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A cross-country analysis of innovation:

The case of creative industries

Bachelor thesis in Economics and Business Administration

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1. Introduction

The video game[1] industry constitutes an intriguing field of study since it has long moved from being a burgeoning branch of the entertainment industry to becoming an irremissible part of it, claiming its fair share among the motion picture and music industries. PwC (2015) predicts the total global video game revenue to exceed $93bn by 2019. Not surprisingly, the creation of knowledge, thus innovation, within this kind of new industry proves to be a highly complex process which is influenced by an abundance of factors such as the national institutional environment of the firms developing the games. This thesis aims to deliver additional value in understanding how differences in innovation within the video games' creative industry of Japan and the United States of America can be explained with respect to the particular institutional settings of the two countries. It does so by examining published game reviews, thus applying a rather uncommon measure of innovativeness aside from patents or similar. Moreover, it endeavors to ascertain why differences related to innovativeness may potentially be ascribable to diverse institutional settings of the countries studied. Japan and the U.S. are of main interest, since besides providing for the biggest game developing companies like Nintendo, Sony, Naughty Dog etc. (Storz & Casper, 2015), no other pairing delivers more contrasting national conditions in which these firms operate.

In order to reach its objectives, this thesis will proceed as follows: section 2 outlines the relevant theoretical framework, discussing the video game industry and innovation theory in general as well as pertaining to said industry. Section 3 describes the data and methods used in order to develop the samples and study of reviews. The findings are contemplated and discussed in section 4 which also deals with possible explanations for the results. Furthermore, one game pairing is examined in detail within section 4. Section 5 accepts and analyzes potential shortcomings and limitations and poses research questions which would further be interesting to address. Section 6 completes this paper by summarizing the main findings and giving a résumé.

[1] When subsequently referring to video games, all consoles, PC-based, and handheld games are included in this term (Williams, 2002).

2. Theoretical Framework and Innovation Theory

2.1. Innovation in the video game industry

All economic activities which originate from individual creativity, talent and skill, and which generate or exploit knowledge and intellectual property belong to the creative industries (Howkins, 2002). Appertaining to these industries are among others the sectors of software, film, music, advertising and video games. As being part of the creative industries, the video game industry features innovative products which combine sophisticated software technology with creativity and interactive properties (Tschang, 2007). Innovation – "the doing of new things or the doing of things that are already done, in a new way" (Schumpeter, 1947) – within this particular creative industry of video games can be characterized by pronouncing a game's three interwoven core dimensions – content, technology and design (Storz & Casper, 2015). Tschang (2007) refers to the former as the intellectual property (IP) which includes the story, characters and the sound of a game.

Intellectual property can either be entirely newly created or in form of a sequel, or, as it is presently trending to, licensed from the movie industry (Storz & Casper, 2015). The dimension of technology relates to the new technological properties (Garcia & Calantone, 2002) such as the console and gaming software. The design dimension rather constitutes a process which turns the technology into a playable products as well as represents the product itself (Tschang, 2007), therefore including the visual appearances and its overall format (Storz & Casper, 2015).

On a further note, a game's gameplay is the way players interact and connect with the game and the overall experience of a player with the game, and is thus expected to be established within all three dimensions. As will be explained, knowledge creation can take place either in one or several of a game's dimensions. Innovations in creative industries are thus of complex nature, explaining the fact that there are umpteen definitions and notions of different kinds of innovations.

2.2. Innovation terms and product architecture

Besides Schumpeter's definition of innovation, Garcia & Calantone (2002) refer to the innovativeness of a product as its degree to cause discontinuity in the marketing or technological process. It follows that the greater the discontinuity the product causes, the more innovative it can be considered. In order to reflect the common notion of innovation literature (Garcia & Calantone (2002), Storz et al. (2015)), the denotations of radical and incremental innovation are elaborated below. However, the terms radical and incremental are considered to fall short of taking into account the effects minor improvements can cause (Henderson & Clark, 1990). Thus, amidst the abundance of innovation and innovativeness terminology, this paper focuses on the denotation of modular and integral product architecture, as this facilitates the classification of concepts into innovations deriving from these two types later on. Moreover, these term differentiate between a product's components and the manner in which they are incorporated into the system, namely a product's architecture (Henderson & Clark, 1990).

A product's components can be defined as any idiosyncratic regions of a product which instantiate a product's functional elements. According to Ulrich (1995), product architecture is thus the chosen combination of the arrangement by which a product's functions are assigned to its physical components and the regulation of interfaces between interacting physical components. This differentiation is of importance here since architectural decisions are made in the beginning of the innovation process, determining the resulting kind of innovation (Ulrich, 1995).

2.2.1. Modular product architecture

In order to guarantee the combination, addition and change possibilities of individual parts, which constitute modular product architecture, single functions need to stand individually as being composed of separate components (Storz & Casper, 2015). Ulrich (1995) refers to this concept as the so-called 'one-to-one mapping' in which each functional element of a product is directly linked to one corresponding physical component. It follows that each component separately performs the one function allocated to it. In addition to one-to-one mapping, modular product architecture features de-coupled component interfaces (Ulrich, 1995). This means that conducted changes to a certain component will not require

another component to be altered as well in order for the overall product to function normally.

Hence, connecting interfaces need to be standardized, thereby allowing for smooth combination and flexibility between components. Since usually almost every change made to components will require alterations of other components to some extent, Ulrich (1995) refers to the de-coupled interfaces in practical terms, applying this approach merely to changes that alter the component in ways contributing to the overall product's improvement. Still, changes within a product are most easily accomplished by applying modular product architecture, as opposed to integral product architecture. With standardized interfaces as a prerequisite for modular innovation, knowledge-creation takes place in one or more components severally (Storz & Casper, 2015).

With regard to video games' innovations, this implies that merely one of a game's dimensions, namely content, technology and design, is affected by the innovation. In addition to standardized interfaces, modular product architecture enables the standardization of components (Ulrich, 1995).

By utilizing standardized components for multiple products, firms are able to exploit improvements made to these components in the course of time. Still, even if firms are unable to reuse components, modular architecture facilitates components' refinements, as they are independent of adhering elements. Therefore, the advantage of modular product architecture lies within the possibilities to experiment with the individual components since changes made to one component will exert only little influence on the others (MacCormack et al., 2011).

Ulrich (1995) exemplifies modular product architecture by envisaging a PC consisting of a monitor, a keyboard, a disk drive, a printer and respective interfaces in form of a plug socket. If the PC is build according to modular product architecture, each of these components is aligned separately and is connected via the standardized plug socket. Each component undertakes the task of its respective function, thus the printer prints, the monitor displays, etcetera. Changes may now take place in the monitor component and are independent of adhering components such as the keyboard due to the detachment of the monitor.

Especially start-ups and project-based companies prefer to adopt modular product architecture for their products since it facilitates experimentation and

specialization within the particular dimensions. Depending on the organization of component interactions, modular product architecture can further be sub-divided into three sub-categories, namely slot, bus and sectional (Ulrich, 1995). Within this thesis, however, innovation will be classified as modular in general due to the unavailable insights about how the interactions between components are arranged.

2.2.2. Integral product architecture

In contrast to modular architecture, integral product architecture features a complex mapping of functional elements to physical components within a product (Ulrich, 1995). It follows that within a product with complex mapping multiple functional elements are realized by more than one component and that multiple components each realize more than one functional element. Accordingly, interfaces between the components are coupled in products with integral product architecture.

Contrary to the de-coupled interfaces of modular product architecture, coupled interfaces in fully integrated products require changes to be made to every component in order to trigger a change in any particular functional element (Ulrich, 1995). This impedes experimenting with individual components, which is the reason why manufacturing expertise, coordination and profound knowledge integration is needed in order to manage the intricate nature of integral product architecture. Even though component flexibility is possible by using integral product architecture as well, Ulrich (1995) states that this entails high fixed costs in tooling, whereas modular product architecture enables variation within a products in a quicker and more cost-efficient manner.

According to Storz & Casper (2015), innovation deriving from integral product architecture is characterized by the knowledge integration occurring across all components of a product. This creates new architectural knowledge and results in a connected system which allows for an improved usability, quality, and knowledge creation across several product's dimensions (Storz & Casper, 2015).

In relation to video games this means that innovation takes place across multiple of a game's dimensions.

Restating the previously mentioned example of the PC elucidates the integral product architecture. If the PC is built applying an integral approach, each of the forecited components are conjunct into one casing (Ulrich, 1995). This impedes

the alteration of individual components since it implicates the unbolting of the whole casing would and the removal of adhering components. An enlargement of the monitor in size, for example, entails the renewal of the chase and changing of the other components' arrangement.

Whereas modular product architecture is better suited for refining the local performance of individual components, an integral approach is most suitable and even required for an overall optimization of a product, the result of which is a product's integrity (Ulrich, 1995).

2.2.3. Radical innovation

Whenever a game succeeds in creating a new genre it can be classified into being a radical innovation since it causes great discontinuity resulting in a new market (Storz et al., 2015). The research department of the Federal Labor Office, the Institute for Labor Market and Employment Research, determines three criteria a product has to fulfill in order to be categorized as radical innovation: novelty, uniqueness and the impact on future technology (Allen & Funk, 2008). Common examples of highly radical innovations are the Watt steam engine (circa 1769), the telegraph (circa 1840) and the World Wide Web (circa 1980) (Garcia & Calantone, 2002).

