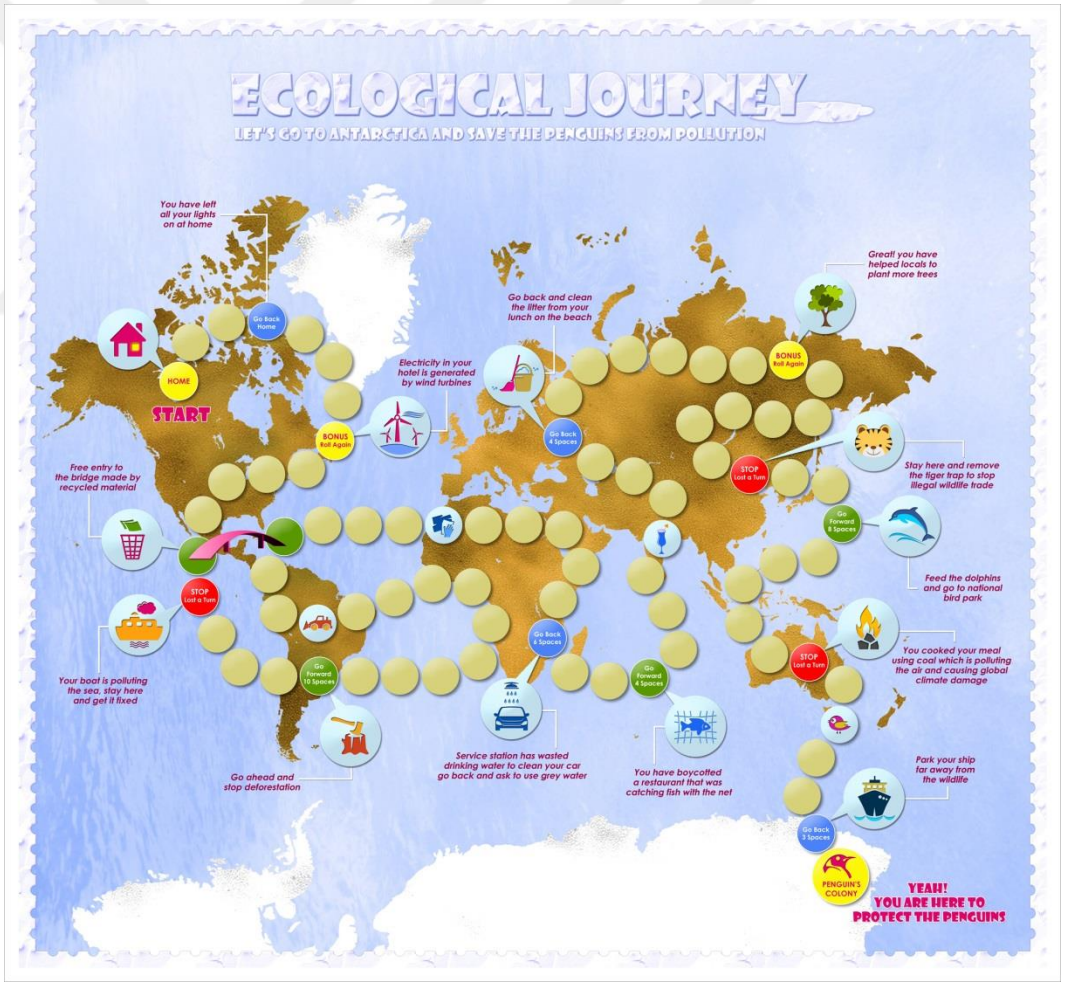
Ideally, games should be designed not only to entertain but also enhance learning besides the acquisition of moral values. Well-designed games could serve as important tools for learning mainly for younger learners who enjoy interesting learning exercise especially those that involve playing games. Through such measures, it is very likely that we will cultivate a culture of morality within the society. Therefore, the extent of ethical diligence within the society will be fair as morally upright children grow up as being morally upright adults. They too may be able to nurture their children into being socially and morally responsible individuals in the society.

3.2. Ecological Journey: Board Game

The environmental state of planet earth is precarious. Many potential disasters are overdue, and some are already occurring such as tsunamis, sea level rise, solar flares, climate change, water shortages, crop failures, pollution, nuclear disasters, etc. The current situation is serious, but it is not the end, and individual responsibility can lead toward the restoration. The prototype board game “ecological journey” is designed as an overview of sustainability education on all the environmental problems that we have. The project is a dice rolling board game played between two or more people on a game board. Ten to fifteen minutes gameplay required counting and observation skills. It is simple for the players to

understand the gameplay logic as it is based on ancient Indian board game "Snake and Ladder" from the 16th century. The objective is to reach the end with the help of stairs and bypassing the snakes that represent enemy (Frater, 2014, p.273).

In Ecological Journey, the players move ahead in the steps according to the number they get on the dice. Journey starts by rolling the dice and ends up to the player's luck. The game rewarded players on creating a sustainable ecosystem and imposed the penalty to the actions against the environmental protection. The winner is the first player to reach Antarctica, find Penguins Colony to save them from the environmental issues such as climate change, oil spills, illegal egg harvesting etc. The board game has been tested in an exhibition and at several places between the people of different age groups. The game provided the players a fun interactive way to learn about the environment dishonor.



Picture 12. Design of Prototype Board Game "Ecological Journey"

Picture 13. Prototype Board Game "Ecological Journey" Details

Photograph 9. Prototype Board Game "Ecological Journey" photographs from the exhibition

3.3. Ecological Journey: Art Work for Mobile and Tablet

In this age of technology, we are moving from board games to the video games. As previously discussed, the mobile games have many advantages over the other mediums of gaming. In a very short time, the mobile game industry has established itself as a global attraction. In the figure below annual global revenue for the video games (million EUR) is shown. The figure shows how traditional console games and PC games are struggling with declining revenue, whereas online games and mobile games are growing rapidly (Nielsen, Smith, and Tosca, 2016, p.17).

