IPRs and Appropriability in the Digital Era: Evidence from the Swedish Video (Computer) Games Industry

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Abstract

This study contributes to a meso (industry)-level understanding of the changing complexity of the general appropriability conditions in the digital era on the one hand, and the role of IPRs in that (appropriability) on the other hand, through a study of an industry sector – the Swedish video (computer) games industry – where digital distribution prevails and IPRs are important (copyrights in derivative works; trademarks in game titles). Combining analyses on EPO patent data, EUIPO trademark data, firm-level interviews and survey data, this study firstly identifies a paradoxical development: on the one hand, there is a clear digital take-off of IPRs’ propensity, namely firms tend to be more active in registering trademarks and valuing their copyrights (firm size and technological platform matter though). On the other hand, the digital traits – digitally induced high levels of interactivities (between supply and demand) and the digital division of a product (in provisions) – provide strong protections (to the innovation) from a technical standpoint, which offsets the importance of IPRs. Then what are IPRs for, in a technologically tight appropriability regime? This study further identifies that the increase of the importance of IPRs is not derived from IPRs’ protection function, but from their signalling function. In the digital era, new products easily disappear in the digital crowd, and IPRs can act as an important remedy by signalling the origin and quality of products as well as new innovations. This study provides a snapshot of the digital complexity pertinent to the issue of appropriability.

Keywords: Intellectual Property Rights (IPRs), Appropriability, Video Games, Digitalization, Innovation.

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1. Introduction

With a general public audience in mind, the focus of this report is empirical. It is aimed to examine how and to what extent the Swedish video (computer) games industry’s appropriability strategies in general, and its usage of intellectual property rights (IPRs) in particular, has changed in the digital context (e.g., digital distribution). It offers a particular focus on (the role of) IPRs. It contributes to the general understanding of the digital transformation of the appropriability regime.

The appropriability regime, as discussed at the firm level, often refers to the extent to which firms can capture the rents generated by their innovations. In scholarly research, this body of work has become known as the profiting from innovation (PFI) framework, initially proposed by Teece (1986): in a tight appropriability regime, firms can easily use patents, copyright, trade secrecy and similar means to protect their innovations and to retain profits, as illustrated by the formula for Coca Cola syrup; in a loose regime, technologies such as algorithms in linear programming are almost impossible to protect, and firms need to rely on other means to ensure appropriate innovation returns.

We know that firms typically rely on a set of mechanisms to protect and to profit from their innovations, and that those mechanisms include patents, (trade) secrecy, (market) lead-time advantages and the use of complementary marketing and manufacturing capabilities (Levin et al., 1987; Cohen et al., 2000; Teece, 1986, 2006, 2010). Moreover, strategic alliances and other contractual forms of collaboration with outside (often smaller, entrepreneurial) firms are used in firm strategies to complement the (portfolio of) appropriability means (Pisano, 2006; Winter, 2006). Business model also plays a role (Teece, 2010).

We also know that appropriability varies significantly between industry sectors: Biotech firms like AstraZeneca and mobile equipment suppliers like Ericsson are active in patenting; pulp and paper companies like Stora Enso and Domsjö Fabriker, rely on trade secrecy to protect and to profit from their (process) innovations. Firms within the same industry often have similar levels of research and development intensity, and consequently, they also share
similarities in the means they use to appropriate (innovation) returns (Long and Laestadius, 2012).

However, we do not know how and to what extent the appropriability regime and strategies are modified in response to digitalisation, servitisation and open innovation. The existing appropriability theories are lagging behind on this front. It is far from clear – also for industry practitioners – how and where firms can financially benefit from their innovation. This project is designed to fill in that gap, through a study of the Swedish video (computer) games industry. This is an industry in which copyrights are involved in derivative works, and in which trademarks, such as Minecraft, are valuable.

The research questions are therefore:

   a) What do the appropriability strategies – particularly the usage of IPRs – of the Swedish video (computer) games industry (and firms) look like?

   b) How has that usage of IPRs – and the associated appropriability strategies – evolved in response to digitalisation?