In relation to the video game industry, the creation of a new genre is considered a radical innovation. Allen & Fun (2008) state that general skill characteristics of American employees, such as the high mobility between firms, facilitate radical innovation. However, radical inventions within the video game industry are quite rare nowadays since most genres have been exploited already.

2.2.4. Incremental innovation

Japan is known for its highly competitive automotive sector in which the improvements can be considered incremental innovations (Allen & Funk, 2008). Incremental innovation therefore defines improvements within existing technology in existing markets, thus smoothing the interplay and coordination between a product's components. Examples of incremental innovations are new versions of operation systems such as Windows 7, or the new generation of Apple's iPad.

Pertaining to video games, incremental innovation enables expedient knowledge integration due to the contemplation of a game's entirety (Storz et al., 2015). In relation to genres, incremental innovation extends and polishes genres, as opposed to creating new ones, thus incorporating and refining already established properties of games, such as gameplay or story, in order to better integrate them (Tschang, 2007).

MacCormack et al. (2011) recognize a link between organization systems and the kind of software products they produce. Accordingly, open source software products are created by volunteer developers who have different goals and belong to different organizations also referred to as 'loosely-coupled' organizational systems, thus resulting in a more modular outcome. In contrast to the latter are commercial software products which are created by 'tightly-coupled' teams sharing the same goals and working on the project full-time. The findings of MacCormack et al. (2011) strongly support the claim that a product's architecture reflects the organizational structure of the developing company.
To better understand the connection between innovation types and associated organizational systems, Japan's and the U.S.' national specifications will be further elaborated.

2.3. Institutional environments of Japan and the U.S.

2.3.1. Japan's institutional environment

The institutional settings in which Japanese video game companies operate can be seen as quite unique. Despite being a new industry, traditional Japanese labor market properties still continue to exist within the video game industry (Genda, 2011). Developers as well as other employees are therefore employed on a long-term basis, supporting the practices of the Japanese internal labor market. This results in transactions being scheduled long-term as well, thus permitting additional traditional practices, such as job rotation, on-the-job training and knowledge integration across sectors, to gain ground within the video game industry (Storz, 2008). These properties lead to straight-forward coordination, ease the use of implicit knowledge and ensure information to flow freely across divisions.

The employees' profound understanding of the firm's products and processes facilitate incremental improvements (Allen & Funk, 2008). Furthermore, the industry holds on to the institution of seniority, presenting the employees with more compensation and power the longer they have been a part of a company. This constitutes a great advantage related to knowledge propagation since more experienced employees do not fear to be outperformed by younger striving candidates but are rather encouraged to share their knowledge with them.

Taken together, these characteristics lead to a high degree of firm-specific knowledge and integrative skills in Japanese firms as well as a thoroughly organized coordination across the sections. Nevertheless, video game companies introduced some hitherto uncommon human resource practices such as the option for irregular employees to succeed in switching into the internal labor market after having proven the necessary organizational and task-specific skills (Genda, 2011). Moreover, in contrast to the traditional industries, new employees are more heterogeneous, thus graduates from non-elite universities are granted access into the internal labor market as well.

Strambach & Storz (2008) see this combination of traditional practices with new, more flexible characteristics as the source of Japanese innovativeness in games and hence one of the reason for the nation's success in the video game industry. Storz (2008) states that Japanese game developers excel in areas like graphics and controlling, due to the speedy data processing needed for technological faultlessness. Furthermore, Japan prevails in striving for perfection and creating very detailed and elaborate characters. These traits are highly valued by players and were probably developed out of the known Japanese tradition of quality manufacturing (Storz, 2008).

Definitely worth discussing is Japan's rich culture in *manga* and the resulting design competences. The cartoon drawing, which first made appearances in the 1920s, has enabled Japan to excel in the areas of character designing, and story-telling. Less useful in more traditional industries like the automotive sector, manga is the driving force behind Japan's popularity and success in winning the majority of awards dedicated to character and story design from the International Game Developers Association. Storz (2008) cites the 'Lifetime Achievement Award' to be the most renowned prize in the video game industry, which was won

by Japanese developers six times from 2001 to 2015[2]. Japan's game companies take advantage of this prevalence, as these design competences are hard to imitate due to the linkage to an almost a century old art (Strambach & Storz, 2008).

As the example of the successful Japanese automotive industry suggests, Japan owes its success to its ability to integrate. This claim is also supported by Storz & Casper (2015) who conclude from their conducted interviews that project team building in Japan relies on the integration of overlapping competencies rather than collocating members according to their skills. Hence, communication is facilitated which further leads to the sharing and integration of knowledge.

It is also of interest to notice that many Japanese game firms originated from well established firms in related entertainment industries which diversified their portfolio when the video games industry emerged in the 1970s (Storz & Casper, 2015). Thus, many publishers in Japan emanated between the 1950s and the 1970s, approximately half of them one to two decades later by diversification (Storz, 2008). This can be recognized as one of the reasons why Japanese video game companies' organizational designs are considered well-managed and stable (Storz & Casper, 2015).

Considered as a whole, the Japanese organizational design seems to be suited for integral innovation. By utilizing the mentioned practices, firms enable themselves to develop integral innovation by overcoming communication barriers, thus aiding knowledge creating across dimensions.

2.3.2. U.S. institutional environment

The project-based organizational design of video game companies in the U.S. stands in sharp contrast to Japan's, mostly due to its fluid labor market which allows for a high mobility between firms. Thus, it is common practice in the U.S. for designers and programmers to have worked for many different game firms throughout their careers. These fluid labor markets and an organizational design based on short-term projects lead employees to develop general skills instead of firm-specific ones and hence promote the invention of radical innovations due to the facilitated transmission of resources (Allen & Funk, 2008). Successful game designers often leave established companies with the intent to found their own

[2] Based on own calculations from http://www.gamechoiceawards.com.

start-up. This phenomenon is referred to as the Silicon-Valley model and led to the development of tight social networks among developers which in turn aids knowledge recombination and creative destruction, resulting in radical innovation (Storz & Casper, 2015).

As mentioned before, start-ups and non-established companies prefer to adapt modular product architecture due to the facilitated possibilities to experiment with independent components. Based on the composition of the U.S. labor market it can thus be stated that U.S.' companies have an organizational design convenient for innovation derived from modular product architecture.

2.4. Interrelatedness of institutional environments and innovations

The mirroring hypothesis claims that a relationships between product architecture and organizational design exists (MacCormack et al., 2011). It can therefore be assumed that Japanese game developers attach more importance to perfecting an existing genres and technologies than to creating new ones whereas U.S. firms generate general knowledge. Storz and Casper (2015) cite the games 'Super Mario 64' (integral innovation) and 'Doom' (modular innovation) as prime examples of how organizational design interrelates to certain kinds of innovation. Thus, it can be asserted that institutional environments and types of innovation are interrelated and different economic circumstances lead to varying innovation (Whitley, 2000). This is in line with the accepted insight that institutions affect actors which in turn affect the outcome (Storz & Schäfer, 2011).

Nevertheless, the interdependence between institutions and innovation can still only be seen as presumptive within this context, as no causality can be proven and more factors have an impact on the resulting products. However, strong evidence exists towards the assumption that differences in innovation are ascribable to differing organizational environments and that the reason can be found within the discussed varying historic background of the industries in the two countries. Allen & Funk (2008) specify this by stating that varying types of human capital impact the forms of innovation that companies develop.

Storz and Casper (2015) predicate that Japanese gaming companies vanquished the U.S.' dominant role and now hold the leading position on the global market. According to their studies, this traces back to numerical and functional plasticity, a somewhat more refined concept of path dependency. This means that Japan's

prevalence in technical competences in, for example, character drawing derived from the core competences in the electronic industry. A high domestic demand combined with the ability to adapt to foreign preferences allowed the companies to further improve their games.

Parallel to this development, functional plasticity of key settings in the system molded to suit new demands and thus facilitated innovation by, for example, transferring knowledge about core competences to the new branch of game software production. This concept of flexible path dependency has caused the correlation of innovation and institutional settings to last over the years, because complementarities between institutional settings cause stability and change in organizational design is mostly difficult to accomplish. This phenomena is also referred to as the 'institutional embeddedness of firms' (Storz & Schäfer, 2011). Furthermore, Storz & Casper (2015) assert that firms decide on the degree of integrality with which their products are featured, hence compete either through innovation within one dimension or choose to compete through dense integration of two or all three dimensions, namely content, technology and design.

As mentioned before, an example of the former would be innovative graphics, while innovation across dimensions is exemplified by improving and integrating preexisting technology to become a better product. Storz et al., (2015) assume that the rather intricate nature of game architecture is better addressed by the ability to integrate knowledge across multiple dimensions by Japanese developers. This does not exclude Japanese games to be modular innovations at times or U.S.' firms to develop integral innovations, but Japan's main strength can definitely be seen in its knowledge integration across dimensions, thus their ability to integrate.

Storz and Casper (2015) state it is therefore obvious that Japanese games' innovation leads back to integral product architecture whereas innovation from U.S. games are ascribable to modular product architectures. Another reason for this is that production for diverse gaming platforms[3] does no harm to Japanese innovativeness while it does harm U.S. games' innovativeness. Japan does well in producing for multiple platforms because of the discussed ability to integrate firm-specific knowledge, which enables developers to widely apply knowledge to varying products.

