Market analysis of a sound simulation start-up company

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Tietokonepeliteollisuudesta on tullut viime vuosina tärkeä osa Suomen vientiteollisuutta. Ala kehittyy nopeasti pelaajien kasvavien odotusten tahdissa. Kehitys ja innovaatiot ovat perinteisesti kohdistuneet grafiikkaan, jolloin peliäänien mahdollisuudet eivät ole saaneet tarpeeksi huomiota ja päässeet kehittymään parhaaseen mittaansa. Pelialan luonteeseen kuuluu kehittää tuotteita loppukäyttäjien mieleisiksi. Pelaajat kokevat usein häiritsevänä että tietokonepelien äänet eivät ole todenmukaisia. Tämän vuoksi on oletettavaa että markkinoilla olisi tarvetta laitteelle tai ohjelmistolle joka parantaa äänenlaatua tietokonepeleissä. Yritys joka parantaa äänenlaatua matemaattisen simuloinnin avulla voisi viedä pelaamisen kokemuksen täysin uudelle tasolle. Tämän opinnäytetyön tarkoituksena on selvittää olisiko markkinoilla kysyntää paremmalle äänenlaadulle ja voisiko sitä tuottava start-up yritys menestyä.

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The gaming industry has grown to be a significant part of the Finnish export industry. The branch is developing fast and requires new innovations and development to meet the ever rising expectations of the players. The progress has been traditionally focused on the graphics, while the slowest development has been in game sounds. Thus gamers find game sound delayed and unrealistic at times. Based on this fact it is assumed that there could be a market for the device or software that is able to provide better sound. This product could be delivered to the market by a firm that can improve sound quality by mathematical simulations and apply the simulations to the processor speed for maximal gaming experience with any computer available.

The purpose of this thesis is to find out if there is a demand on the market for a firm that can produce better sound quality. The firm is assumed to operate on business to business market and produce a sound quality improvement program.

Table of Contents

"Always trust computer games."

— Ridley Pearson —

1.1 Introduction

The production budget of computer games has increased drastically during the past years. The production of an entire, large budget computer game costs 10 million dollars in 2004, as the cost in the beginning of the 1990's was only 40 000 dollars. The higher cost is due to the increase in innovate: 3D graphics are essentials today as well as developed sound effects including voiceovers. Another cost increasing factor is personnel related costs, equipment depreciation, R&D and royalties paid for the products that are not launched yet. Computer games today include enormous amounts of polygons and require artists from various fields, which directly increases the cost of production (Crandall & Sidak 2007).

Investments to the development have been made for a good reason. Gaming has become a popular form of entertainment in Finland during the past decades. Today, 60% of the population (aged 16-64 years) online has played a videogame of some sort during the past year and 32% of these gamers have bought an online game during the time. Gamers describe videogames to be immersive, entertaining and way to escapism (ISFE 2012). Gaming has been also linked to many benefits, such as improved health, well-being, and general mood as well as social and emotional functions. Non-gamers tend to suffer from a higher level of depression and find their disposition negative. Even occasional, less than once in a week, gaming is enough to attain the health benefits. Active game playing increases children's energy expenditure. Players are also improving their performance in attention weighting, so that they discard the irrelevant and focus on the important aspects. Surgeons who played Nintendo Wii outperformed their colleagues in keyhole surgery procedures. The downside is that violence in video games can transfer into real-life aggressive behavior in individuals (CBS News 2013).

Game design components, such as sound, can be used to improve user experience and engagement. The user behavior can be directed towards intended goal or direction by rewarding or reputation systems. This gaming component application outside the game context is called gamification (Deterding, Sicart, Nacke, Dixon, 2011).

1.2   The research problem

Sound is an overlooked area of game development. To experience the most realistic environment, the player has not only to see but hear it. Sound design components are building an environment and telling the player the location of approaching objects. (The Telegraph 2013) When the objects in the game collide, the game engine should respond in a realistic manner. Depths and heights of colliders need to be accurate to provide a realistic gaming experience. (Goldstone 2009)

As the sophistication of sound design has increased and become more convenient to use, consumers are willing to invest on superior sound quality. The level of the savvyness of the consumers is leading to the fact the standards keep audio devices developing further (The Telegraph 2013). This leaves an assumption that consumers will demand more of the audio even in the future and push the standards even higher. There will be need to develop software as well as hardware to meet the demand.

The purpose of this thesis is to gather and analyze information about computer game sound at present and get insight if there is a market for the sound simulation software. Further evaluating marketing, selling and protecting procedures for sound simulation technology, that provides real time applications for instance for computer games.

2   Audio systems

Communication within the game environment is traditionally made by graphics. Immersion is relying on realism and therefore on contextual sounds. There are audio-mostly games where output stimuli in games consist mainly of sounds. The focus from eye to ear is attained by rough graphics and realistic high quality sounds. (Örtqvist & Liljedahl 2010)

Ability to observe visually is limited down to one thing at the time, and can be shut out by closing eyes. Audio has no similar shut-down mechanism, though person can hear from various sources simultaneously and discard the irrelevant. (Jørgensen 2008) (Ekman, Lahti, Nummela, Lankoski, Mäyrä 2005)

Technological development in audio systems during the recent years has come to a point where not only the player plays the game, but also music affects how the player plays the game. This so called adaptive music makes the gaming even more personalized experience. (Young 2012) The computer game players are expecting that the visual effects in the game are accompanied by sounds, in the way they are in real world. If the sounds are not present, the environment is interpreted to be unnatural and distracting which lowers the quality of the

experience. (Houtkamp, Toet, Bos 2012) It is expected that dynamic soundtracks become standard in the game music. (Young 2012)

Game music and sound are important elements in game design, and personal preferences determine whether player wants to play with sound, music or both of them (Nacke 2009). Combination of sound and music in games release tension and have soothing effect. (Grimshaw, Lindley, Nacke 2008) Music also affects players' level of arousal, concentration and performance. Those factors are essential factors affecting engagement in a game (Lawrence, 2012). A good gaming experience is described to be like an immersion to the game environment; forgetting and ignoring the physical, real environment around. This immersion can be enhanced with better audiovisual hardware, such as larger screens or surround-sound speakers. It is assumed that more realistic, better sounds leads to better player immersion. (Nacke 2009) Without sounds the feel of immersion disappears. (Grimshaw et al 2008)

When creating a game, sounds are loaded and attached to the game objects with descriptive properties, such as bouncing from solid objects. (Nacke 2004) Sound in kinetic games is the motivating factor, forcing the player to respond. Sounds alert of the upcoming events that are not visible yet, providing possibility to prepare for them. Sounds are used as symbols that are linked to the objects and goals player has to attain in a game. Sound symbols have function of decreasing the learning curve and assist to identify locations, environments, moods and characters in the game. (Collins 2007) The sound quality should therefore be as accurate as possible to give the player a chance to give the best performance in the situation.