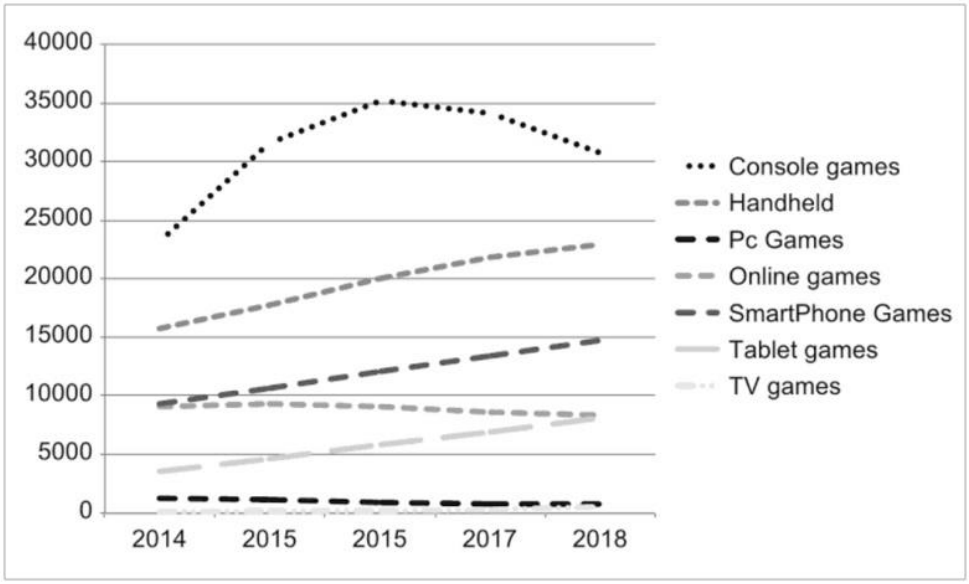


Diagram 5. Annual Global Revenue for the Video Games (Million EUR)

After the prototype board game next step is to figure out the ways to incorporate board game into the mobile game. Artwork of a city has been designed as a proposed game level for the mobile game. The character will walk/run on the street between different architectural style buildings. The players control the game by rolling the dice and walk. After every few steps, there are penalties for doing anything wrong for the environment and rewards for being good. Every stage, players put into a scenario where they have to do their best to finish the journey in a sustainable fashion within the given time. The journey required different energy sources to keep the player energetic that are available in the different form in the game. The goal is to make the dynamics of this game so compelling that the player will not be able to put down the game once they have started.

3.3.1. Making of Ecological Journey: Mobile Version

Potential art assets are the part of research to sketch out an attractive environment that will give the player a sense of pleasure in the game when looking at the graphics. Prototype board game is tested with the players that fall within the target audience of above ten years old that helps to get feedback to improve on gameplay and design repetitively.

3.3.2. Animated Intro: Storyboard

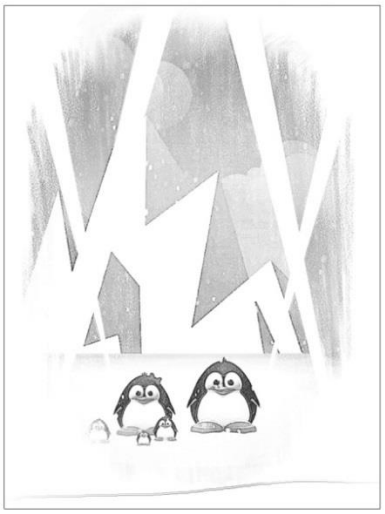
The short animated film of 90 seconds is a part of the game introduction where Penguin describes his life before the human intervention in their region such as Antarctica. The idea of animation was organized on the paper and later on storyboard help to focus on the idea and improve the quality of animation.

Following is the animation storyline

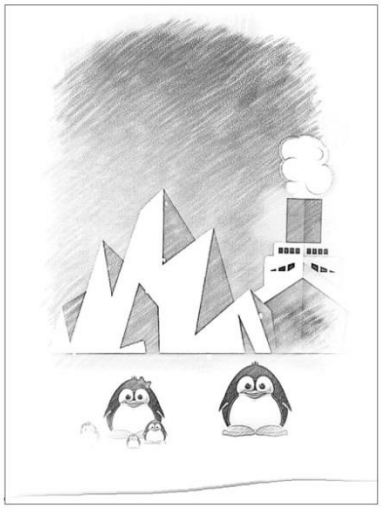
[00:06] Oh, everyone is here (Ahmm). [00:8] Once there was I and my family and our beautiful little icy world. [00:14] We danced upon the ice and caught every falling snowflake, it was lovely. [00:23] That's how I had always known the world to be. [00:27] Until 'they' came. [00:32] Their inconsiderable lifestyle took away from us our land, our lives, and our world. [00:42] The snowflakes were no more. The icy land beneath shook and drifted apart and so did my life and my people. [00:51] In my mind I see them but I see myself no more. [01:00] Am I dead? [01:10 – 01: 19] Dear human, it's time you let the world be. It's time you turn back before the world turns its back on us. It’s time to play your role.

Some of the visuals from the animation’s storyboard can be seen in the picture 14.

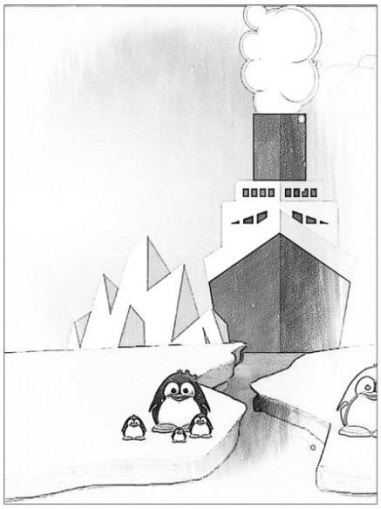
Oh everyone is here (Ahmm) 0006



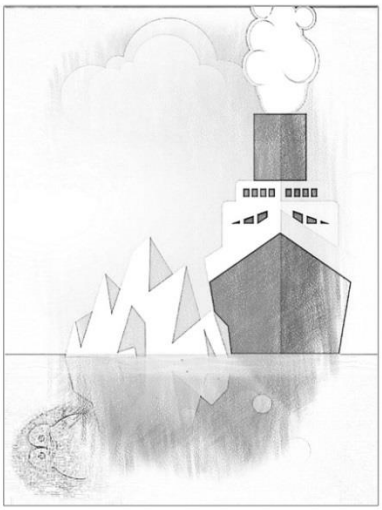
We danced upon the ice and caught every falling snowflake, it was lovely 0008



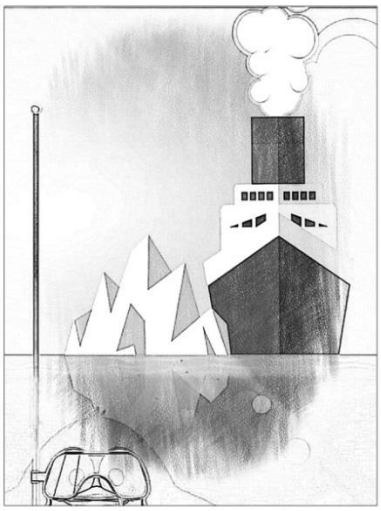
That's how I had always known the world to be. Until 'they' came 0023-0027



Their inconsiderable lifestyle took away from us our land, our lives, and our world. 0032