[3] Platforms in the video game context are defined as the console, computer or handheld devices used for playing the game.

Based on hitherto findings, I therefore expect Japan's organizational environment to be better suited for integral innovation, whereas American national conditions lead to more modular innovation. As seen, these expectations are consistent with those of innovation literature, inter alia Storz & Casper (2015). Japan's and the U.S.' innovations are known to be integral and modular in other industries, for example in the automotive sector. In order to examine whether this holds true for the creative industry of video games as well, and to provide the foundation of this thesis' analysis, the following hypotheses shall transfer this assumption to the creative industry. Therefore, on the basis of the discussed expectations, I hypothesize the following two statements, which are to be either corroborated or refuted with this thesis:

1a Japanese innovations are integral in the creative industry as well,

1b American innovations are modular in the creative industry as well.

3. Data and Method

3.1. Samples and sampling method

My empirical research is based upon two samples consisting of 25 games each and uses experts' reviews of those games which are analyzed by means of the text-mining software 'Leximancer'. Although the common approaches to measure innovations are patents or intellectual property rights, these constitute unsuitable measurements of innovation in creative industries since patents are less prevalent in these industries. The alternative approaches comprise new genre creation, awards and reviews written by industry experts. The latter promises to be most suitable as reviews unify evaluation on several of a game's dimensions of content, design and technology, and observe in which components of a game innovation take place (Storz et al., 2015). Thus, reviews form the instrument of assessing the games' innovativeness in this thesis and provide for additional value as reviews have only found little use in innovation literature so far with the main exceptions of Storz & Casper (2015), Storz (2008), Storz et al. (2015) and Strambach & Storz (2008). Furthermore, reviews provide for detailed testing from diverse experts, thereby uniting many several opinions.

By reason of the relevant settings discussed in the previous section, namely the contrasting organizational and institutional environments, reviews from games of U.S. and Japanese developers qualify best for the analysis. Thus, one sample includes 25 video games from Japanese developers while the second one consists of 25 video games from U.S.' developers. In order to provide for a meaningful interpretation, the samples were carefully selected from a preexisting register of games hyperlinked to their respective entries at MobyGames and divided into games developed by Japanese and U.S.' firms. The American website 'MobyGames' (http://www.mobygames.com) is by its own account the world's largest video game online archive. With a multitudinous collection of over 96,000 itemized entities and nearly 15,000 reviews (MobyStats, 2015), MobyGames depicts a depository of video games including arcade, computer, mobile and console games from over 165 platforms. The listed games at MobyGames are subdivided into genres, namely action, strategy, adventure, racing, etcetera. My samples comprise solely games of the genre action, as the quantity of games filed at MobyGames is largest for this genre (23,557 games in this genre of out 96,000), and in order to guarantee a better comparability between games. In addition, Tschang (2007) states the genre action to be by far the most-played console game category, constituting a share of over 30% and thereby indicating the market preference. Furthermore, a time period of 11 years has been set, thereby including games published between the years 2004 and 2014. Since the games' reviews are the analysis' target, reviews from the American magazines 'IGN' (Imagine Games Network) und 'GameSpot' have been selected among the multiplicity of magazines and websites publishing video game reviews due to their magnitude and accessibility.

In summary, in order to guarantee an exploitable data set, a game had to meet the following criteria in order to be included in the sample of 25 games per country: (1) genre: action, (2) year: 2004-2014, (3) reviewed from both IGN and GameSpot, (4) main game or large enough extension. Since each game's edition has its own entry at MobyGames, the latter premise precludes special editions and minor extensions in form of downloadable content which may not yield meaningful enough reviews.

Adjusting the above mentioned game register's settings to meet these criteria, it yielded 251 Japanese games and 208 U.S.' games. Within this selection the games

were randomly sampled. To ensure a sample size of 25 games, every 10th Japanese game was selected at first (251/25=10,04) and every 8th for the U.S. sample (208/25=8,36). However, the register's settings could not control whether both IGN and GameSpot had reviewed the selected game as required by criterion (3). Therefore, if the randomly selected game did not meet criterion (3) (for example if only GameSpot had reviewed the game but not IGN or if neither had reviewed the game), the iterative method illustrated in figure 1 was applied until a suitable game was found.

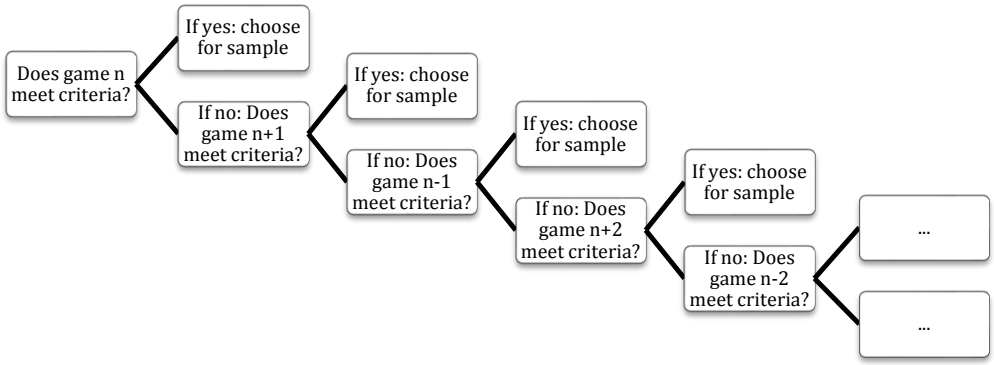

Figure 1: Iterative selection method if game does not meet criteria

The following table delineates the resulting samples for Japan and the U.S.. For a fully detailed table of the sampled games depicting the games' release year and the platforms they were reviewed for please refer to Appendix A.

Table 1: Game samples

#	Japanese Games	U.S. Games
1	The Legend of Zelda: The Minish Cap	Day of Defeat: Source
2	Super Princess Peach	Half-Life 2: Episode One
3	The Legend of Zelda: Phantom Hourglass	Left 4 Dead 2
4	Star Fox 64 3D	Portal 2
5	Super Mario Galaxy 2	Quake 4
6	Final Fight: Double Impact	Star Wars: The Force Unleashed
7	Mega Man Maverick Hunter X	Jak 3
8	Resident Evil: Deadly Silence	The Last of Us: Remastered
9	Resident Evil: The Darkside Chronicles	Uncharted 3: Drake's Deception
10	Sengoku Basara: Samurai Heroes	Ratchet & Clank Future: A Crack in Time
11	Ultimate Marvel vs. Capcom 3	Resistance: Fall of Man
12	Kirby: Canvas Curse	Gears of War
13	Donkey Konga 2	Gears of War 3
14	Star Fox Assault	Unreal Tournament 2004
15	Death by Degrees	Call of Duty 2
16	Me & My Katamari	Call of Duty: Ghosts

17	Super Smash Bros. for Nintendo 3DS	Call of Duty: MW3
18	Drill Dozer	BioShock
19	Game & Wario	BioShock Infinite
20	Puppeteer	Tribes: Vengeance
21	Sonic and the Secret Rings	Halo 2
22	Sonic the Hedgehog 4: Episode I	Dance Central 3
23	Fatal Fury: Battle Archives Volume 1	Mortal Kombat: Unchained
24	Metal Slug Anthology	God of War III
25	Sin & Punishment: Star Successor	Feeding Frenzy 2: Shipwreck Showdown

3.2. Analysis with Leximancer

Once the samples were acquired, the reviews of IGN and GameSpot were copied and pasted into respective documents for analysis with Leximancer. As stated before, Leximancer is a text-mining software that offers insights into text, in this case into the reviews. For my analysis I used the free of charge trial version of Leximancer. Within the software certain settings can be adjusted in order to refine the results, such as a list of words called stopwords[4] that are supposed to be excluded from the analysis. This includes commonly used words with no intrinsic meaning, for example 'and', 'throughout', 'because' and so forth.

Uploading the documents and running the projects once per every game and once per country by means of the content-analysis software, Leximancer yielded concept and theme collections for every game as well as for all Japanese games combined and for all U.S.' games combined. The concept collections consist of groups of cognate words that travel together within the text, listing the words counted the most and giving them a relevance percentage according to occurrence frequency. The theme collections are concept clusters that have some similarity or connectivity derived from their close proximity within the text.

I carefully selected the most significant concepts[5] of the respective outputs from the Japan and U.S. sample which promised to give evidence about specific game features and constructed a table comparing the differing relevance percentages in order to derive meaning from the differences. The remaining concepts were disregarded for two reasons: either because they did not appear to provide for any explanatory power or because they may have had explanatory power but the scope of this thesis limited the selection. Unfortunately, no t-tests could be performed for the overall differences' significance since merely two values were available.

[4] For a detailed list of stopwords, please refer to Appendix B.

[5] For further information on how the concepts were selected, please refer to Appendix C.

Thus, I relied on the word context and the difference's magnitude in order to decide whether a difference in the relevance percentage has potential meaning or should be rejected. For the five concepts with the highest explanatory power, however, each individual relevance percentage was extracted from the games' concept collection and respective t-tests were performed in order to quantify the differences' significance. However, these t-tests most probably cannot be seen as representative for the overall difference's significance, as insights about Leximancer's algorithm for computing the relevance percentages are missing[6].