Simulations are traditionally custom made to the audio fabric, every inch linked with sounds. That would often leave dead (or deaf) spots. Game sound differs from the film sound for instance so, that there is only one essential sound provided. Sound is heard also as the game progress and player has gone pass it. The sound is a manipulation tool for atmosphere and emotions. (Bridge 2012) Realism in interactive media can be heightened by sound rendering, which divides in two stages: sound propagation, meaning computed impulse responses in an acoustic space, and sound rendering, meaning generating audio signals from the impulse responses. Accuracy of the virtual environment is depending of the geometric presentation of the space. Location and motion of objects in that space can be measured via responses. (Taylor, Chandak, Antani, Manocha 2009) Sound propagation from a source to a listener transfers information about the size of the space surrounding the sound source. The source can be identified when not visible, which heightens the feel of immersion. (Taylor et al 2009) (Raghuvanshi, Snyder, Mehra, Lin, Govindaraju 2010) Sound provides alerts of the activity, and information of its direction and distance. Sound waves scatter and diffract in realistic environment, requiring more precise calculations. Loudness of sound alters because of various reasons, for example in furnished room compared to unfurnished room. (Raghuvanshi et al

2010) These calculations should be done more efficiently to provide realistic gaming experience.

3   Marketing Environment of Sound Wave Applications

3.1   Demographic Environment

Demographic environment consist for example of population size and age mix. Population is distributed unevenly through the world, focusing mostly on the coastal and the urban areas. At the moment the population growth is occurring the most in the third world countries, while the population in western countries is declining. Age mix in third world is youth dominated, as population in western countries is getting older. (Kotler, Keller, Brady, Goodman, Hansen 2009) When predicting the future sales of a product, the characteristics of the end-users have been in focus. End-user is consumer, who buys the final product from the store. Computer game playing persons has been traditionally young and often male. For the sound simulation firm that means that future markets are in the economically growing developing countries, such as in Latin America. As the sound simulation is a software component for the computer game, it is not directly dependent of the market growth in certain areas or populations. Direct demand means that the product satisfies the consumer demand directly; hence components for the software are seen as indirect demand. Game developing firms buy the components to their games and set the price to the final product accordingly. Generally population growth interprets more sales for computer games and thus increasing demand for the sound simulation software.

Ethnicity is important factor, according to Kotler et al (2009). Taking the minorities in consideration helps to introduce product to new consumer groups that have little experience of the product. Increasing ethnicity is important factor when advertising computer games, as any other products. Sound simulation software is not too dependent of ethnicity-factor, again because it is component of a computer game. Software has characteristics to be immaterial and neutral, which is not drawn to any ethnic group directly.

Kotler et al (2009) mention also educational groups, household patterns and geographical shifts in population factors that affect demand of the products. These factors are closely linked to the income level amongst the local population. The higher the income, the higher the demand for the products can be assumed to be. Almost 800 million people in the world are illiterate and can be found in poor countries. Majority of them are women. Some other countries, such as United States, have good proportion of the population that has a college degree. College degree means supply of skilled work force. High educated population also interprets higher demand for books and magazines in good quality.
Sound simulation firm will need highly educated people to develop the product, so it needs to search the markets where that kind of supply exists. The computer games are sold mostly on

countries that have educated people. To be able to play a computer game requires often that the player is indeed literate. As majority of the illiterate people live in poorer countries and are women, the effect on demand of computer games is low. Sophisticated features, such as sophisticated sound quality, plays even smaller role there.

Household patterns that Kotler et al (2009) mean are traditionally seen as a family that consist of man, woman and child/children inclusive possible other relatives living in the same housing arrangement. Although, in the recent years the households have changed to SSWD (single, separated, widowed, divorced) and their derivatives, such as single parents and empty nesters. Homosexuals living together are also the new factor that traditional view of household did not consider as a potential marketing target.

Household pattern is interesting factor for the sound simulation company. A computer game component that improves the sound quality is more likely to attract those who have an ability to invest to the good sound system for the gaming. These people are often single and/or well-educated with no kids. Other important target market for computer sounds are minors. Socio-cultural environment is the perception of the people themselves; beliefs, values and norms, relationships to others, to the society, to the nature and universe. This affects the demand and consumption of products. There are subcultures with altered belief-patterns, which provide often surprising results while marketing on them. Trendsetting in music, fashion, ideas, entertainment and attitudes arises from the teenagers. As they grow, they consume same products later on. (Kotler et al 2009) Gamers can be seen as a subculture which behaves somewhat homogenous way. The common feature amongst gamers is that most of them are heavy-users to computer games.

Technological environment is described as creative destruction, taking the old technology's place and affecting the economic growth rate. There are four important trends in technological change; increased regulation of technological change, unlimited opportunities for innovation, varying research and development budgets and accelerating pace of change. (Kotler et al 2009) In the case of technology, sound simulation start-up itself is part of the technological development. It is dependent of the hardware development and software that is used to develop its own software.

Political-legal environment consist of government agencies, laws and pressure groups. Business legislation has 4 purposes, to protect consumers from unfair business practices, protect companies from unfair competition, to charge businesses with the social cost crated by their products or production processes and to protect society from unregulated business behavior. Consumerist movements are the forces companies have to deal with. (Kotler et al 2009)

The sound simulation start-up is dependent of general laws and politics considering entrepreneurship and computer programs. The pressure groups against computer game violence can affect sound simulation firm at worst case scenario, but is highly unlikely.

Other important aspects are economic environment and natural environment. Economic environment relates to purchasing power via income, saving, prices, credit and debt. Price-sensitive high income consumer as a target market is the most sensitive of its kind. (Kotler et al 2009) Generally the amount of liquid assets is affecting indirectly sound simulation software demand. The more money people have in hand, the more they spend on goods such as computer games. Computer game sales are assumed to decrease of the economy is declining and vice versa. Natural environment is not too much in relation with software good in consideration here. Regulations in electricity consumption for the environment could be aspect that has distant effect on software use and development.

3.2   Competitive Environment

Every firm on the market deals with competition with some extent. There are products and services on the market that satisfy the customers' needs adequate way. A start-up firm should try to attain all the information available on the current operating methods, business applications, market situation, and competitive environment in the region and future predictions applying the field. The more comprehensive information firm has, the more possible is its success.

The most important is to identify the closest competitors. Knowing their strategies, strengths and weaknesses helps firm to find suitable strategy to provide superior products and services to those competitors offer. Knowing the firm's competitors help to create differentiated marketing, profile and give offerings for the potential buyers. (Enteprise Finland 2013) Company can also select which customers it is willing to keep and which are acceptable to lose. (Kotler et al 2009)

There are almost hundred computer game development firms in Finland in year 2013. Approximately 20 firms are consulting businesses to the game industry, focusing mainly on legal services or business development. Ten companies are doing sound effects and soundtracks to the computer games. (IGDA 2013) The Finnish gaming market turnover was approximately 100 million euros in years 2009-2011. This means 2,5-3 million games sold per annum. (Figma 2011)

Analyzing competitors can be done by dividing them into strategic group by the target market they have, objectives competitors have, what they seek in a marketplace and drives their

behavior. It is important to know their profits and strategies. Expansive competitors need attention in order to arrange mobility barriers. Mobility barriers make market expanding more difficult or even impossible and can be set by the authorities or rival companies.