In the term “video-games”, the “video” part came from displaying imagery using raster graphics on the CRTs on which the games were played at one point (Wolf, 2001). While video-game is a standard term used by industry practitioners, in academia there are many varieties. For example, Lastowka (2011) uses the term “digital games” when discussing games’ relationship to Web 2.0 computer games. Here, we refer to games that are played on consoles, PCs and mobile handsets, and the expression embraces both (software) code and audio-visual work. It therefore excludes board games and casino games.

The empirical context is discussed in Section 2. In Section 3, we briefly go through the legal nature of the video (computer) games. Section 4 presents theoretical elements pertinent to this study. Section 5 presents the study results and Section 6 concludes this report.
2. Empirical Context

2.1 The Connotation of Digitalisation

What does digitalisation connote here? When did digitalisation begin?

Digitalisation in the video (computer) games industry mainly refers to the following (not causally exclusive) trends:

- a) the rise of digital distribution (via Steam, Apple Store, Google Play, Twitch, OnLive ...);
- b) the rise of mobile gaming and the rise of multiple-platform gaming;
- c) users’ early involvement: user feedback can be incorporated in game development as early as in the alpha phase today, in early access games; users can “modda” (modify) games to completely different degree today, from adding skins to complete overhauls, also in much earlier phases today (the modda culture);
- d) the rise of free-to-play (i.e., freemium);
- e) the rise of independent game-engine developers (earlier game engines are mostly developed in house in, e.g., big sized firms);
- f) The rejuvenation of “indie” (independent developer) culture (because of possibilities for self-publishing via digital platforms).

Consequently, there has been an exponential growth in the digital products coming to market, companied with an even more rapid diffusion of technology/products. Entry barriers (for developers) are getting lower, but new products/games are also easily lost in the crowd. Many innovations never manage to get into the market. The consumer (gamer) is often also the creator (developer), illustrated by the modda (modification) culture in the video (computer) games industry. This challenges not the least the boundary definition of the ownership of innovations (and IPRs);

When did digitalisation begin? Table 1 presents some insights from the interviewees (in the pilot study).
Table 1: When did digitalisation begin?

<table>
<thead>
<tr>
<th>Landmark Year Stated</th>
<th>Who Said So?</th>
<th>Motivations</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>PC game developer</td>
<td>When <em>Steam</em> started to be widely used as the main distribution channel</td>
<td>Steam Spy, however, shows a qualitative jump in release (tripling) in 2014</td>
</tr>
<tr>
<td>2009</td>
<td>Dataspels-branschen (Swedish games industry association)</td>
<td>When <em>Angry Birds</em> was released, marking a departure in mobile games</td>
<td>Hits phenomenon – over three billion downloads of angry birds</td>
</tr>
<tr>
<td>2008</td>
<td>Indie (independent) game developer</td>
<td>When <em>Braid</em> (a software platform by Microsoft) was released and when indie games became “professional”; broadband speed also increased significantly</td>
<td>Along with the general rise of independent game engines (e.g., Unreal; Unity) that in turn facilitated a quick time to market and the development of games for multiple platforms</td>
</tr>
<tr>
<td>2007</td>
<td>Mobile game developer</td>
<td>Smartphones are released (conditioning the take-off of mobile games)</td>
<td>Marking the start of casual and social games (with a wide span of sophistication)</td>
</tr>
<tr>
<td>2010</td>
<td>Console game developer</td>
<td>When distribution goes online (via Steam, Apps Store)</td>
<td></td>
</tr>
</tbody>
</table>

To process the quantitative data (presented in Section 5), 2010 is used as a marker in the following text to mark the beginning of digitalisation.
2.2 The Swedish Profile

Before making a detailed examination on the Swedish video (computer) game industry’s appropriability (including IPRs) strategies, it is important to understand the Swedish position in the global video (computer) games industry. The Swedish video (computer) games industry:

I) has experienced a rapid expansion, a digital expansion: between 2005 and 2017, the compound annual growth rate (CAGR) of revenue was 32%, the numbers of firms – documented in the industry organisation as limited liability firms – increased nearly fivefold, from 71 firms in 2005 to 343 firms in 2017, and 23% of the newly established firms between 2016-2017 are associated with virtual reality, which is considered a leading platform (based on Spelutvecklarindex, 2005-2018). This expansion is even more starkly visible after 2010 when games went digital: the CAGR between 2010-2017 was 43% (in revenue).\(^2\) Does this indicate that digitalisation has helped the Swedish profile?\(^3\)

II) has, historically, always had a functional bias toward (game) development (with game studios). Hardware development (of, e.g., consoles) is virtually non-existent, and only a few actors have been engaged in publishing and distribution. This implies that trademark and copyright are the most relevant IPRs here, not patents (consoles have a closer connection to hardware and consequently to patents).

III) is dominated by small firms that are active in a large international market. The (development) language is English; the consumption of online games is international. International recognition is therefore important. Consequently, the patent and trademark registrations are likely to be international (in, e.g., the European Union Intellectual Property Office [EUIPO]).

Figure 1 shows the growth in revenues.

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\(^2\) Authors’ calculation based on statistical data (Spelutvecklarindex, 2005 -2018)

\(^3\) The Swedish growth rate – in revenue – between 2017-2018 was higher (17%) than the global average (13%) (Spelutvecklarindex, 2018)
Figure 1: Swedish video (computer) games industry/firm turnover change (Unit: MSEK).
Source: based on Dataspelsbranschen data index (i.e., Spelutvecklarindex, 2005-2018)

Figures 2 and 3 show that activities – in the forms of employees involved and established (and vanished) firms – have been ongoing for a long time.

Figure 2: Number of (limited liability) firms in the Swedish video (computer) games industry (2005-2017). Source: based on Dataspelsbranschen data index (i.e., Spelutvecklarindex, 2005-2018)
There is (or was) a known growth paradox among industry practitioners and policy makers. It was argued that Swedish video (computer) games firms could not grow any bigger, in the sense that they are bought by foreign companies when they reach a tipping point – a certain expansion level, illustrated by three well-known acquisitions: Electronic Arts acquired DICE in 2006, Mojang Microsoft acquired Minecraft in 2014 and Activision Blizzard acquired King in 2016. This is not only a problem of growth, but also one of appropriability. The latter refers to the problem that innovators (i.e., game developers) often succumb to the so-called first party, namely the makers of video (computer) games consoles, and/or to middlemen (e.g., publishers, distributors) in the pie sharing of profit in the AAA era. While AAA (Triple-A) games refers to games that were developed with a large budget, the AAA era refers to a consolidation era in which big actors such as the first-party manufacturers and publishers had the upper hand in competition: consoles – dominated by Japanese and American actors – had an oligopoly; Entry barriers were high in an era of locked-in platforms (i.e., the console-dominated era).

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4 A deal of $2.5 billion
5 A deal of $5.9 billion.
Is that still the case today? Has the so-called growth paradox changed since digital distribution began?

Figure 4 indicates that there are some changes, namely that most of the mergers and acquisitions (M&As) in 2017 and 2018 were actually between Swedish actors, plus Swedish firms buying international firms.

Figure 4: M&A in the Swedish video (computer) games industry in 2017 and 2018. Source: authors’ calculation based on the Dataspelsbranschen data index for 2018.

Is this a consequence of the digital growth witnessed in the Swedish video (computer) games industry (Figures 1-3)? If so, does it indicate a strengthened appropriability of Swedish video (computer) game firms? While a general growth regression falls outside the scope of this study, in Sections 4 and 5, we explore the changes that occurred on the appropriability front, with a particular focus on the changes in usage of and attitudes towards IPRs.

3. The Legal Nature of Video (Computer) Games

Bearing in mind that jurisdictions can differ a lot in how – and which parts of – the games and the authorships are protected (e.g., as a computer program and/or an audio-visual work) (WIPO, 2013), in the following, we briefly explore (a) the types of IPRs relevant for
video (computer) games in a general manner and (b) the digital extensions of games, namely new IPR problems raised when video (computer) games started to go digital.