In order to be able to classify games into certain kinds of innovation, namely modular and integral, I created the following table of words and terms belonging to each classification using the table 'Integral and Modular Innovation: A Comparison of Matched Games in the Video Game Industry' by Storz and Casper (2015). The latter contrasts pairings of Japanese and U.S.' games based on not solely the genre action but also includes games with the genres strategy, racing, adventure and role-playing. Aiming to develop a general approach by which words can be classified into either modular or integral innovation, I extracted no game-specific words but rather terms applicable to all sorts of video games. Furthermore, I sorted the words and phrases into categories as shown below in order to deliver a better overview.

Hence, when analyzing Leximancer concepts, I refer to this table in order to help classify games into either modular or integral innovation.

Table 2: Word classification

Modular product architecture	Integral product architecture
Gameplay: • Sets new **standards** in graphics and gameplay • Gameplay is fantastic • Much more limited in gameplay and design • Extreme attention to detail, and depth of gameplay material • Dated graphics and little sound/music, but exceptional game-play and design • Novel **gameplay** element **Graphics:** • More single components such as its innovative technology and graphics • Superb graphics and **sound** make an	**Gameplay:** • Well-done integration of **gameplay** and **graphics** • Widely praised for the integration of a **variety** of gameplay styles **Graphics:** • State of the art of graphics and **sound** • **Smooth** graphics • Lush graphics drawing from the Japanese manga tradition • Nothing at all really new in terms of gameplay, graphics, or genre (RTS), but a much larger gameplay **world**, excellent gameplay balance, and replayability • Somehow manages to bring it all into the **world** of 3D graphics without a single hitch **Plot:** • Perfect interactive movie • Top combination of excellent action and superb **story**

[6] For further understanding on how the percentages differ, please refer to Appendix D.

enjoyable gaming **experience** • New uses of light • Stop motion photography • Graphically intense and luxurious • **Graphics** are at times beautiful • Terrific **graphics** **Plot:** • Not much plot • More realism • Invented a new genre combining real time strategy and role playing elements. **General:** • Amazing **experience** • Invention of new genres • Radically innovative • Most ambitious and **original** games	**Characters:** • Right amount of action, **character** interaction, and mental challenge • Excellent **characters** **Integration:** • Woven together in a beautiful tapestry • Most elements of the game had been seen elsewhere • A game that melds so much together and is so **different** than anything else on the market • Tight integration of graphics, sound, and story-elements to create a movie-like **experience** **General:** • Industry **standard** for excellence • **Players** standard in **fun** • Higher complexity • Manages to add enough new elements to make the game truly stand out from the previous releases in the **series** • Instant **classic** • Triumph of style and **originality** • Gorgeous to look at, a dream to **control**, and filled with some of the most exciting moments

For the purpose of gaining deeper insights into what the concepts really reveal, I additionally selected one meaningful game pairing to construe the respective reviews, individual concepts and theme collections in detail. The pairing was selected by examining each game's concept collection and consists of the Japanese game 'Mega Man Maverick Hunter X' and the U.S.' game 'The Last of Us: Remastered'.

3.3. IGN ratings and additional data

For further analysis and in order to offer a different perspective not only of innovativeness but also of overall perceived quality of the games, the respective IGN and GameSpot scores were gathered as well as the Critics' Score[7], a score between 0 and 100 calculated by MobyGames and indicative of the critics' overall score for a game.

In addition to the overall IGN score published along with the review at MobyGames, IGN has a differentiated rating system of its own evaluating games in the sections 'presentation', 'graphic', 'sound', 'gameplay' and 'lasting appeal' on a scale from 0 to 10. Of interest in this respect are the sections 'gameplay' as well as 'lasting appeal', because 'gameplay' could be found at the concept selections of the reviews and because of the prevalent opinion that Japanese

[7] The IGN and GameSpot scores were not accessible for every game since some reviews were not listed at MobyGames and consequently had to be retrieved from the IGN and GameSpot websites themselves, therefore missing the respective Critics' Score as well.

developers prevail in gameplay. Furthermore, the scores for the section 'lasting appeal' may trace back to integral innovation, as a game's lasting appeal offers insights about how developers internalized a game's experience throughout the playing time. Thus, I collected the ratings and performed several t-tests in order to examine whether a significant difference between the scores of the two countries could be detected. The surprising results are inconsistent with the expectations, as they reveal a significantly better score in gameplay for U.S. games. However, this result may be linked to biases in the sample selection, which will be explained later in the discussion.

4. Results

This section presents my findings and descriptive statistics in forms of tables, starting with the concept analysis before illustrating the score analysis with values rounded to the first position after the decimal point. The table below depicts the selected concepts with the respective relevance percentages of both the U.S. and Japan. In addition to that, table 4 presents the t-tests performed for the five most significant concepts.

4.1. Leximancer concept analysis

Table 3: Leximancer concepts and relevance percentages for all games per country

Concepts	Japan relevance percentage	U.S. relevance percentage
characters	85	48
original	79	37
gameplay	64	57
different	59	59
use	53	52
feel	52	50
experience	50	52
world	48	27
character	47	0
classic	43	0
easy	38	0
control	34	0
story	32	64
simple	31	0

Table 4: T-tests for Leximancer concepts

T-test	H_0-Hypothesis	P-value	Conclusion
1.	H_0=There is no significant difference between Japan's and U.S.' relevance percentages for the concept '**characters** '	0.518472323	Accept H_0, difference is due to random chance
2.	H_0=There is no significant difference between Japan's and U.S.' relevance percentages for the concept '**original'**	0.208532634	Accept H_0, difference is due to random chance
3.	H_0=There is no significant difference between Japan's and U.S.' relevance percentages for the concept '**gameplay'**	0.012195996	Reject H_0, there is a significant difference
4.	H_0=There is no significant difference between Japan's and U.S.' relevance percentages for the concept '**world'**	0.895414386	Accept H_0, difference is due to random chance
5.	H_0=There is no significant difference between Japan's and U.S.' relevance percentages for the concept **story**	0.017982453	Reject H0, there is a significant difference

When analyzing the concepts for all country specific concepts, it is striking that Japan's third highest rated concept is 'characters' with a relevance percentage of 85 percent, as compared to merely 48 percent for U.S. games. Japan, furthermore, lists the single form 'character' with a percentage of 47 whereas this word cannot be found at all in U.S. concepts for all games. This finding could be related to Japan's rich tradition in manga drawing, which also emphasizes character details. This may constitute an important indicator for classifying Japan's innovation as integral because integral product architecture is characterized by refining preexisting features, in this case character designs. Moreover, Table 2 provides evidence that integral innovations are often described by the mentioning of the excellent characters. As seen in table 4, the first t-test based on the individual games' relevance percentages for 'character' contradicts the difference's significance for this concept by accepting the null-hypothesis that the scores' differences are due to random chance. Yet, as mentioned before, this t-test does not directly relate to the overall difference, but only to the individual concept collections. Thus, the t-test's result is not directly transferrable to the overall concept analysis based on the concept collections per country, making a direct interpretation disputable.

The concept 'original' proves to be of interest since the distinctively higher percentage for Japanese games (79 versus 37) may trace back to how Japan's game industry originated. As Japanese games seem to be viewed as much more classical and original than U.S. games, this could stem from the companies being

older and more established than American game companies as discussed in the second chapter. This finding is underpinned by the concept ‘classic’, which has a relevance percentage of 43 for Japanese games but no occurrence for U.S.’ games. Again, the t-test indicates that the individual score’s differences of the relevance percentages for ‘original’ are due to random chance, undermining the interpreted difference within this concept. However, discussed limitations about these t-tests continue to apply.

The concept ‘gameplay’ was assumed to have meaningful informative value and, as seen in table 4, the performed t-test for the individual relevance percentages state the difference to be significant at a five percent level. Yet, the relevance percentages of both countries are almost alike (64 versus 57). The reason for this might be explained by Tschang (2007) who defines an occurring phenomenon in the video game industry called rationalization as the focusing on business interests which constrains a designer’s creativity. This orientation of rationales is thus risky in creative industries as it can hinder the creation of innovation. An intriguing quote from Pritchard (2000, p. 53) epitomizes this conflict between business rationale and creativity: “The game business is brutal to those who fail to move forward with the times, but it’s also equally brutal to those who experiment too much and stray from the expectations of the players.”

According to Tschang (2007), rationalization is the reason for declined radical innovations observed in the video game industry and augmented incremental innovation. Besides, as studies show, this may also be the reason why Japanese and U.S.’ companies produce increasingly similar games as seen, for example, in the emergence of immersive 3D games (Tschang, 2007). Accordingly, this alignment also occurs in parts of graphics and scripting since firms thereby balance their uncertainty about market preferences.

Hence, this may serve as an explanation why the relevance percentages in the concept ‘gameplay’ for Japanese and U.S.’ games do not differ as much as anticipated when expectations are based on the theoretical background knowledge that Japan’s gameplay is prevailing. Table 2 supports these findings in view of the fact that both countries’ gameplay is praised alike for its excellence. However, the slight dominance of Japan’s relevance percentage may reflect the theoretical tendency. The explanation for the similarity might further be applied to the

concepts ‘different’, ‘use’, ‘feel’ and ‘experience’, as the relevance percentages are almost alike for these three terms as well.