Strengths and weaknesses are related to product quality, customer awareness, technical assistance, product availability and selling staff. Three variables to monitor are: share of the market, share of mind (which means first company to come in mind in this industry) and share of heart meaning first preference to purchase. (Kotler et al 2009) Sound simulation start-up has a good chance to gain all the 'shares' there is on the market to gain, as long as first competitors start to appear.

Most companies aim to battle out their weaker competitors, or target the weaknesses of their stronger competitors to keep up with the best. Good competitors compete by the industry rules, favoring the healthy industry. Bad competitors take risks by producing overcapacity meaning that they buy market share instead of earning it. Companies attack bad competitors to eliminate the industry equilibrium imbalance. Close competitors are those companies often compete with. Distant competitors are though those to keep in mind. (Kotler et al 2009) The game design reminds other entertainment experiences, for instance amusement park, movie scriptwriting or storytelling. The difference is that those activities require low mental capacity, while games are challenging and the design provides a meaningful play. (Ermi & Mäyrä 2005) There are plenty of activities that challenge human mind pleasurable way, so sound simulation within computer games is facing good share of competition.

3.2.1   Competitors

Competitors are the firms that rival for the same customers and respond to the same need. In a competitive market a single firm cannot affect the price it sells or buys input goods, either. (Perloff 2004) Competitors can be analyzed by looking at the value chain about firms' financial resources, size and production capability. Important thing to analyze how the firm creates value to the market through its priorities, market offerings, commitment, managerial culture and how the firm sees itself on the market. Success is not guaranteed by only satisfying the customers' needs, as the actions competitors change the scene continuously. It is proven that firms that observe competitors actions perform better in business than those firms that do not pay same kind of attention to their rivals. The key factor is to satisfy customers better than the competitors in order to attain long-term advantage in the market. In recent years competitive environment has reached wider geographic dimensions, higher intensity and level of competition. Niche attacks are frequent and strategic alliances appear while mischievous competitors appear on the market. Another changed factor in market envi-

ronment is the quickening pace of innovations. All these factors determine if the firm is able to succeed and grow on the market. (Banahene 2010)

The competitors to the sound wave simulation firm are fulfilling the purpose but not quite being the same product. Competitors are substitutes to the wave simulation software. There are firms for game programming that contain sound elements as is, such as Carara, Lightwave XSI, Maya, 3D Studio Max, Cheetah 3D, Cinema 4D and Blender 3D (Goldstone, 2009). Software for general simulations available are Ansys, Comsol ,Actran and Genesis. These tools can be used to simulate sound waves in a given space, but they are not best tools for it.
ODEON Room Acoustics provides software for simulation, measurement and auralisation. (Odeon 2013) Brüel & Kjær Sound & Vibration Measurement A/S is having acoustic software applications using acoustic data. Real Sound Lab uses simple, fast and reliable technology as a solution for correction of linear distortions of electro-acoustic devices like loudspeakers and microphones.

3.3   Market expanding strategies

According to Kotler et al (2009) expanding the market share for the market challenger can be made by attacking either market leader, underfinanced equal size competitors or attacking the local and regional competitors.

Market-Nicher strategy is to create, expand and maintain the niche. It is recommended strategy for the firms entering the market. Those firms charge higher prices than its' mass-market counterparts and provide high value to the customers. The niche firms gains high marging, instead of mass-market firms' high volume. In order to survive better on the market, multiple niching is preferred to single niching. (Kotler et al 2009) Osterwalder & Pigneur (2010) point out that customer relationships, distribution channels and value proportions are custom made to meet the demands of the niche market. In the case of sound wave simulation start-up, the perfect niche to focus on is the end-user specialist that makes products for one type of end-user. Another possible niche to consider could be customer-size specialist; the sound wave simulation firm is most likely selling its products mainly to the large gaming companies.

The same selling channel niche could be also interpreted to be a so-called specific-customer specialist. Although mainly improved sound provider would be a product-feature specialist. The whole business idea relies on assumption that gamers are willing to pay for the improved sound quality.

Market leader competitive strategy is to maintain its share of the market and expand the total market it operates in. Total market expands as the company finds more usage for its' products or by getting new customers. More usage stands for increased frequency or amount product used. (Kotler et al 2009)

4   Business-to-Business Markets and Competition in Sound Wave Application Markets

4.1   Collaboration of Companies

Business suppliers and customers manage their relationships to improve their efficiency and effectiveness. Various forms of collaborations are the core of successful holistic marketing strategy. (Kotler et al 2009) Collaboration is a powerful tool to execute tasks; joining forces and pooling resources is the primary method for collaborations for achieving goals that would be impossible to attain working independently. (Gadja 2004) Vertical coordination between the buyer and seller in business can often benefit from collaboration in their business activities. This requires naturally great deal of trust between the parties, and the relationship evolve dynamically. (Kotler et al 2009) Trust is attained when time, energy and effort put into communication between the partners. Collaborations are depending of the positive relationship and effective connections between partners. (Gadja 2004)

Development of the relationship depends on changes in business environmental uncertainty and interdependence between parties. It is common that one partner get more out of the economies of scale that collaboration creates. Also single partner has higher barrier to enter the market than the collaboration partner. In the beginning of the collaboration, one partner often experiences drastic market growth. One collaboration party possibly has more power over the other, based on the information asymmetry between the parties. Uneven knowledge would also profit one firm more if it would invade to its collaborator's market. (Kotler et al 2009)

Buyer-supplier relationships differ in availability of substitutes or by supply; complexity, importance and market dynamism related to it. The relationship and the power positions in it changes over time. Presence of market constrains or lack of certainty on the market keeps the cooperating partners in close relationship. (Kotler et al 2009) Business allies have tendency to repeat partnerships over time, as it is costly to find new partner in business and requires checking up their performance. (Todeva & Knoke 2005)

Customer-supplier relationship has tendency to create tension adaption and safeguarding. Vertical coordination ties customer and seller closer together, leading to specific invest-

ments, tailored to specific value-chain partner and company. This grows firms' profits, gives better positioning but locks up the firm to the particular relationship and increase sunk costs. (Kotler et al 2009)

There's a risk of opportunism in vertical coordination; if the supplier performance monitoring is weak on the buyer's side, the supplier can cheat and lower the quality of the goods or services. Poor performance in collaboration can be also due refusal to adapt to changed circumstances. Opportunism cause cost as firms have to put labor to observe the quality, the asset that could have more use in more productive tasks. (Kotler et al 2009)

A start-up firm needs good contacts in order to deliver products and develop them to meet up the contemporary requirements the market sets. Collaborations are firms' tool to increase the business performance. Collaboration investment purpose is to seek positive return. Collaboration of any kind is considered a positive continuum for the participants. Collaboration parts are able to perform better progressively and invest so that their collaboration capabilities grow intelligently. Business growth is originated from investing on business-critical processes. Collaboration technology can end up being the strategically asset to gain higher performance in organizations. (Frost & Sullivan 2013)

New businesses success depends on how effective interaction firm has with business networks, customer, supply and financial markets, political actors and consultants. (Peña 2002) Collaborations can provide certainty and funds to each other. More importantly they can send positive signals to the market when the qualities of the firm are not well known. These collaboration tricks provide aids to the startup to cope with the most common problems it would normally face when entering and establishing to the market. Startups get access to social, technical and commercial resources that would normally take years in the market to attain.