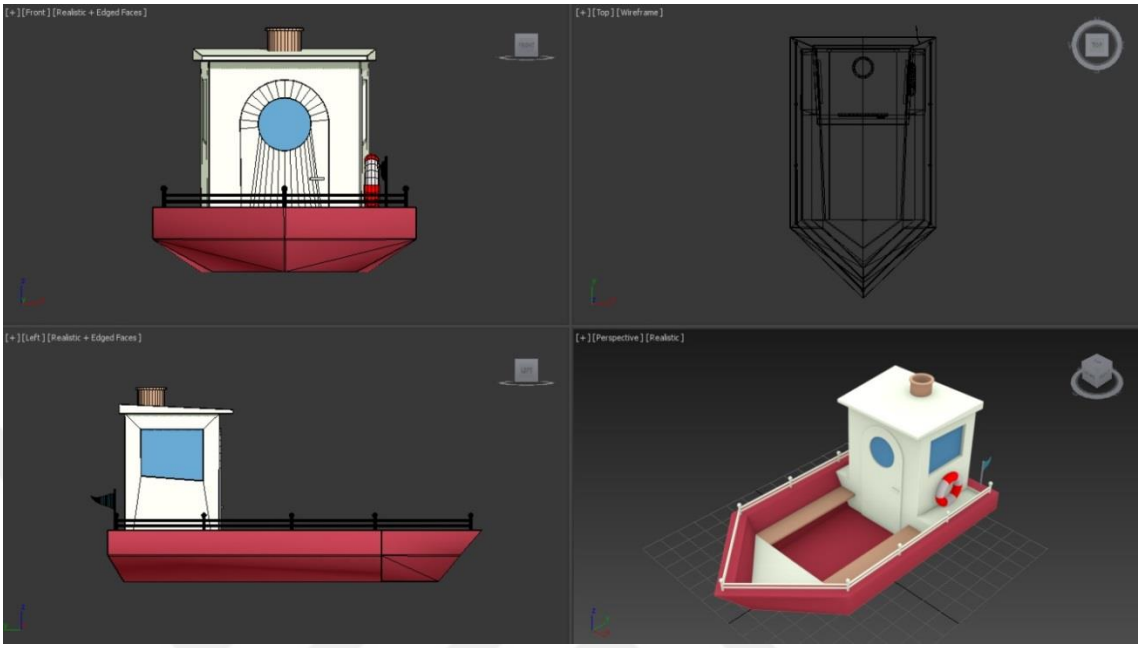
In my mind I see them but I see myself no more. Am I dead? 0051-0100



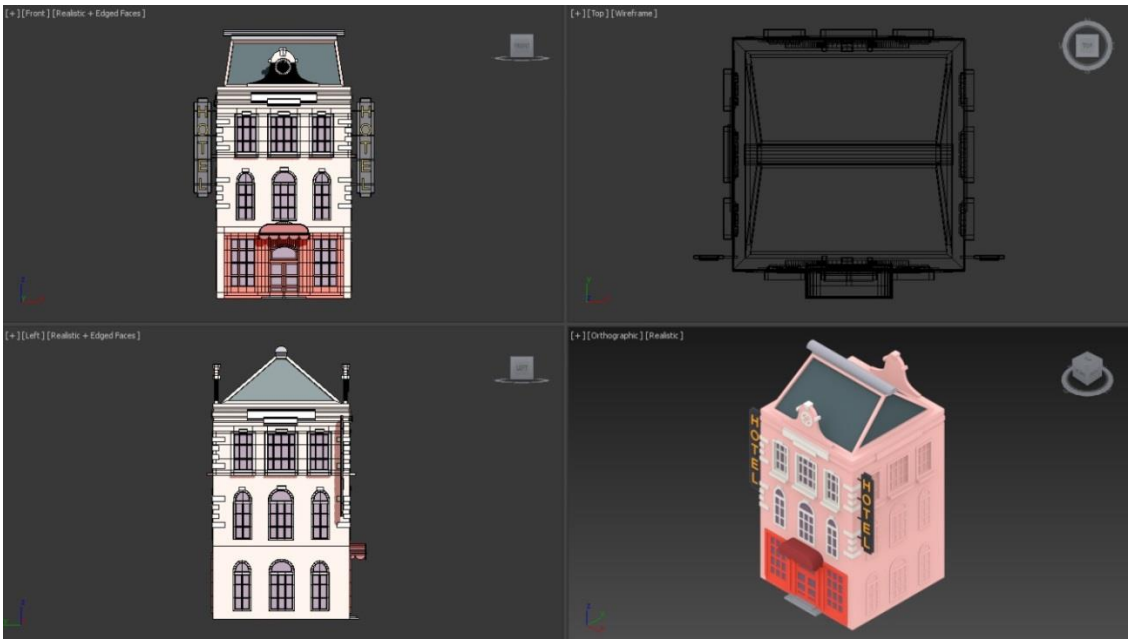
Dear human, it's time you let the world be. It's time you turn back before the world turns its back on us. It's time to play your role! 0110-0119

Picture 14. Introduction Animated Video Storyboard

3.3.3. Creation of Art Assets



Picture 15. 3D Boat Model for Ecological Journey (Mobile Version). 3Ds Max screenshot with texture and basic shader.