As mentioned before, the content intellectual property comprises a game’s story, its game world, the art, game’s settings, background of a game, its history, and kind of objects within the game (Tschang, 2007). Roch (2004) states that publishers assign content IP the highest value in a game. Thus, it can be inferred that concepts similar to these topics refer to a game’s content IP and have great importance attached to them. The concept ‘world’ appears in both the Japanese and the U.S.’ games, although it has a higher relevance percentage for Japan (48) compared to the U.S. (27). This leads to the assumption that the holistic approach of integral product architecture is reflected in Japan’s creation of holistic game worlds with much attention to richness in detail and subtleties. Consistent with this belief is the description of immersive worlds in Table 2 which matches the integral approach. However, as similar for the concepts ‘characters’ and ‘original’, the t-test based on the individual games’ relevance percentages for the concept ‘world’ proves the differences to be due to random chance. Yet, this does not transfer directly to the overall analysis.

The concept of ‘story’ raises several questions as the surprising findings indicate a twice as high relevance percentage for the U.S. than for Japan (64 versus 32). This is unexpected because it stands in contrast to the already discussed concept ‘world’, although both ‘story’ and ‘world’ can be related to the content IP where Japan’s prevalence was assumed. Moreover, Table 2 presents rather mediocre evaluations for U.S.’ games’ story as opposed to Japan’s games for which story lines are often compared to movies.

This finding may be explained by taking licensed IP into consideration. Due to the geographical proximity of the film industry Hollywood and the American game industry in Silicon Valley, U.S. game firms frequently develop games which are remakes of published movies. This may contribute to the improvement of U.S. stories as the ideas stem from another source, namely the movie industry. However, contradictory to this hypothetical explanation is the fact that although licensed game projects focus on IP, it is said that their quality is afflicted due to the time pressure of insuring that the release dates of the movie and the game coincide (Tschang, 2007). Nevertheless, this affliction of quality may apply to the technological aspects of the games only, leaving unaffected the quality of the

story itself. In addition to this, having examined the individual game's concepts, the t-test for 'story' concludes that the percentage differences between Japanese and U.S.' games are significant at a five percent level. However, based on this sample it can only be conjectured what the reasons behind this finding are.

As mentioned before, a game's gameplay refers to the player's interplay and connection with the game. Thus, the concept 'control', which scores a relevance percentage of 34 percent, but does not appear in the U.S. concepts at all, potentially relates to a game's gameplay. Furthermore, the concepts 'easy' and 'simple' receive a relevance percentage of 38 and 31 respectively for Japanese games and do not appear for U.S.' games. It could be inferred that the apparent smooth handling of Japanese games reflected in these three concepts trace back to the integral manufacturing approach which emphasize the neat implementation of components across a game's dimension. This is aligned with the absence of these concepts in U.S. games' reviews since modular innovation takes place in only one dimension and hence the means of controlling of a game, namely the interplay multiple dimension such as technology and design, may not be the main focus there.

4.2. Detailed analysis of a game pairing

The game pairing with the most explanatory power within the individual concept collections consists of the Japanese game 'Mega Man Maverick Hunter X', reviewed for the PSP and the U.S. game 'The Last of Us - Remastered', reviewed for the PlayStation 4. The former received an overall Critics' Score of 88, whereas the respective score for 'The Last of Us - Remastered' was not listed at MobyGames. IGN, however, awarded the game with the highest possible score of 100 points. The following table depicts relevant concepts and themes of the respective games.

Table 5: Pairing concepts and themes

Mega Man Maverick Hunter X		**The Last of Us - Remastered**	
Concepts	**Themes**	**Concepts**	**Themes**
Original (100)	Time (100)	World (82)	World (70)
Familiar (17)	Original (95)	Original (45)	Original (4)

For ‘Mega Man Maverick Hunter X’, the concept ‘original’ is attributed a relevance percentage of 100 percent, thereby underlining the overall analysis’ findings. As stated earlier, this may lead back to the integral product architecture of Japanese games and to the Japanese game industry’s genesis. Taking a closer look at the actual review of ‘Mega Man Maverick Hunter X’, however, it discloses that the concepts do not always bear the derived meaning. In the review, the experts employ to the word ‘original’ in order to relate to the preceding game ‘Mega Man X’. Therefore, the concept ‘original’, which has a high relevance percentage in the overall Japanese sample of 79 percent, is frequently used by experts when reviewing sequels or remakes, thereby leading to the high relevance of the word. On the one hand, the reference to sequels stands in contrast to the implied word’s meaning of something being existent from the beginning on, thus referring to the Japanese common practice of improving preexisting technology. On the other hand, the word itself may not bear the implied meaning, but certainly the review’s context does, as this extracted sentence from the IGN review proves:

> “In terms of gameplay, Capcom didn't mess around too much with established formula. It still feels and plays like the original you've come to cherish.”

GameSpot’s review further supports this finding:

> “If you've played the original Mega Man X, the setups, scenarios, and battles will seem largely familiar to you. Visually, however, this is completely new, with crisp 3D graphics to modernize the experience and some new anime vignettes to help tell the story”.

Moreover, this extract refers to the mentioned technological and story improvements which inter alia constitute integral innovation. It becomes obvious that concepts can have ambiguous meanings, a limitation of content analysis, which will be further discussed in chapter 5. The theme ‘time’ is composed of the words ‘time’, ‘play’, ‘familiar’ and ‘Vile’, the latter being a character’s name with no semantic value. Although Leximancer attributes this cluster of concepts a connectivity of 100 percent, it seems to indicate no interpretable meaning for my analysis. The theme ‘original’ with a relevance of 95 percent summarizes the words ‘original’, ‘bosses’, unique’ and ‘looking’. At least the words ‘original’ and ‘unique’ seem to be connected, although no certain connectivity can be proven. Evidently, interpreting themes is too vague to deduce reason, which reduces Leximancer’s theme interpretation to merely construing its relevance percentage. Having said that, the relevance percentage of the theme ‘original’ of U.S. game

‘The Last of Us – Remastered’ amounts to 4 percent, compared to 95 percent for the Japanese game. Yet, the concept ‘original’ receives a noticeable relevance percentage of 45 percent. Although ‘The Last of Us – Remastered’ is a remake as well, having studied the review it becomes clear that ‘original’ solely refers to the previous game and stands in no relation to the meaning it has for the Japanese game. The review eulogizes the game’s new graphical accomplishments, underlining the modular innovation which takes place in one of a game’s dimension, namely technology. In addition to that, the concept ‘world’ receives a relevance percentage of 82 percent and the theme ‘world’ a similarly high value of 70 percent. Within my sample, this is unlikely for U.S. games, taken into consideration the overall analysis, in which ‘world’ merely reached a value of 27 percent for all U.S. games. Scrutinizing GameSpot’s review for ‘The Last of Us – Remastered’, it reveals that the experts refer to the period the characters live in, scilicet a post-pandemic world:

> “(…) vision of a world that makes no room for people to really live their lives anymore. In this post-pandemic military-ruled society, the most anyone can hope for is merely to survive.”,
>
> “The story is set in a world where every human life is in constant danger (…)”.

Thus, it can be implied that it has no similarity with the meaning of the concept for Japanese games, where it emphasizes the integrality and holistic approach of the games. The detailed analysis for this pairing hence reveals that concept analysis is to be exercised with caution since the apparent meaning of concepts may differ from what is actually meant within the text. Nevertheless, within this detailed analysis of the two games, it could be shown that the Japanese game indeed focuses on integral innovation whereas the U.S. game excels in modular innovation.

4.3. Score analysis

When examining the sample’s score analysis, it is salient that all three scores, thus IGN, GameSpot and the overall Critics’ Score, grade U.S. games with a higher value than Japanese games. It could therefore be inferred that U.S. games with an average score of round 85 are in general considered more innovative and at large better than Japanese games with an average score of 77,5. The performed t-tests listed below in table 8 prove the differences between Japan’s and U.S.’ IGN and overall Critics’ Score to be significant at a five percent level. Merely the

difference in GameSpot's evaluation seems not to be significant, indicating that the difference is due to random chance.

Table 6: Score analysis

	IGN Score	GameSpot Score	Critics' Score	Average Score
Japan	79.5	76.7	76.2	77.5
U.S.	87.5	83.5	83.9	84.9

Most interesting to note is that the findings by Storz et al., (2015) indicate the exact opposite: Their performed t-tests prove Japanese video games to be significantly more innovative with a Critics' score of 74 for Japanese games compared to 71 for U.S. games. The mentioned composition of the Japanese video game industry, namely the composition of mainly established diversified firms, may contribute to the explanation why Japan managed to successfully transfer traditional labor market institutions into a new industry and thus accomplished to apply the needed complex management structures for innovations. Despite being labeled one of the least entrepreneurial countries (GEM Global Report, 2014), the ability to integrate knowledge across a game's dimension within the Japanese system provides sufficient possibility to innovate just as well if not better than the U.S. system of high mobility and creative destruction.

Seen below are the results from the differentiated IGN ratings subdivided into the individual sections.