Collaborations also include risks, such as leaking their knowledge to the partners or by losing control of the other important assets of production. The alliances firm makes can affect its capabilities as well as possibility to signal them on the outside. Collaborations within technology developing companies can facilitate innovations. (Baum, Calabrese, Silverman 2000) (Todeva & Knoke 2005) There are complimentary assets to enhance growth in businesses. When the startup collaborates with more mature company, there is a possibility for the startup exchange its' small share of knowledge to mature company's broader information base. This type of exchange is though happening seldom in the reality, due lack of interest from the startup founders. (Baum et al 2000) Sound simulation start-up could also benefit the repeated and standardized manner that collaborations make sales within. The cash-flow is essential to the firm at the beginning in business.

Motivation to form a strategic alliance can be an intention to expand into new businesses and getting access to new technologies and production methods that allies already use. Getting part of the research and development is beneficial especially for the smaller, younger firm in vertical integration.

Organizations can learn from another by observing and interacting about each other's knowledge base. Studies have proposed that such network relationships may influence international market entry and selection decisions, as well as facilitate international growth Inter-organizational learning can yield new knowledge and new capabilities. Information exchange between firms becomes important when the startup has intentions to penetrate international markets. Mature firms are larger in size and already active in the (inter-)national market. A startup can "free ride" the information the older firm has about market trends and customer preferences. This helps a new firm to pick the most lucrative new markets and prepare the entry accordingly. Mature company collaboration can also introduce startup to useful organizations and investors. (Bruneel, Yli-Renko, Clarysse 2010) As the sound-wave start-up holds knowledge how to provide better sound for the computer games, it cannot operate on the market without a firm that buys its products. Other companies can survive without sound simulation software, but it provides superior quality sound compared to current sound solutions.

4.2 Developing the business model

Business model is simply described as the logical basics firm makes money on. There are four important areas in business; customers, offer, infrastructure and financial viability. Building blocks for business model include 9 building blocks which are: customer segments, value propositions, channels, customer relationships, revenue streams, key resources, key activities, key partnerships and cost structure. (Osterwalder & Pigneur 2010)

Business idea is not enough though; a firm requires an innovative business model in order to operate in successful manner on the market. A good business model adapts on customer needs and offers new value propositions to them. Technological innovation is often behind the new business models; there is clear need to introduce new product to the market and possibly meet the consumer demands even better. Sometimes the innovation is the new business model itself. (Teece 2010)

It is suggested that cause of so many startups fail because they spend their main resources, time and money, on creating a product which is not right for the market. The realization what product should have been come too late. The less risky way to penetrate the market is

to create so-called "minimum viable product" that contains just few characteristics that users can easily give feedback of. This gives the company possibility to accelerate development process and enter the market with the version of the product that meets the customer needs. Simultaneously the possibility that the firm would develop a product no one wants decreases significantly. (Nobel 2011)

Selecting, improving and adjusting the business model are complicated procedures. The models are depending on the situation they are presented to the market.

Business models it also seen as a logic that company applies, how it operates and creates value for the stakeholders. Business model describes the firm's customer value proposition and profit formula, as well as key resources it has and key processes it applies. Firm may have preconceptions about how the business should run and set constrains to development to other directions. (Teece 2010) To counteract the uncertainty Osterwalder & Pigneur (2010) suggest challenging the industry´s strategic logic and established business models in order to create valuable innovation. The so-called blue ocean strategy contains four key questions. The first one is to recognize what industry takes for granted and should do better without. The second question is to which factors of the business model should be above the industry's current standard. The third question wonders factors that should be below it. The fourth question is the factors that are missing in the industry, but should be created. Additionally, innovation should be introduced to unexplored markets and non-customer groups to find out its true value. The final purpose is to reduce cost and create value with innovative business model. Completely new business model is a result of deeper understanding of the consumer needs and how the competitors are failing and succeeding to fulfill those needs. New business idea also sees improvement possibilities in organizational and technological sectors of a firm. Besides the business idea itself, it often goes through a "try and error"-phase. Technological change, however, does not necessarily change the business models used. (Teece 2010)

The business idea can by the key factor that leads the firm into success. There are six general steps leading to great ideas. The first step is to "know" there are ideas out there. The second step is to recognize problems within one's environment. The third step is to find the solution to the problems obtained. The fourth step is to be passionate and zealous about the business idea. The fifth step is to test the idea if it is working and are customers willing to pay for it. The sixth step is to find out if the market is ready for the idea; shall market entry happen later or today. (Forbes 2013) In this case, the idea is to revive the sound quality in computer games to meet up today's standards by creating a better software solution. There is existing software for general wave simulations. They produce simulations for industrial use, mainly for engineering purposes.

4.3 Description of the product and its services

The product is a good of transaction; "transaction is the exchange of values between two parties". These values are resources of some kind: goods, services, money and energy, sometimes even feelings. Transaction has to fill three requirements to proceed. Firstly, there must be at least two parties in a transaction. Each part has to have a value to another part. The parts must be able to communicate and accept or reject other part's offer for exchange. (Shaw & Jones 2005)

The sound wave simulation firm is about to create a software that is supported by annual service-packs that update the original product. This is a commonly used type of product definition in the software branch and well-accepted manner to provide a product with regular service. In the beginning of the computer game production, everything was developed within the same company. This trend has existed since 1980's when independent software producing businesses emerged. At the same time Nintendo Entertainment System came up with a game license fee that means money received from every game sold on the market. (Crandall & Sidak 2007)

4.4 Pricing of the product

Choosing pricing model requires understanding about customer needs and willingness to pay. The market around the company deserves a good share of attention when pricing; presence of competitors, complement providers, suppliers and distributors. Their positioning is likely to affect the firm's competitive position on the market now and in the future. Adjustments must be take place when conjunctures change from the initial point. (Teece 2010)
The sound wave simulation is mainly business-to-business product that will be priced according to the buyers' ability and willingness to pay. The reputation and quality of the product is further regulating the price development.

4.5 Protection of the idea

Intellectual property refers to legal rights which are result of intellectual activity that can take place in the industrial, scientific, literary and artistic fields. Intellectual property is protected by the law which gives the beholder economic and moral rights on their creations, allowing simultaneously public to have access to the creation. This is due to encourage economic and social development following fair trade principles.