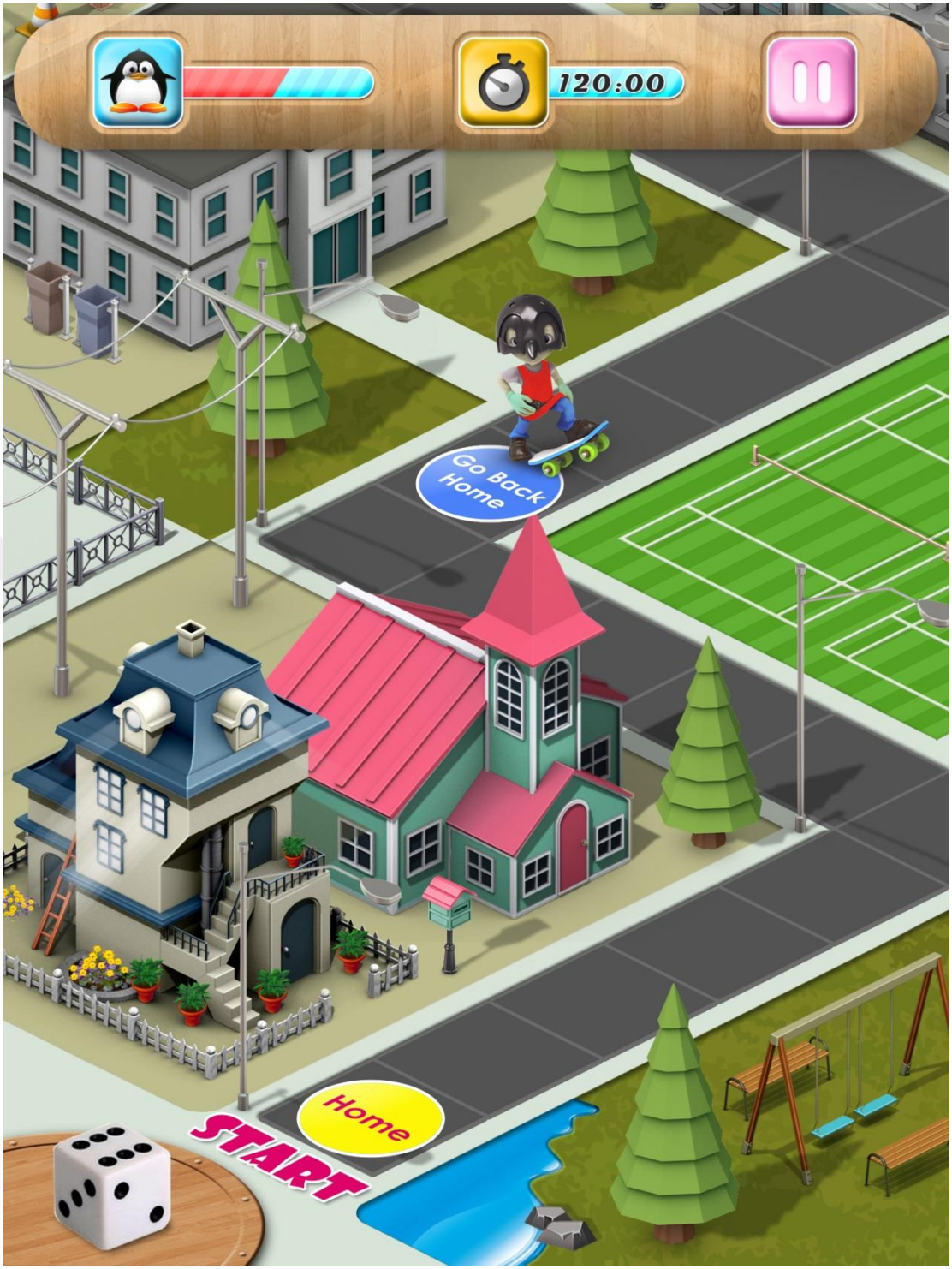


Picture 16. 3D Model of Hotel for Ecological Journey (Mobile Version). 3Ds Max screenshot with texture and basic shader.

Picture 17. Texturing of 3D Models in Photoshop

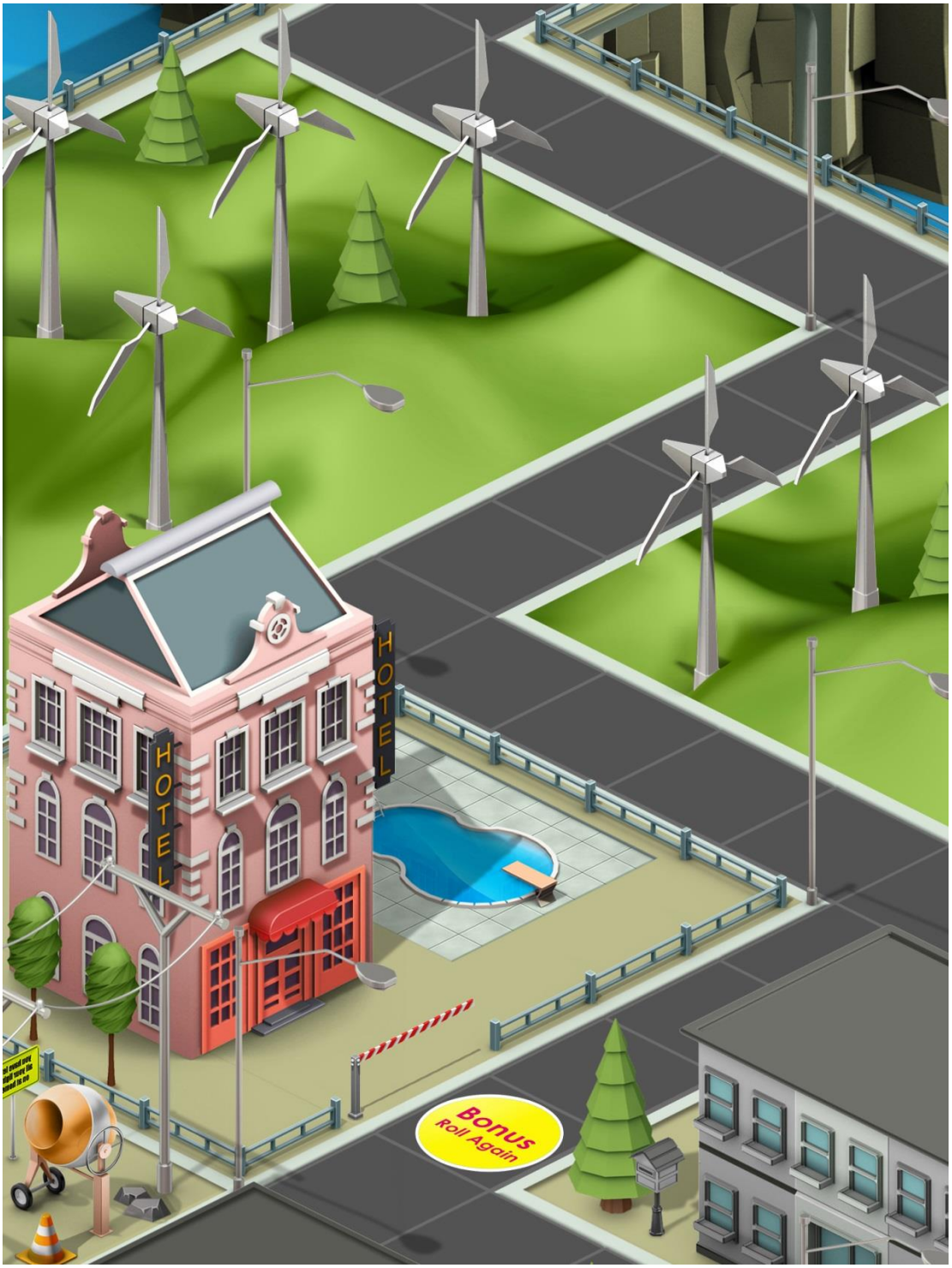
Picture 18. Splash Screen of Ecological Journey

Picture 19. Level Screen of Ecological Journey



Picture 20. Proposed Art Work Screen 1: First level of the Game Ecological Journey

If the player reached at step 12 then has to come back home because the player has left all the lights on at home. The player pays the price by returning to the step 1 and start again.