Table 7: IGN rating

	Presenta-tion	Graphics	Sound	Gameplay	Lasting Appeal	Overall (not an average)
Japan	7.8	8.1	7.7	7.7	7.5	7.8
U.S.	8.8	8.6	8.8	8.8	8.5	8.8

Table 8: T-tests

T-test	H_0-Hypothesis	P-value	Conclusion
1.	H_0=There is no significant difference between the **IGN scores** of Japanese and US games	0.012975327	Reject H_0, there is a significant difference
2.	H_0=There is no significant difference between the **GameSpot scores** for Japanese and U.S. games	0.072463898	Accept H_0, difference is due to random chance
3.	H_0=There is no significant difference between **Critics' Score** for Japan and U.S. games	0.016663537	Reject H_0, there is a significant difference

4.	H_0=There is no significant difference between the IGN rating for Japan and U.S. in the section '**presentation'**	0.006367525	Reject H_0, there is a significant difference
5.	H_0=There is no significant difference between the IGN rating for Japan and U.S. in the section '**graphics'**	0.144712604	Accept H_0, difference is due to random chance
6.	H_0=There is no significant difference between the IGN rating for Japan and U.S. in the section **'sound'**	0.002548813	Reject H_0, there is a significant difference
7.	H_0=There is no significant difference between the IGN rating for Japan and U.S. in the section '**gameplay'**	0.00567275	Reject H_0, there is a significant difference
8.	H_0=There is no significant difference between the IGN rating for Japan and U.S. in the section '**lasting appeal'**	0.01363208	Reject H_0, there is a significant difference

According to the IGN rating, U.S.' games perform better in every section. This would support the general appraisal of the score analysis and emphasize the U.S.' dominance over Japanese games. The differences in sections 'presentation' and 'sound' prove to be significant at a one percent level according to the performed t-tests. U.S.' superiority in the section 'sound' seems to be supported by the favorable words and positive evaluation of U.S.' games' sound from table 2. However, also Japanese games' sounds are praised by critics, which makes the significant difference in these sections rather inexplicable and further information would be needed to validly asses this difference. U.S.' games score half a point better in the section 'graphics' than Japanese games. One could assume that this is because experts generally consider new graphical accomplishments to be better improvements than subtle refinements and optimization of existing graphics. Yet, table 2 depicts praises of both U.S. and Japanese graphics. However, the performed t-test indicates the difference within this section to be due to random chance, thus, the difference may only be due to the sample collection.

Based on the theoretical framework compiled in the second chapter, it should be assumed that Japan proves prevalent in terms of gameplay. Yet, the differentiated IGN rating of my sample indicates a distinctively higher score to U.S.' games' gameplay than to Japanese games' (8.8 versus 7.7), as can be seen in the table 7 above. As depicted in table 8, this profound difference proves to be significant at a one percent level, further undermining common expectations. Apparently, IGN experts appreciate U.S. games' gameplay, thus the gamer's interaction and experience with the game itself. This may be due to modular innovations in the controlling aspects of games or because radically new innovations, as often seen

in U.S.' games, lend the games an exciting gaming experience. However, the underlying reasons for this finding can only be conjectured.

A game's lasting appeal refers to an enduring enjoyment during the entire playing time of a game, thus to sufficient game length, and furthermore to replayability. Taken into consideration the Japanese habit to excel in neat integration of design and technology across a games' dimension, it could vaguely be inferred that Japan prevails in the section 'lasting appeal' and that this term traces back to integral innovation. However, U.S.' games score a point more than Japanese games and the t-test seen in table 8 proves the difference to be significant at a five percent level. Thus, modular innovation of U.S. games might affect a game's replayability on a greater extent than do games featuring integral innovation.

The IGN overall score grades the sampled U.S. games with rounded 8.8 on average whereas Japanese games score a full point less, thus 7.8. In general, this finding underlines the overall impression of my sample that U.S. video games perform better than Japanese games. Although answering this question has not been the main objective of my thesis, it constitutes an interesting finding and yields alternative perspectives on the perceived innovativeness of U.S. and Japanese video games.

My findings underline the precognition about the interrelatedness of institutional environments and innovations discussed in the second chapter and furthermore offer insight into how concepts relate to either integral or modular product architecture in the video game industry which belong to the creative industries as mentioned before. Several authors, amongst others Strambach & Storz (2008), have additionally found the results in other creative industries, namely the business software industry.

Based on this and in regard to my findings, the hypotheses of this thesis, namely that Japanese innovation are integral in creative industries as well and that U.S. innovations are modular in creative industries as well, can be corroborated. Thus, institutional ascendancies may have proved to last despite augmented globalization and the countries' firms have managed to transfer national advantages and specifications of innovations into the creative industry of video games and in a wider context, into creative industries in general.

5. Discussion

5.1. Limitations and shortcomings

5.1.1. Limitations regarding the approach

When evaluating the results' explicability, it has to be borne in mind that the used approach may be too limited with respect to sample size or even not appropriate at all in order to assess the reviews. Alternative ways of research include surveys and interviews with developers and publishers, or case studies in order to allow for deeper understanding and richer data of the matter at hand.

5.1.2. Limitations regarding the reviews

Furthermore, it has to be noted that although the samples feature games from a time frame of 11 years, no development over the years can be observed when examining games' innovativeness by means of content analysis. Another limitation regarding the selection of reviews and scores depending on the platform must be considered. Although the reviews and scores were mostly equivalent for a game no matter for which platform it was evaluated, in at least four cases the Mobyscore and the reviews differed depending on the platform it was evaluated for. One prevailing example is the Japanese game 'Metal Slug Anthology'. IGN rated the game for the platforms PlayStation 2 (PS2), PlayStation Portable (PSP) and Wii, allotting a score of 79, 75 and 72 points respectively. The tones of the reviews vary accordingly: in its PS2 review, IGN writes "(…) grab a friend and put some quality time into one of SNK's greatest franchises." whereas in the review for Wii IGN criticizes: "Metal Slug Anthology is still a bit of a letdown". GameSpot as well differs in its assessment of the same games; for 'Metal Slug Anthology' it awarded the highest score to the game when evaluated on PSP (82 points), the PS2 version receives a similar score of 81 points. The difference becomes significant for the Wii version which is assigned mediocre 75 points from GameSpot.

These findings implicate limitations for the sample as I chose to include only one review per magazine per game and therefore had to select out of three differing reviews with different scores, thereby contorting the results by influencing the score means. To compensate this shortcoming, I decided to choose accordingly to the distribution of the platforms already sampled, thus balancing the quantity each

platform appeared in the sample. However, results in score means and also concept collections could still have differed if other reviews of these games were chosen. Other examples of games where differences in scores and reviews occurred were the U.S. games 'Quake 4', 'Star Wars: The Force Unleashed', and 'BioShock', and the Japanese game 'Ultimate Marvel vs. Capcom 3'. In relation to this, the general distribution of platforms constitutes a limitation insofar, as the occurrences of the particular platforms varied distinctly across the U.S. and Japan, which may have aggravated the comparability of the two countries.

Table 9: Platform distribution

Platform	Japan	U.S.
Gameboy Advance	2	0
Gamecube	2	0
Nintendo 3DS	2	0
Nintendo DS	4	0
PlayStation 2	3	1
PlayStation 3	4	8
PlayStation 4	0	2
PSP	2	1
Wii	4	0
Wii U	1	0
Windows	0	9
Xbox 360	1	8

All in all, 12 different platforms were included in the sample. The platform count of U.S.' distribution adds up to more than 25 because some reviews were written for multiple platforms but did not differ in their evaluation. As it can be seen in figure 2 Japanese reviews related to a broader range of platforms than the U.S.' reviews, which seem to be based on only a few platforms. The sampled Japanese games' reviews addressed 10 of the 12 platforms, thereby excluding Windows and Wii U. U.S.' games' reviews, however, only related to 6 out of 12 platforms, concentrating mainly on PlayStation 3, Windows and Xbox 360, and thereby disregarding all platforms made from Japanese producer Nintendo[8].

[8] Nintendo DS, Nintendo 3DS, Wii, Wii U, as well as GameCube and GameBoy Advance are all produced under the umbrella brand Nintendo.

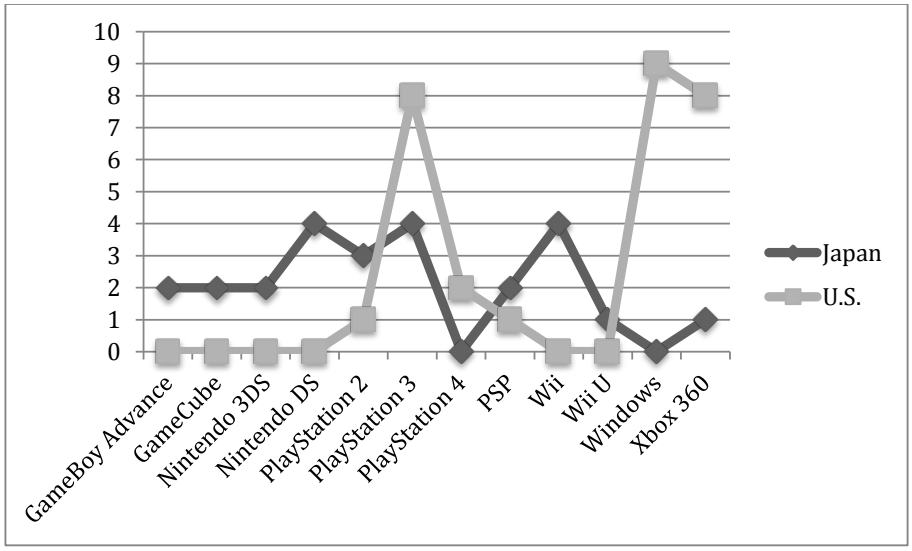

Figure 2: Platform distribution

The differing technological characteristics of the platforms, such as the great differences in controlling or gameplay limitations on handheld consoles like the PSP or GameBoy Advance, may have impacted the experts' evaluation of the game itself and hence altered the outcome of my samples. Although it appears as if experts evaluating U.S.' games tend to refrain from reviewing these games on Nintendo platforms, this trend within my study does not clearly indicate an overall tendency and the problem may be eliminated by increasing the sample size. Furthermore, it has to be added that not all U.S.' games are released for all platforms, thus prohibiting the possibility to write reviews for these platforms in the first place.