Intellectual property is often divided into industrial property and copyright. The World Intellectual Property Organization (WIPO) concluded in 1967 that intellectual property give rights to literary, artistic and scientific works, as well as performances of performing artists, phonograms and broadcasts. Protection covers inventions in all fields of human endeavor, including scientific discoveries and industrial designs. It can be given to trademarks, service marks and commercial names and designations, which gives protection against unfair competition and all other rights resulting from intellectual activity in the industrial, scientific, literary or artistic fields. Computer programs are able to get patent if they have technical features that contain technical solutions. If not, the program can be protected by copyright. (WIPO 1967)

There is a positive relationship between intellectual capital and business performance, due the knowledge management and structural capital development; hence intangible assets are critical source to sustainable competitive advantage. Intellectual capital in form of knowledge, experiences and learning can be acquired in three forms; relational, organizational and human. These intangible assets are fundamental to new firms' success on the market. As the startups do have difficulties with lack of business experience, competition of existing industry and fragility by being a small firm. This leads to continuous learning process for the entrepreneur. The task is mainly to become competitive in the marketplace by reaching optimum efficiency level and explore possibilities to expand the business activity. (Peña 2002)

Human capital in a firm can appear in three forms related to entrepreneur's previous experience, motivation level and level of education. These intangible factors have a positive relationship to business performance. Similar firm features, such as ability to adapt rapid changes and apply right strategies, have determining factors to growth and survival of the firm. Besides the human capital, the firm can gain from relational and organizational assets it has, depending on how valuable and useful they are.
Intellectual property comes in use if firm gains stability or growth in business. If the business fails or declines, the intellectual property has poor results to the business performance or it ceases all together (Peña, 2002).   Business ideas at some level are copies of another, so it is likely that business idea itself cannot receive protection for its intellectual property. Description of a business model although can get a copyright protection. (Teece 2010)(PRH 2014)

5   Business Idea of a Sound Wave Application Company

Every business venture should be driven by the consumer demand on the market.
Market demand of a good can be defined by the total quantity defined group of people would purchase in given area during a given period. The amount is affected by the current market-

ing program and marketing environment. Estimating demand for a market entering company can be found out by calculating the total market potential. This is at its easiest done by multiplying price with amount of potential buyers and average quantity they would purchase. Alternatively it is possible to use so-called chain-ratio method, which multiplies a base number, for instance population, varying number of adjusting percentages related to the good in consideration. (Kotler et al 2009)

Demand for the sound simulation software that would mean population multiplied by the average percentage income per capita spent on software multiplied by the average percentage of amount spent on computer games. The last multiplication would be expected percentage of amount spent on sound quality improving simulation software component, but the purchase is just speculative, as the sound wave simulation ware is immaterial part of the game and therefore cannot be purchased separately. Sound simulation software is therefore considered as indirect demand, as demand for it does not virtually exist without the demand of sole computer games.

The market demand can be estimated also by doing market forecast, meaning the expected demand and amount actually spent on marketing at given time point, and market potential, the marketing expenditure approaching infinity at given marketing environment. Then the excessive expenditures on marketing would not increase sales further. The company can estimate also the share it could get of the market, according the marketing effort. Marketing environment and marketing plan define company sales forecast. (Kotler et al 2009)

The computer program development contains two essential development phases: analyzing the work, followed by coding. This applies regardless the complexity or its size of the program (Royce, 1970). The product development is done by using so-called waterfall model, which starts by defining the requirements, moving on to design, implementation and verification and lastly maintenance. (Blank & Dorf 2012)

Business plan can be constantly changing, but should include few essential elements. First of all, the business plan should describe what the business will produce and who the customers are. The innovativeness about the idea and how it will attract buyers are important factors about the description, as well as SWOT-analysis. Another part of the business plan is to describe the team behind the company and its skill set. The education and experience in the field should be evaluated. Third part is to describe the product as the potential customer sees it and how it differs from those the competitors produce by its price and features. Fourth factor is to identify customers and what they require. The geographical location, amount and buying decision factors are important information about the customers. It is good to recognize what problems customers may have and how the company can provide solution to those problems. Fifth factor is to embrace the competitive environment and industry gen-

erally. Distinctive and innovative solutions are preferred to those which already are provided by the competitors. By knowing the strengths and weaknesses of the competitors is possible to find the feasible, strong business idea. Sixth part is to scale the size of the market. Amount of customers and competitors on the target market are determining constraints. Possibilities for development and growth of geographical market area are important to know before entering the business. There can be economical and regulative constrains in the market the firm is about to enter, which are good to know before expanding there. Seventh factor is about advertising and how it supposed to reach and inform potential customers. Differentiated marketing for customer segments is essential and firm should know how to stand out from the crowd of competitors. Practical sales planning must be done too. Eight factor is to evaluate short and long-term risks. Preparing for the fluctuations in economy, copycat competitors and leaving customers reduce the shock value of those incidents and help to cope of them. Ninth factor is to recognize if firm needs help against copying for its products. Protective measures can be done by patent, utility-model protection, and trademark or simply by making non-disclosure agreements with customers and collaborators. (Suomen Uusyrityskeskukset 2011)

The start-up firm needs also capital in order to enter the market. Venture capital is one factor to finance the early stages of the business operation. Access to venture capital can also explain differences how well startups establish their business to the market. The firms that get funding are growing before and after their access to venture capital. Although growth is not prediction that the firm will get more funding later on. (Davila et al 2002)
Venture capital is often provided by private or institutional investors. The purpose for a firm to approach new investors is to seek risk sharing, expertise or specific skills investors have and can provide them to the company. Other intangible assets investors can provide are networking, monitoring and advance. More centered ownership models like joint ventures, private equity and partnerships are ways to reorganize cash flow claims and decision rights. (Baldenius & Meng 2009)

6   Marketing

Marketing is no transaction of goods itself, but can be seen as a combination of purchase and sale which creates market exchange of social value. (Shaw 2005) Marketing is attention seeking, responding, voting and donating, all having purpose to lead consumer in positive purchase decision. Marketing is meant to direct the demand to the products company produces. The demand spans from negative, nonexistent, latent, declining, irregular, full, overfull to unwholesome demand. The purpose of the marketer is to recognize the demand stage and alter it so it matches the desires. (Kotler et al 2009) Consumer demand is not limited to goods; they are also after solutions on their needs. If the market for the demand does not

exist yet, there is a possibility for entrepreneurs to perform activities on the market by building organizations in order to perform actions. (Teece 2010)

For the single business marketing goal is to create sales so that firm can operate profitable manner on the market. Firm's sales are depending on the marketing mix and the market share responds to how successful the marketing mix is. Optimal marketing mix consist of decisions whether to improve product, reduce price or do more effective promotion or distribution. Increased sales are approved to lead increased market share. (Shaw 2005)

6.1   Business to business marketing

Business to business marketing mix differs from the marketing mix for the consumer products. Market communication is done more detailed manner and often face-to-face. Demand of business goods is derived from the consumer needs and demands. That is because target market is smaller, well-defined and the decision process is more complex than in consumer marketing. (Glynn 2009)

Relationship based marketing is based on interaction, relationships and networks, instead of the traditional 4 P's, segmentation and branding, traditionally used in marketing mix approach. Business is made through negotiations, mutuality is important factor and long term goals are achieved by accomplishing short term goals. (Alajoutsijärvi, Mannermaa, Tikkanen 2000) This emphasizes personal selling skills and the sales force ability to lead the buying decision to the right direction. Marketing personal have an obligation to ensure that customers are willing to buy the product, so that the firm can get an adequate price of the sales and ensure the continuance of the business. (Glynn, 2009).