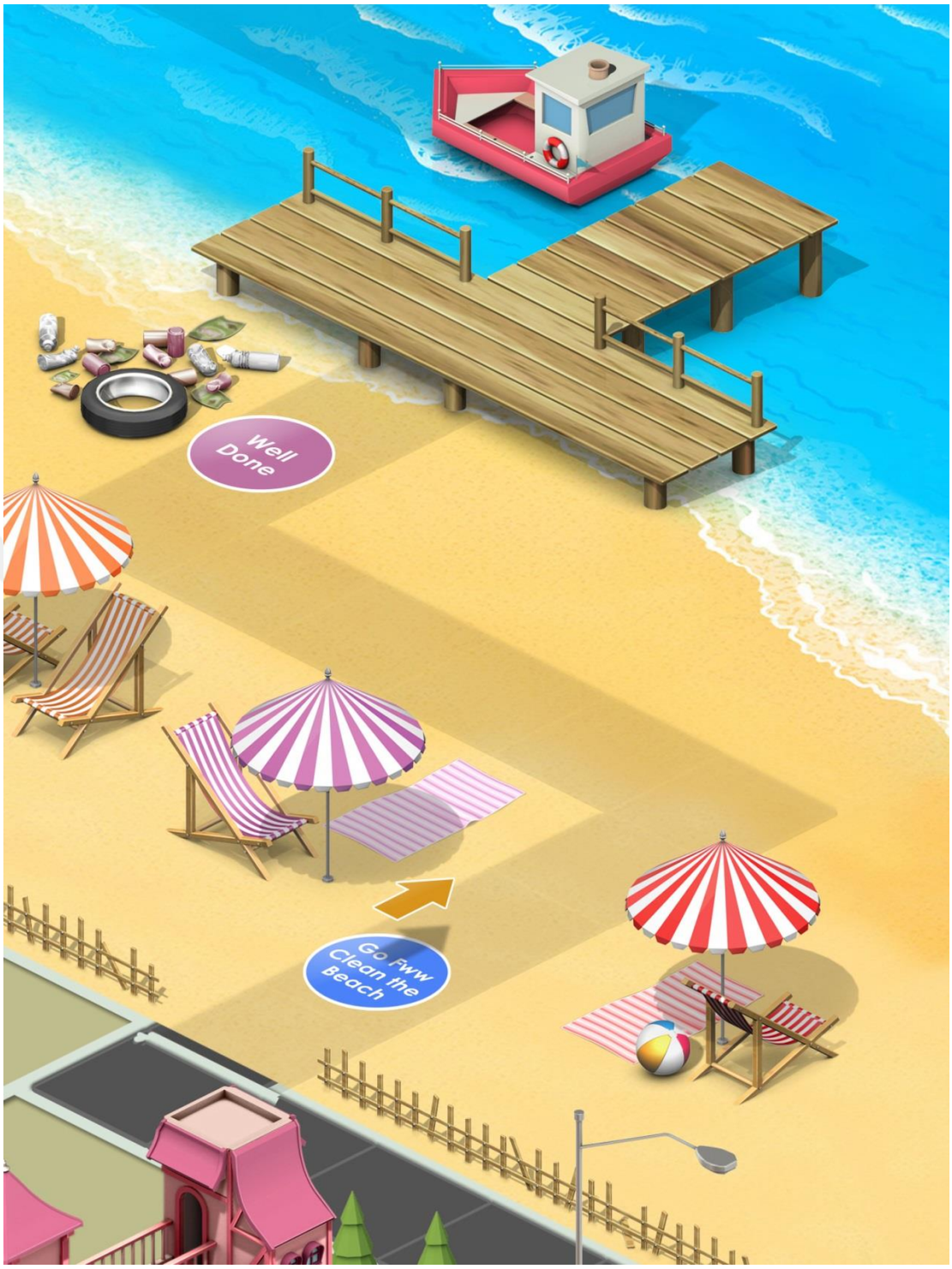


Picture 21. Proposed Art Work Screen 2: First level of the Game Ecological Journey

The player will be rewarded with the bonus turn because of staying in the hotel where the electricity is generated by the wind turbines.

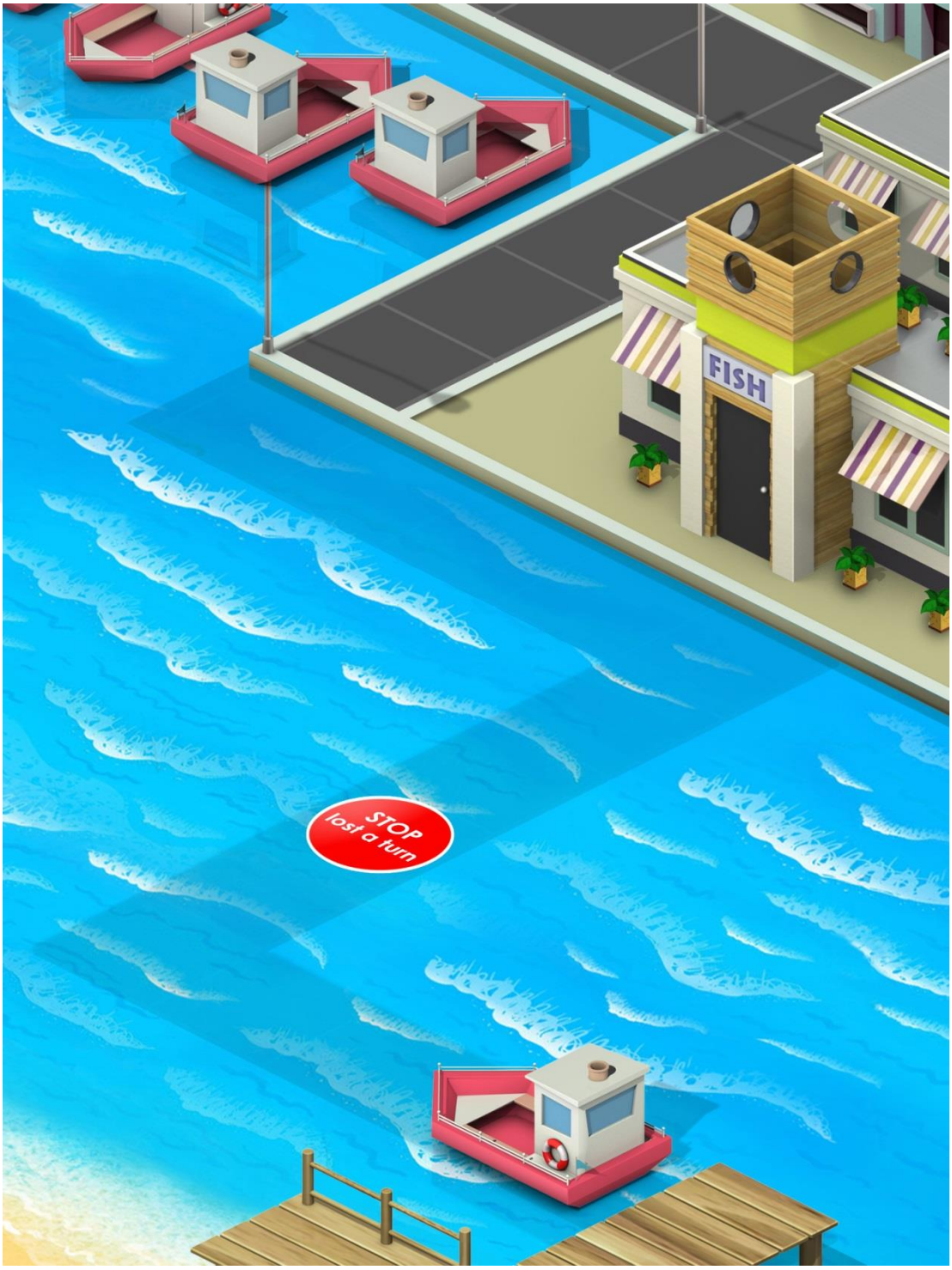
Picture 22. Proposed Art Work Screen 3: First level of the Game Ecological Journey