One might still ask whether IGN and GameSpot experts and reviewers are biased in favor of U.S.' games due to the fact that both magazines are indeed American, thus implying that the majority of employees writing the reviews are American as well. Yet, this is only a vague suspicion that has furthermore been at least partially addressed by using two different magazines, thereby further diversifying the experts' opinions.

5.1.3. Limitations regarding Leximancer

Leximancer brings about additional limitations which caused the output to be less interpretable than expected. One example is the inexpressive concept 'time' which has the highest relevance percentage of 100 percent for both Japanese and U.S.

games. Even though the stoplist was edited, Leximancer still delivers concepts which trace back to names or meaningless words. In addition to that, the ambiguity of concepts may lead to misinterpretation, as it cannot clearly be stated where the concepts derived from. Furthermore, the supplementary output to the concepts, namely the theme collections, do not prove to be very informative; Leximancer is unable to select umbrella terms and thus simply picks one term as theme under which several words are grouped. The grouping however does not always appear to bear meaning, resulting in void outcomes per se.

Nevertheless, this limitation does not only relate to the software but is also interrelated with the reviews. Thus, if the concepts seem to be less significant, it could also trace back to the experts writing about game-specific content rather than the game's innovative composition in a game's dimensions.

5.1.4. General limitations

In addition to a very small sample size of 25 games per country and the use of only two magazines, the ambiguity of innovation terminology further adds to the results' uncertainty. Garcia & Calantone (2002) also claim that the abundance of different terms for innovations lead to misunderstandings and hinders research and comparability. Storz & Casper (2015), furthermore, point out general risks when basing research only on one selected industry in two countries, since there are most probably additional factors that influence the results, such as the selection of firms and the macroeconomic environment in general. Hence, this field of research should further be explored in the future.

This is related to the limitation of generalizing my findings to the creative industries. Although similar results have been found for the business software industry, one additional industry may certainly not suffice in order to conclude to creative industries in general with certainty and further research about other creative industries would help investigating the matter in more detail.

5.2. Further research

Storz (2008) has identified that dynamic changes within innovation systems are indeed possible: "I identify two sources of plasticity, which allow dynamics and change in innovation systems: numerical and functional plasticity" (Storz, 2008). She states that a period of decreased dynamics took place in the Japanese video

game market from 2000 to 2004; thus, the question comes up whether dynamics and changes in innovation systems are traceable by means of review analyses. This related to the mentioned shortcoming that no development over the years is observable. Therefore, broader research as to tracking innovation changes over time by analyzing reviews would further contribute to the understanding of why innovations differ across countries.

Furthermore, Tschang (2007) scrutinizes whether institutions and matching incentives are presently in their best possible state for benefiting innovation. He suggests that newly designed institutions with other incentives more similar to the movie industry may be needed in the future. Thus, further inquiry into the future of current conditions would be worth inquiring as well.

With regard to the numerous limitations and shortcomings the content analysis with Leximancer brings about, it should be considered to try out alternative text-mining software such as 'Semantria by Lexalytics'. Semantria offers an interesting feature, namely the determination of a text's 'mood', thus calculating whether a text has a rather positive, neutral or negative attitude towards the topics written about. This could be regarded as an indicator of subtle distinctions of seemingly alike performances and innovativeness of games. The Japanese reviews for 'Death by Degrees', for example, is analyzed to be written in a negative disposition (-0,166), which reflects the low Critics' Score of 53. The Japanese game reviews for 'Sengoku Basara: Samurai Heroes', however, having an equally low Critics' Score of 54, appears to be written in a neutral tone (+0,025) (see Semantria Demo). Nevertheless, not having tested alternative software, it cannot be stated for certain that the output would prove to be more useful than the output Leximancer delivers.

When browsing the web for articles about the gaming industry, I came across several press releases stating that innovation in the U.S. is dying and that the industry is facing a serious decline in creativity (Denning (2015), Panetta (2015)). Given the fact that most radical innovations in form of new genres have indeed been nearly exploited, the future of prospective video game innovations, further developments, as well as the question of how the industry in general will deal with future changes and upsurging globalization would constitute a fascinating field of research for innovation literature dealing with the video game industry.

6. Conclusion

The objective of this thesis was to find out whether certain kinds of innovation within the video game industry could be traced back to associated institutional settings of Japan and the U.S. which in turn are responsible for the production of these kinds of innovations. Moreover, it sought to ascertain how games' concepts could be ascribed to either integral or modular innovation. Thus, given the theoretical background about the Japanese and U.S.' institutional environments, it should be shown that Japanese games' innovations are integral, whereas U.S.' games' innovations are modular. It proceeded by analyzing games' reviews by means of the text-mining software Leximancer and by examining miscellaneous scores and ratings that were attributed to the games. The Leximancer concept analysis has shown irresolute yet interesting results. Concepts such as 'characters' and 'original' were most likely connected to integral innovation stemming from Japanese games whereas 'gameplay', contrary to expectations, applied to both Japanese and U.S.' games. Other concepts, for instance 'story', raised interesting questions, the tracing of which may constitute an intriguing field of further research. The detailed analysis of the selected game pairing has revealed how the actual meaning of concepts may differ significantly from the implied interpretation. Furthermore the extensive comparison contributed to a deeper understanding of the concepts 'original' and 'world' insofar as it underlined the interpretation of these terms as an indicator for integral innovation. Within the sample, the overall comparison of scores and ratings has demonstrated a dominance of the U.S. over Japan pertaining to innovativeness and perceived quality of the games. This has been an astounding discovery as it stands in contrast to the findings of Storz et al. (2015). Taken into consideration relevant shortcomings, the thesis still provided sufficient qualitative grounds to corroborate the proposed hypotheses based on the conducted analysis.

Ultimately, it can be stated that due to the existing limitations of the analysis no certain causality can be verifiable between the institutional settings of Japan and the United States and evolving innovations, however, an interactive relatedness is most strongly assumed.

Appendix

Appendix A: Detailed samples' table

Appendix A1: Japan sample

#	Game	Year	Platform
1	The Legend of Zelda: The Minish Cap	2004	Game Boy Advance
2	Super Princess Peach	2005	Nintendo DS
3	The Legend of Zelda: Phantom Hourglass	2007	Nintendo DS
4	Star Fox 64 3D	2011	Nintendo 3DS
5	Super Mario Galaxy 2	2010	Wii
6	Final Fight: Double Impact	2010	PlayStation 3
7	Mega Man Maverick Hunter X	2005	PSP
8	Resident Evil: Deadly Silence	2006	Nintendo DS
9	Resident Evil: The Darkside Chronicles	2009	Wii
10	Sengoku Basara: Samurai Heroes	2010	PlayStation 3
11	Ultimate Marvel vs. Capcom 3	2011	PlayStation 3
12	Kirby: Canvas Curse	2005	Nintendo DS
13	Donkey Konga 2	2004	GameCube
14	Star Fox Assault	2005	GameCube
15	Death by Degrees	2005	PlayStation 2
16	Me & My Katamari	2006	PSP
17	Super Smash Bros. for Nintendo 3DS	2014	Nintendo 3DS
18	Drill Dozer	2006	Game Boy Advance
19	Game & Wario	2013	Wii U
20	Puppeteer	2013	PlayStation 3
21	Sonic and the Secret Rings	2007	Wii
22	Sonic the Hedgehog 4: Episode I	2010	Xbox 360
23	Fatal Fury: Battle Archives Volume 1	2006	PlayStation 2
24	Metal Slug Anthology	2006	PlayStation 2
25	Sin & Punishment: Star Successor	2010	Wii

Appendix A2: U.S. sample

#	Game	Year	Platform
1	Day of Defeat: Source	2005	Windows
2	Half-Life 2: Episode One	2006	Windows
3	Left 4 Dead 2	2009	Xbox 360
4	Portal 2	2011	PlayStation 3, Windows, Xbox 360
5	Quake 4	2005	Xbox 360
6	Star Wars: The Force Unleashed	2008	PlayStation 3
7	Jak 3	2004	PlayStation 2
8	The Last of Us: Remastered	2014	PlayStation 4
9	Uncharted 3: Drake's Deception	2011	PlayStation 3

10	Ratchet & Clank Future: A Crack in Time	2009	PlayStation 3
11	Resistance: Fall of Man	2006	PlayStation 3
12	Gears of War	2006	Xbox 360
13	Gears of War 3	2011	Xbox 360
14	Unreal Tournament 2004	2004	Windows
15	Call of Duty 2	2005	Xbox 360
16	Call of Duty: Ghosts	2013	PlayStation 4
17	Call of Duty: MW3	2011	PlayStation 3
18	BioShock	2007	Windows
19	BioShock Infinite	2013	Windows
20	Tribes: Vengeance	2004	Windows
21	Halo 2	2004	Windows
22	Dance Central 3	2012	Xbox 360
23	Mortal Kombat: Unchained	2006	PSP
24	God of War III	2010	PlayStation 3
25	Feeding Frenzy 2: Shipwreck Showdown	2006	PlayStation 3, Windows, Xbox 360