Differentiation is conducted on the relationships instead of among products. Same way the company manages customer portfolio instead of product portfolio. The foreign market entry is done by focusing on the emerging and exiting business relationships abroad. (Alajoutsijärvi et al 2000) Sound wave start-up firm can take contact with the existing companies in the industry by taking part game happenings, where the whole or the partial scene is present. Another way to build awareness is to release demos and prototypes, so that users can try out the new product and give ideas of the development targets.

A component to computer games, that the sound wave start-up firm is about to build, is primarily sold to the large game producer companies. This assumption leads to that marketing has to be done directly to those gaming houses. Business buyers buy straight from the manufacturers instead of numerous intermediaries. The more complex the product, the more likely

it is bought directly from the manufacturer. Business cycle between businesses last for years, but can require several contacts prior the actual purchase. As comparison, business-to-consumer sales are done more rapidly and frequently; meaning often few seconds thinking and daily repeated purchases. There are many influencers within the buyer company, such as management and owners of the company, prior the sales the firm has to persuade and convince. There are also different customer segments across and within the organizations, which has to been in considerations when building a brand in a business-to-business setting. (Glynn 2009) The first sale is often the most difficult to accomplish, but once the business relationship is established the further sales are easier. The sales can be done in the same manner as before and requires less effort. This is the main goal for the sound simulation start-up, as it cannot survive without repetitive sales from the business partner.

6.2   Brand building

Branding is enhancing the good product features. A brand is defined by a good or service product with a distinct name, sign, term or symbol to identify and differentiate it from those competitors provide. Those qualities can be intangible, emotional or symbolic. Product performance qualities can be also tangible, functional or rational. The purpose of the brand is to improve the financial value of the firm. Another meaning to brand existence is to improve consumers' lives by helping consumers in decision-making; a brand is signaling quality that the product will satisfy the consumers' needs. For the company, the brand creates an entry barrier for the potential competitors, as the brand signals a competitive advantage. The consumers are willing to pay 20-25 % more of the brand products than competitors' products. (Kotler et al 2009) A strong brand gives benefits on the marketplace by increasing customer loyalty, creating security towards competitive marketing, making marketing communication more effective and giving opportunity to extend the brand to other products. It also helps with trade cooperation, gives larger margins and inelasticity towards price increases. (Keller 2009)

Effectiveness of the brand depends of the brand knowledge; experiences, thoughts, beliefs, feelings, and images related to the brand and how it is associated in consumers' minds. The goal is to create strong, unique and favorable associations to the product. (Keller 2009) (Kotler et al 2009) Brand image consist of consumers' preferences and perceptions about the brand. Brand equity is the consumers' response to marketing the product, which is based on the brand knowledge. An identified brand has positive brand equity when the brand is recognized and response to the product and the marketing is favored. (Kotler et al 2009) Brand

awareness means the consumers ability to remember the brand under various conditions. (Keller 2009)

The sound wave start-up firm could benefit of the branding as the brand equity is valuable asset in business-to-business context. According to Kotler et al (2009) future brands are characterized by relevance, simplicity and humanity. As the sound wave firm is a part of a game or other software, the branding is not as direct as in business-to-consumer brand building. It is preferable to brand sound wave firm in order to help consumers to choose the product that contains high sound quality.

The challenge is that brands nowadays are global, which makes them more difficult to manage. A brand is no longer interaction solely between the seller and buyer, but involves now suppliers, employees, media, investors, competitors and government. The weakened control is also due the information easily accessible on the internet and other media; consumers are able to find similar goods cheaper by using search engines. This however does not apply on abstract brands; they focus on consumption experiences to attain insight and intimacy to their customers, which keeps them safe from the information explosion. (MIT Sloan Management Review 2003)

7   The End User Approach

There are threads on the gaming sites that claim that sound quality in the games is not as high as it should be considering the possibilities of modern technology. Often hardware is more developed than audio tracks and therefore can reveal the weaknesses in the recordings.

Alias "Munkk1" (Figure 1) writes on the Pelaaja-online magazine writes: "…for the monitor use, the speakers reveal all the defects sound source and recordings may have…"
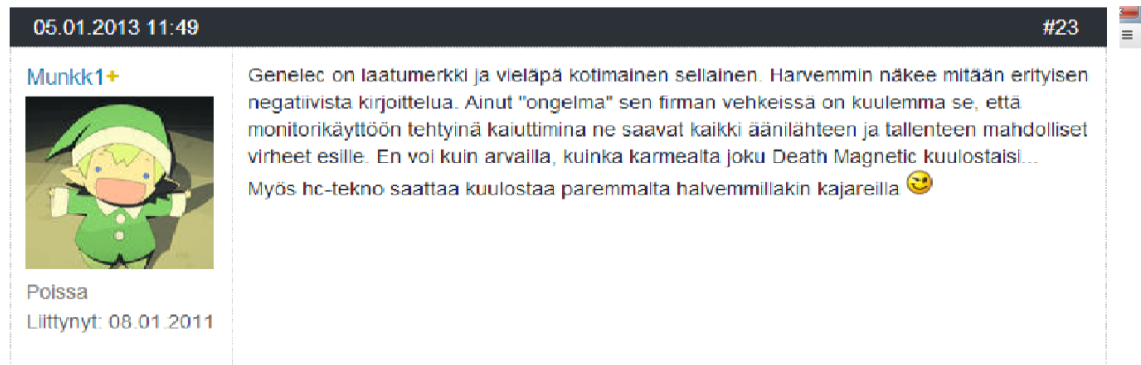
Figure 1: Thread post on Pelaaja-magazine

The same sort of notion makes alias "Nameless player" in the gamespot.com-site (Figure 2); 3D sound is produced less sophisticated manner than in the late 1990's and the hardware has developed faster than the software. The gamers tent to prefer headsets, which reveal more nuances from the audio than speakers. The more accurate tautology is not always good for the overall experienced sound.
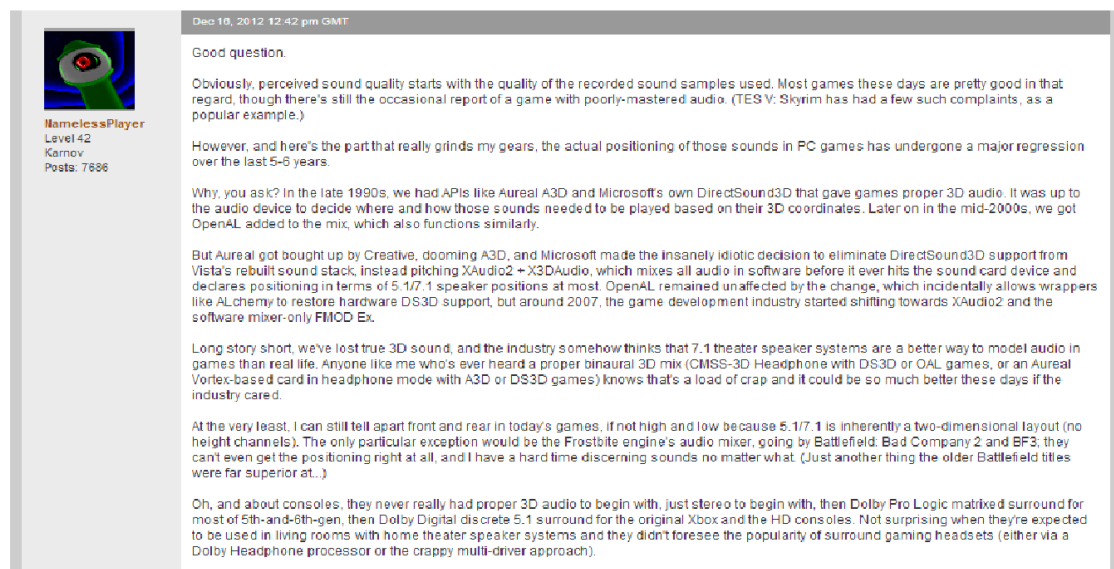