There is a free entry to the bridge made by recycled material. Otherwise players have to wait until the train passes.



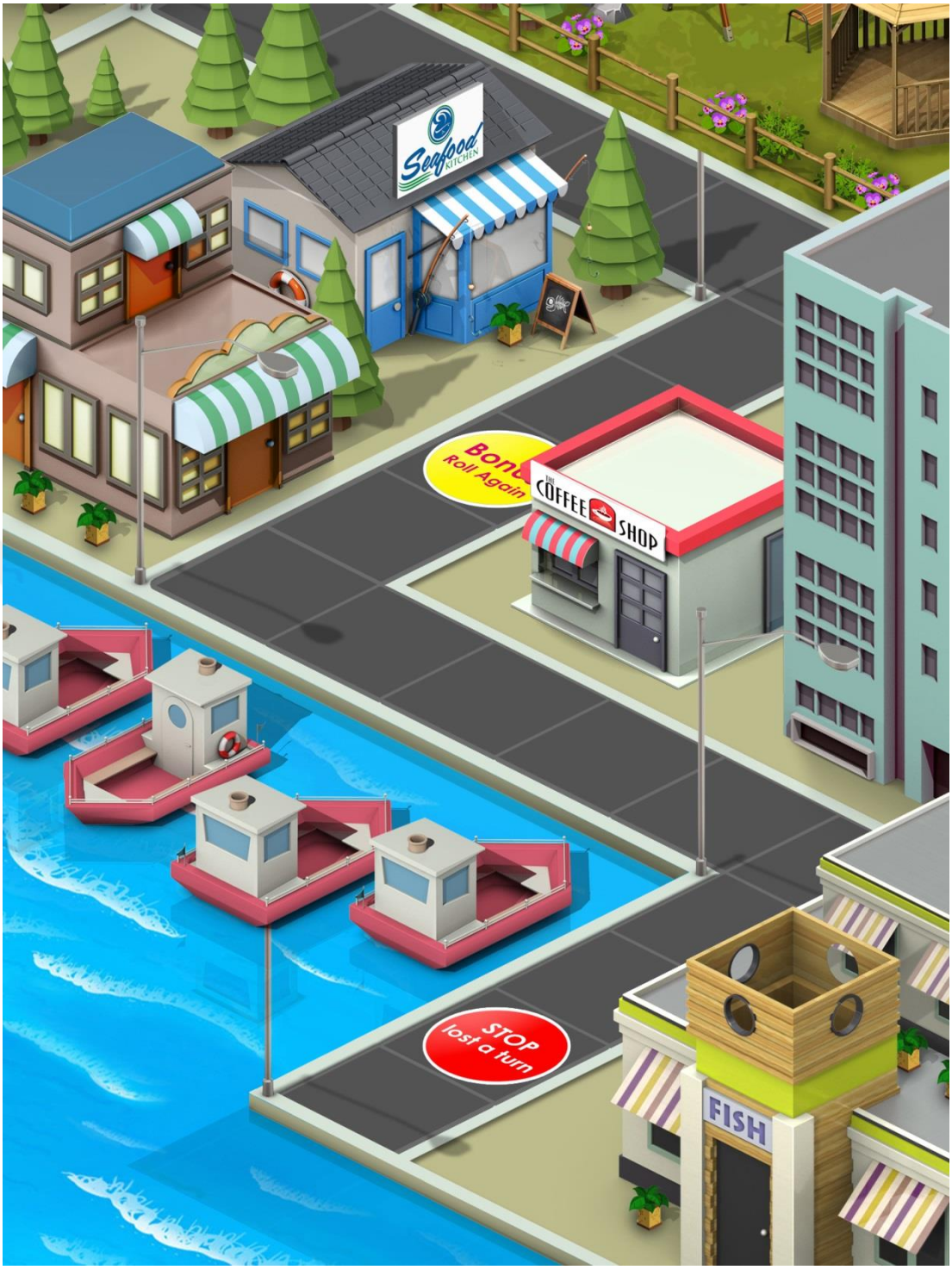
Picture 23. Proposed Art Work Screen 4: First level of the Game Ecological Journey

"Go forward and clean the beach" by reaching to the arrow point, the player will get a power-up effect that takes the player directly to the dirty area to make it clean.