Appendix B: Stopwords

Appendix B: Leximancer stopwords

might’ve	he'd	said	until	over	began	she
something	right	these	else	once	he	few
bit	he's	isn’t	february	feb	herself	eat
each	big	go	she's	before	they’re	made
six	could	side	do	f	g	d
may	e	b	c	thou	a	must've
n	o	would've	l	m	won't	j
k	h	i	yes	w	eh	v
eg	new	u	yep	t	s	what
r	q	p	nothing	et	z	ago
y	er	yet	x	you'd	took	i’ll
by	enough	same	has	that’s	who	close
couldn't	would	any	you’ll	jan	friday	had
they’ll	be	think	get	thursday	what’s	far
it’ll	much	and	particularly	oct	near	i'd
often	we’d	against	i'm	make	thine	thing
does	shan't	couldn’t	set	through	must’ve	especially
all	five	april	at	as	still	hello
neither	therefore	al	never	which	great	see
i'll	am	an	there	off	sep	ah
why	they	you've	no	nine	it’d	of
help	hey	among	on	only	says	her
ok	alright	that's	itself	move	oh	maybe
or	done	them	then	will	pl	it’s
small	thee	upon	indeed	getting	don’t	most
he’d	wasn’t	across	he’s	rather	me	september
don't	it's	my	okay	it'd	per	within
you're	we’ll	last	second	sometimes	monday	being
him	actually	since	where	every	eight	almost
unto	more	his	we'd	january	when	onto
november	isn't	such	here	kinda	i’ve	hadn’t
this	tue	who’s	i’d	way	hi	from
i’m	add	while	was	hm	if	below
they’ve	you’re	thurs	between	less	he’ll	is
those	it	your	into	in	know	away
two	wednesday	themselves	also	found	etc	they'll
we’re	its	etc.	shan’t	exactly	although	basically

yeah	it'll	along	wouldn’t	turn	going	how
under	mon	would’ve	always	sunday	lot	own
we	sort	i've	give	next	run	didn’t
hard	definitely	there’s	whatever	we'll	later	uh
jul	back	come	us	jun	seen	um
cannot	seem	up	either	tu	doesn't	october
part	let’s	keep	to	com	both	huh
we’ve	you'll	good	doesn’t	must	didn't	th
after	who's	hasn’t	what's	however	whose	so
tues	gone	december	that	thereof	than	whom
got	can	about	well	fri	above	four
too	cent	haven’t	thur	you	soon	anything
seven	high	our	very	out	forth	for
towards	whether	went	thy	are	can't	shouldn't
thu	yourself	uhhuh	we're	again	did	wasn't
like	without	shall	many	not	he'll	nor
haven't	now	nov	shalt	say	myself	saw
years	ask	some	might	put	won’t	kind
according	they've	dec	tuesday	want	end	just
apr	let	you’d	already	should	wouldn't	point
really	ten	but	hath	hadn't	little	show
been	though	together	hasn't	were	hear	please
toward	there's	three	july	you’ve	might've	she’s
we've	himself	hast	even	perhaps	ever	call
other	have	june	one	state	pretty	let's
because	another	sept	august	mean	they're	find
ye	with	can’t	shouldn’t	came	the	around
begin	quite	aug	their	first		

Appendix C: Concept selection

Appendix C: Ordered concept collection

Japan		**U.S.**	
Concept	**Relevance percentage**	**Concept**	**Relevance percentage**
Explained concepts with explanatory power			
characters	85	story	64
original	79	different	59
gameplay	64	gameplay	57
different	59	experience	52
experience	50	use	52
use	53	feel	50
feel	52	characters	48
world	48	original	37
character	47	world	27
classic	43		
easy	38		
control	34		
simple	32		
story	32		
Not explained, but may have explanatory power			
time	100	time	100
play	92	enemies	78
series	91	play	77
players	69	players	65
level	69	fun	57
enemies	67	series	55
fun	62	better	48

look	51	best	40
boss	46	look	37
special	42	enemy	36
design	42	making	35
adventure	40	player	34
enemy	35	levels	34
arcade	35	variety	34
music	30	level	31
feels	29	design	27
making	26		
Not explained and supposedly no explanatory power			
mode	64	weapons	78
action	57	multiplayer	76
screen	57	take	72
levels	53	campaign	71
take	43	action	66
playing	43	mode	64
makes	41	down	63
down	41	makes	63
fighting	40	combat	49
attack	38	maps	48
need	38	Duty	45
stages	36	modes	44
items	36	things	43
things	36	shooter	42
Sonic	35	version	41
battle	34	weapon	39
times	33	points	38
Link	32	gun	38
battles	32	system	37
aren't	31	moments	35
number	31	place	35
stage	30	PC	33
attacks	30	long	33
used	29	playing	32
takes	28	sense	32
lets	27	work	31
past	26	team	31
simply	25	single-player	31
		times	31
		number	29
		fighting	29
		first-person	28
		quickly	28
		fire	28
		previous	28
		comes	27
		using	26
		plenty	24

		Ghosts	22
		life	22

Concepts like ‘characters’, ‘gameplay’, ‘world’, ‘story’ and ‘original’ were the assumed to bear intrinsic meaning and to trace back to certain institutional settings and kinds of innovation and were hence selected for the analysis. Other concepts like ‘use’, different’ and ‘experience’ were selected because the respective relevance percentages of these concepts were alike for both countries, the fact of which made analyzing the concepts interesting.

Leximancer yielded a multitude of additional concepts which would have been worth investigating if the scope of this thesis had not limited the number of concepts that could be analyzed. However, they were only second choice, since they provided for less obvious meaning than the chosen concepts. Yet, concepts such as ‘boss’ or ‘enemy’ may have further traced back to Japanese mange tradition and would have been interesting to investigate. Furthermore, concepts such as ‘music’ or ‘design’ might have proved interesting to examine since both are related to a game’s outer appearance and graphical presentation, the mentioning of which may have in turn led back to either integral or modular product architecture.

Concepts with no apparent explanatory power were words like ‘down’, ‘take’ or ‘need’, since they bear no interpretable semantic meaning. Moreover, meaningless nouns such as ‘action’, battle’, attack’ or names (‘Link’, Sonic’ etc.) were excluded from the analysis. The mentioned nouns probably relate to the chosen genre and have no apparent connection to either product architecture or country specific institutional settings.

Appendix D: Composition of relevance percentages for ‘characters’

Appendix D: Composition of relevance percentages for ‘characters’

Japanese games	Japan relevance percentage	U.S. games	U.S. relevance percentage
The Legend of Zelda: The Minish Cap	37	Day of Defeat: Source	0
Super Princess Peach	0	Half-Life 2: Episode One	0
The Legend of Zelda: Phantom Hourglass	0	Left 4 Dead 2	0
Star Fox 64 3D	38	Portal 2	67
Super Mario Galaxy 2	0	Quake 4	0
Final Fight: Double Impact	0	Star Wars: The Force Unleashed	31
Mega Man Maverick Hunter X	0	Jak 3	0
Resident Evil: Deadly Silence	30	The Last of Us: Remastered	36
Resident Evil: The Darkside Chronicles	0	Uncharted 3: Drake's Deception	0
Sengoku Basara: Samurai Heroes	28	Ratchet & Clank Future: A Crack in Time	0
Ultimate Marvel vs. Capcom 3	58	Resistance: Fall of Man	0
Kirby: Canvas Curse	0	Gears of War	0
Donkey Konga 2	0	Gears of War 3	0

Star Fox Assault	0	Unreal Tournament 2004	0
Death by Degrees	0	Call of Duty 2	0
Me & My Katamari	94	Call of Duty: Ghosts	28
Super Smash Bros. for Nintendo 3DS	0	Call of Duty: MW3	0
Drill Dozer	0	BioShock	0
Game & Wario	0	BioShock Infinite	0
Puppeteer	0	Tribes: Vengeance	19
Sonic and the Secret Rings	0	Halo 2	0
Sonic the Hedgehog 4: Episode I	0	Dance Central 3	0
Fatal Fury: Battle Archives Volume 1	46	Mortal Kombat: Unchained	50
Metal Slug Anthology	0	God of War III	0
Sin & Punishment: Star Successor	0	Feeding Frenzy 2: Shipwreck Showdown	0

It can be assumed that the overall relevance percentage of concepts is composed differently than merely as a summary of the individual ones. Hence, for a better understanding of how the individual relevance percentages differ from the overall relevance percentage, this table shows the individual percentages for the concept ‘characters’ for each game per country. The overall analysis per country yielded a relevance percentage of 85 for Japan and 46 for the U.S.. The table, however, shows that ‘characters’ only appeared in seven Japanese game’s reviews and in six U.S.’ game’s reviews at all. Taken into consideration only those Japanese games in which ‘characters’ appeared as a concept, it yields a mean of rounded 41. Thus the overall analysis value for Japan of 85 is distinctively higher. Similar for the U.S. the individual percentages’ mean is 33, compared to an overall relevance percentage of 46. Lacking information about Leximancer’s algorithm, it cannot be ascertained how the relevance percentages are composed. Thus, as a measure of precaution, it is assumed that the t-tests shown in table 4 cannot be seen as representative of the overall difference’s significance.

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