Figure 2. Thread post on Gamespot.com-site

In the online gaming magazine Gamasutra (2009) (see Figure 3.) the self-attributed game developer claims that consumers indirectly set the standard for the sound quality. That will say that the development has been lagging due the lack of proper demand.
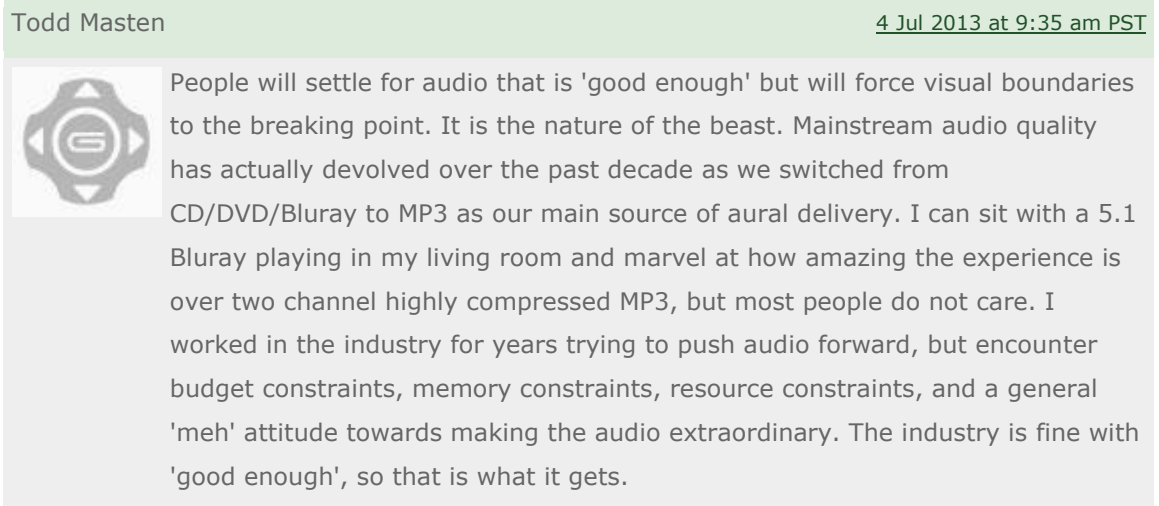
Todd Masten	4 Jul 2013 at 9:35 am PST

People will settle for audio that is 'good enough' but will force visual boundaries to the breaking point. It is the nature of the beast. Mainstream audio quality has actually devolved over the past decade as we switched from CD/DVD/Bluray to MP3 as our main source of aural delivery. I can sit with a 5.1 Bluray playing in my living room and marvel at how amazing the experience is over two channel highly compressed MP3, but most people do not care. I worked in the industry for years trying to push audio forward, but encounter budget constraints, memory constraints, resource constraints, and a general 'meh' attitude towards making the audio extraordinary. The industry is fine with 'good enough', so that is what it gets.

Figure 3. "Todd Masten" comment in Gamasutra

In the same thread in Gamasutra (see Figure 4), there is some speculation if the poor sound quality could be partially caused by the lagging hardware development.

Robert Schmidt	3 Jul 2013 at 6:06 pm PST

I may be off base but I feel that the advances in audio cards lags way behind that of video cards. I would expect on-board voice recognition and synthesis by now. I guess the market doesn't put as much pressure on the audio card in-dustry. It seems to me that many audio applications could use the same sort of massive parallelisms as video cards. Perhaps nvidia should jump in.

Figure 4. Robert Schmidt in Gamasutra

Deriving demand for sound simulation software according the gamers comments is obvious. There are those who are disappointed to the minimal development within sound. Even the gamers seem to be aware that large public has not appreciated good sound quality too much. Producing a good sound requires investments and people have not been interested to do them. Despair for the quality sound can also rise from the lack of producer who would provide the market better sound software. If that is the case, sound wave simulation start-up would have great prospects in satisfying consumers' needs and successfully operate in business.

8   Other Applications

8.1   Architectural tool

The propagation of sound with simulation technique can be applied not just games, but other virtual environments and architectural objects. The input factors needed for the simulation is the geometry of the scene, positioning of the sound sources and the position of the listener. The outcome is the impulses the listener sense. (Antani 2009) Architectural design as well as materials chosen affects the way sound energy is absorbed, transmitted and reflected in the chosen space. The measurements of acoustic properties are traditionally done by setting sound sources to intended place and measuring their impact by microphones. These impulse responses are analyzed to obtain acoustic characters of the measured room. This requires that physical environment for measurements already exist. With virtual simulation acoustic characters can be defined before the construction. Other benefits of the sound simulations are elimination of background noise and that the simulations can be repeated with none of the factors changed. (Haapaniemi 2012) There have been problems in the new Helsinki Music Centre concert hall acoustic. Singer voice is "killed" and must be strengthen by loud speakers or by placing singer extraordinary places on the stage. (MTV3 2013)

8.2   Product placement

Product placements are visual, audio, or combination of these two. In the most cases, product placements are visual that shows the brand. Audio product placement is not showing the brand at all. (Williams, Petrosky, Hernandez, Page 2011) According to Shrum (2004) prominent audio product placement is easier to recall than discreet visual placement. Audio product placements history is long and earliest examples are found in lyrics as early as 1908, song being Cracker Jack in "Take Me Out to the Ball Game". (Neer 2004)

Like music, advertising has an ability to entertain the audience. Product placement in entertainment is a following logical step. As the video games are popular form of entertainment, product placement can add value to the game. Gamers experience that familiar brands add realism to the game and improve feeling of immersion. Products placed on games are also educating the players' existence of new products. This leads to possible purchase in the future, if the product is not already available on the market or the area where the player lives. The brand placement is seen as an active part of the gaming experience, which provides a tool to market products to otherwise hard-to-reach audiences. Brand communication in video games is close to realism and the products can be used for interaction during the game play. Attitudes towards the brand can be shifted to more positive and the broader selection of the goods presented in the frame of the game play. (Mackay, Ewing, Newton, Windisch 2009) Is worth noting that individuals, who have negative approach towards commercials generally, have negative approach to commercials even in computer games. (Nelson, Keum, Yaros 2004)

Sound simulation could be used to make more clear or subtle commercial messages to the games, at advertiser's preference. The less disturbing advertisement is more likely to be well-accepted among players. This applies to the subconscious commercial messages as well; the marketing message gets through without annoying the player.