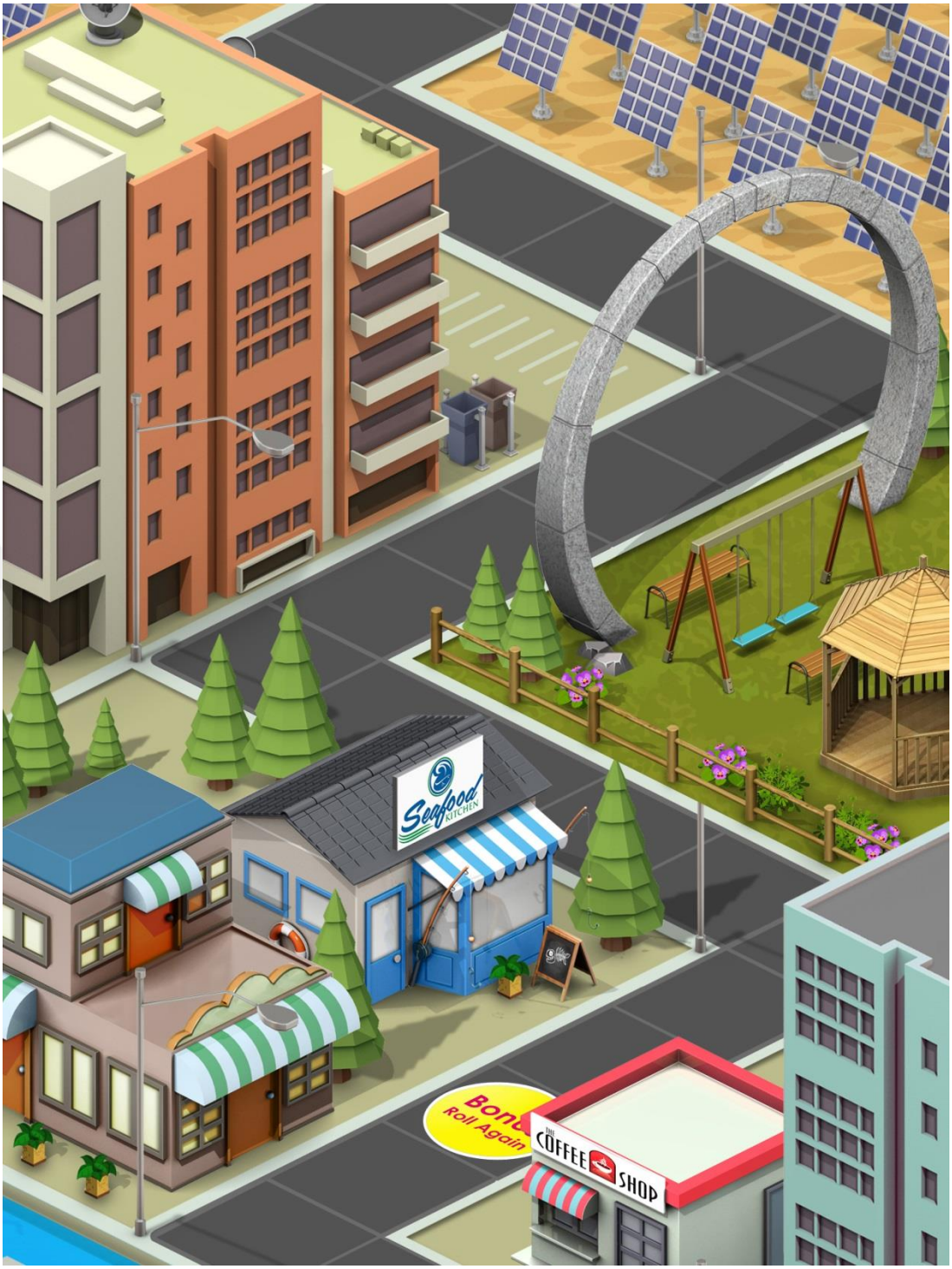
Picture 24. Proposed Art Work Screen 5: First level of the Game Ecological Journey

On the red point the boat will start producing smoke and spill oil in the sea. Player will lose the turn at this point and asked to get the boat fixed and then move.



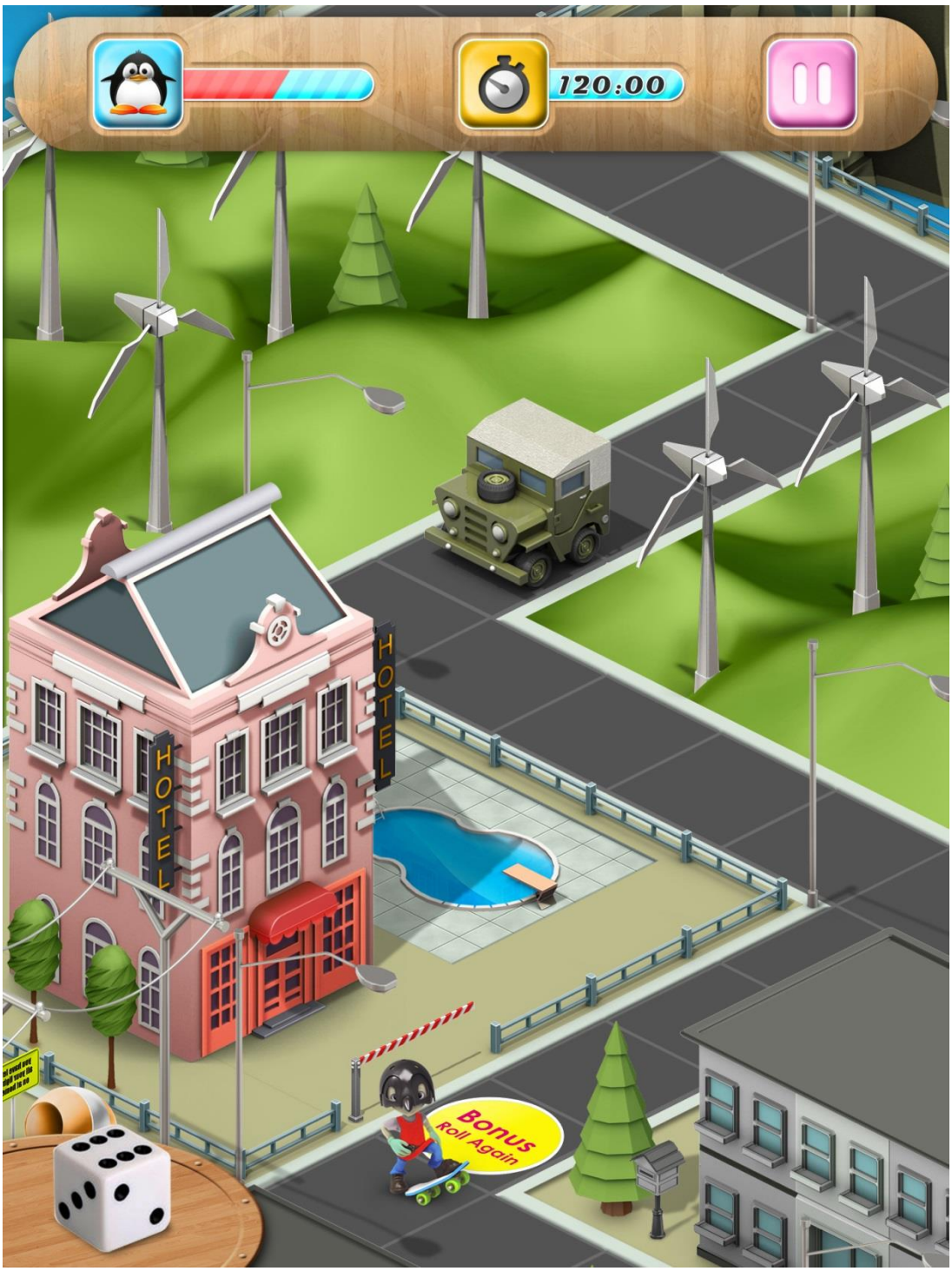
Picture 25. Proposed Art Work Screen 6: First level of the Game Ecological Journey

Overfishing creates difficulties to maintain a sustainable environment. A large fish restaurant on the sea side is catching fish with the net. By eating there will punish the player and motivate to eat from the restaurant where they catch fish with the rod.