8.3   Skill training

Simulated acoustic environments can be used to teach orientation for visually impaired children. (Inman, Loge, Cram 2000) Special designed audio-based virtual environment can be used to develop abstract memory using haptic perception to create mental images of the virtual space in consideration. Ability to learn to integrate spatial and haptic references seemed to improve self-esteem and self-value that lead to increased social interaction. (Sánchez 2005)

The emerging technology makes 3D audio computer hardware available at low cost. Teaching function in acoustic space can be applied in reality, for instance by creating a street crossing scenario that tells to safely cross the street when the traffic is low. In theory, any physical environment that is difficult for the blind can be computer simulated if there is enough processing power available. (Inman et al 2000) It can be assumed that the more accurate the sound is, the easier it is to visualize the surrounding environment based on audio samples. Sound wave simulation could provide a tool to create the most accurate realism of the audio environment.

In the audio only game, the stream from the other players is core part of the game and provide main channel to the content. Audio heighten the tension in online gaming and provide information of the context. When taking the game outside on the streets, background noise provides hints of presence and position of the other players. (Flintham, Anastasi, Benford, Hemmings, Crabtree, Greenhalgh, Rodden, Tandavanitj, Adams, Row-Farr 2003)
Precise sound makes possible games where the invisible spiritual world overlaps with physical world. The sounds from spiritual world can be heard which enables interaction within the two worlds. (Lankoski et al 2004) Sounds linked to avatars helps player to recognize them, send and receive signals relevant to the gameplay. Audio helps also in chaotic situations when visual information is difficult to contain. (Jørgensen 2008)

Training professionals in a virtual environment does not seem to be as sound dependent. For instance, in firefighter training there was no significant difference on arousal and engagement with and without sound. Training in virtual scenario with added sounds was experienced

less convincing. This is due that the firefighters were gamers in the leisure time and used to high-quality sounds. (Houtkamp et al 2012) The question if the high quality sounds would have helped in training process remains unsolved.

8.4   Mobile applications and the future work

The research applying the mobile phone game sound have been minimalistic and done mostly in Finland during the 2000's. Development and research has not gone far in a decade, although there has been drastic development in mobile phones during the same time.

Handheld game consoles have existed for a long time, but connectivity to other devices is a new aspect in mobile gaming. Mobile gaming differs from playing with the stationary game device mainly just by sound setting. (Ekman et al 2005) Handheld game consoles are often played among other people. Silence is required for the game sounds to be heard, as the gaming devices have limited sound output capacity. (Collins 2007) The distinction of left and right sound source is not guaranteed when using mobile devices. Background noises may distract sounds relevant to the gameplay and reducing the feel of immersion. Besides, mobile devices audio systems are often developed for speech. The ultimate goal would to provide so much audio information that the player is able to play the game without watching the device at all. In that case the audio provides enough information that decision making in the game is possible. Strong audio also enhances the visual events which strengthen the immersive feeling to the game world. That opens the possibility to move in physical world that is reflected to the game play on the mobile device and lead to enhance the familiar physical surroundings. Some development is required in devices, though. For instance inserting a compass to provide information how the player is headed. (Ekman et al 2005)

Sound simulation tool could come in hand to improve mobile game sound, or mobile sound alone. The starting point is lousy, so slightest improvements could be faced with great success on the market.

9   Conclusions

The gaming market has been growing and developing constantly since the release of first computer games. The quality of the games has improved continuously at the same time. The gamers are more demanding when it comes to features in the game. The "wow"-factor is harder to achieve as time passes. It seems that gamers are willing to invest more on the sound in the gaming, as the visuals have reached the satisfactory level.

There is no clear demand for any gaming component directly. This applies sound wave simulations tools as any other gaming products. The market is heavily supply-oriented and customers recognize their needs only when the new product has already been released.

As the research focus of computer games has been on artificial intelligence and graphics (Nacke 2009), which leaves sound much to improve in the other research field. Sound accuracy is the logical step to make computer games more realistic.

The gamers are aware of the need of good sound to gain fully immersive and accurate gaming experience. Investments on good sound have been growing trend even in declining economic situation. Exclusive home electronic device manufacturer Bang & Olufsen computer game segment 'Play'-segment generated 41% increase revenue in the financial year of 2012-2013, while traditional audio visual segment revenue decreased 19% during the same time period. (Bang & Olufsen 2013)

As the sound simulation in real time requires lot of capacity from the computer hardware, the full potential of it is attained in the coming years. According to Moore´s Law, from 1965, the number of transistors on a chip doubles about every 1,5 years. (Intel 2005) The cost of devices also reduces and making them more reliable. Integration to other devices becomes possible and allows more applications to be used. (Chien & Karamcheti 2012) This opens possibilities to make sound simulation techniques even more accurate and widely available at lower cost.

Being a new concept on the market, the idea of sound simulation should be protected from the competitors. A patent is one way to protect the idea. As an idea itself cannot be protected by patent and the same applies to the software. (PRH 2014) This leads to assumption that in order to be patented, new innovation in sound simulation must be inserted in hardware. Branding is easier and more likely to be chosen to be a protective measure to the sound simulation start-up. Brand knowledge is the key for the sound simulation to manage break-through on the market; the goal is to create a household name so that gamers can choose to buy games according if it has sound simulation software or not. Making brand knowledge global phenomena requires good collaborations though.

Marketing lies in reality in good consumer experiences. Gamers are active online and inter-changing user-feedback rapidly and frequently. As the most of the game players are young, they have grown within the social media, meaning that they are highly media literate. Advertisement campaigns shall be intelligent and amusing; otherwise the target audience discards the marketing message.

When it comes to competitors, the real knock-out can be imagined in situations where really accurate sound (such as echo prediction) is needed. This is not necessarily the game industry interest but towards high fidelity sound solutions generally. Hifi-audio is a business of the rare, and if some feature is needed it is bought almost despite the cost. As there are no direct competitors on the market, sound simulation software can only substitute or complement existing solutions. That evokes companies within the field to collaborate. Sound simulation as a start-up should find more mature firm to vertically collaborate in order to provide the market what is really demanded. Providing high quality sound to the games, sound simulation is in fact tool for gaming companies to compete against other forms of leisure time entertainment. Better sound makes games more lucrative option to spend time with.

The question is that if all sound in computer games should match reality 1:1. Real world is filled with unpleasant noise and game environment can be a way to escape from it. Putting noise in to the game disrupts the leisure time purpose of gaming, even though realism it would provide could be immersive.

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Figure 1. http://www.pelaajalehti.com/yhteiso/pelaajaboard/aanentoisto   Page 26

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Page 27

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Page 27 and 28