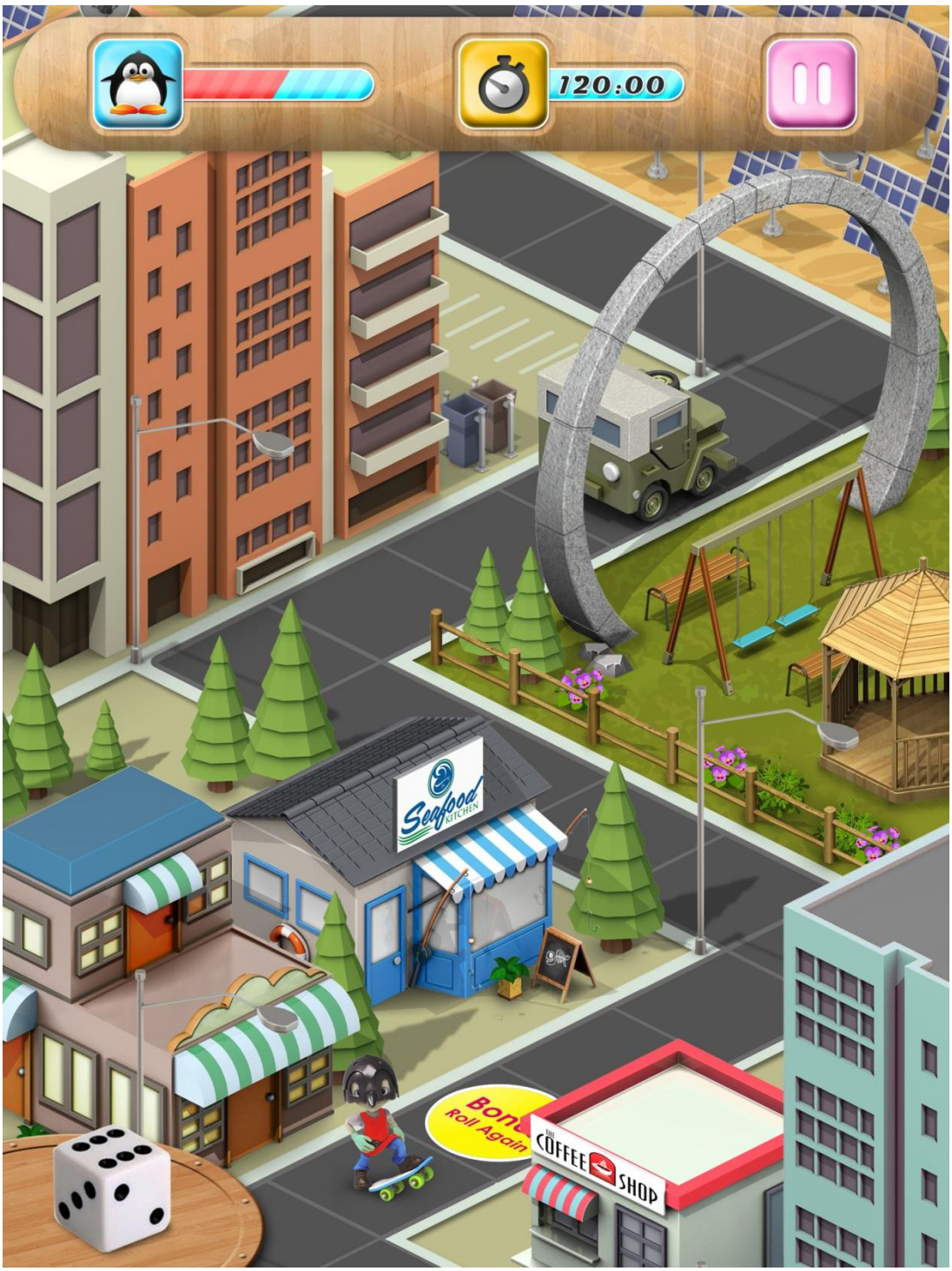


Picture 26. Proposed Art Work Screen 7: First level of the Game Ecological Journey

As mentioned previously, overfishing creates problems to preserve a sustainable atmosphere. The game encourages the player to eat from a fish restaurant where they catch fish with the rod.



Picture 27. Proposed Art Work Screen 2 with User Interface and Character: First level of the Game Ecological Journey



Picture 28. Proposed Art Work Screen 7 with User Interface and Character: First level of the Game Ecological Journey

3.4. Conclusion

Firstly, it may be argued that since games are specifically designed for entertaining and not for preaching subjective moral values, they do not fall within the ambit of raising social consciousness but it has been concluded based on studies that, games do play a major role and responsibility in seeking out and encouraging aggressive, hostile and anti-social conduct, especially among younger users. Thus, the use of more pleasant, soothing and friendly social cues could well erase negativities and increase calmer behaviour, especially among addicted users of games, especially boisterous video games, which over time, quite naturally, makes their users mimic characteristics and activities of the players in such games.

Mimicking gaming war heroes in games is the natural outcome of Static Influence Theories, the lack of judgmental rationality among younger users of violent games is indeed more disconcerting, especially when they manifest no remorse, or regret for indulging in anti-social behaviour. This could only be effectively resolved if their moral and ethical senses (distinguishing between right and wrong) are in the right places and they are taught to do good and avoid bad things in their lives.

Hence, game industry promoters owe it to themselves, communities, young innocent users, and public in general, to ensure that their money-spinning business also considers building, enforcing and sustaining morally highest standards of ethical values and social consciousness into their products. Irrespective of the economic costs, just in order to ensure that the moral and ethical values of human societies are not only upheld but also promoted and advanced in the years to come.

This research has been mainly focused on the bond between morality and ability to learn with fun. Though educational is involved in other media like movie, music, and literature but interactive experience in video games has considerable potential to demonstrate. The experiential gaming model for mobile and tablet devices in this thesis is still in its early stages. To provide a convincing gaming experience to the players the game design needs to be more fun and full of special visual effects.

In this research, a board game was studied from a distinctive point of view. It takes the time to find proper research to design a different gameplay than the board game that is more suitable and can be developed in less time. Actual cities need to be designed with the real locations and particular problems that need to be highlighted in particular regions. More questionnaires and surveys and required to gathering the information regarding the social issue in a particular city. It is certain that social media affects the involvement of player and therefore, one future objective is to study that how social media can help video games to bring a common change.

The challenge of future research is to develop a functioning educational game model that can be used in the public places to create awareness about the moral issues in the society.

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