Table 2: Video (computer) games and IPR laws

<table>
<thead>
<tr>
<th>What to protect? (examples)</th>
<th>Copyright</th>
<th>Trade Secret</th>
<th>Trademark</th>
<th>Patent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Code; Music; Story; Characters; Graphics/drawing; Art; Website Design; Imaged geographic locations.</td>
<td>Mailing lists; Pricing info; Industry contacts; In-house development tools; Deal terms.</td>
<td>Firm name; Firm logo; Game title; Game subtitle; Identifiable catch phrases (of the game or firm).</td>
<td>Inventive game play elements; Inventive game design Elements; Technical innovations (including in hardware).</td>
</tr>
</tbody>
</table>

Emerging digital problems  When third-party materials (including user-generated contents) are incorporated in game creation.

Source: adapted from WIPO (2014) and firm-level interviews.

In the following, we elaborate the IPRs that are relevant for video (computer) games. It is important to note that among the formal means of IPRs, *copyright* and *trademark* protection are the most relevant ones:

*Copyright*: Video (computer) games fall into two domains of copyright law: (I) computer programs (software) and (II) audio-visual or cinematographic works (WIPO, 2013; Grosheide et al., 2014). The discussions related to the scope of legal protection of copyright law mainly relate to three areas: (I) idea versus expression, (II) derivative works and (III) fair use (Landes and Posner, 1989). A simplified interpretation (of the doctrines) may be (a) copyright protects the expression of the game ideas (the media such as software code), not the ideas themselves (although the boundary between idea and expression is debatable in legal cases) and (b) derivative works require a license, if the original works (e.g., books, films) have not fallen into the public domain. The derivative works part of copyright law is important in the
game industry as cross-inspirations – from books (novels), films and musical compositions, paintings and games – are very common. That is to say, the expressive works in these creative industries draw heavily on earlier expressive works (e.g., storylines) in adjacent industries. This is illustrated with Shrek – originally a film – being developed as a game later.

Copyright is, however, (often) not subjected to registration in most jurisdictions, and therefore it is not statistically traceable. It is therefore difficult to know the scale and scope of the derivative works (and licenses) involved in Swedish video (computer) game creation.

*Trademark* registration for video (computer) games/computer games traditionally includes company name, company logo, game title and game sub-title, and the trademarks can be graphics as well as words. The digital (infringement) addition to the above-mentioned categories include domain name and characters (e.g., Super Mario). An image of the character can also be registered as a trademark today, but it was earlier mostly protected by copyrights (Greenspan et al., 2014). A game product can therefore be connected to multiple trademarks; namely, it can be identified by the developer’s or distributor’s trademark, and/or by the game’s trademark itself, and/or by the characters’ trademark. The majority of (indie) games, however, only have trademarks on the title and the producer’s name.

It is important to clarify that in innovation studies, the “mark” concepts – *house mark*, *trademark*, *service mark* (Schmoch, 2003) – are sometimes used interchangeably. A good or a service may bear both a *trademark* (or a *service mark*) and a *house mark*.

*House mark* is legal jargon. It is a trademark for identifying the provider of a wide variety – not number – of goods or services, and those goods or services often have their own and separate trademarks (or service marks) (USPTO, 2018).

*Service mark* is a replacement for trademark – in some jurisdictions (e.g., the United States) – when service, rather than product, is concerned. It may be a word, a phrase (even a slogan), a symbol, a design or a combination of these elements. While a house mark is commonly used in the chemical, pharmaceutical, publishing (also on video [computer] games), food (packaging) (e.g., Kellogg’s) and fashion industries, it says very little about the completion of a (new) product development project (e.g., a new game). With a strong house
mark (e.g., *Ubisoft* in game publishing), the proprietor does not have to register a new trademark in anticipation of the launch of a newly developed product. In general, in video (computer) games, a strong house mark (e.g., *Mojang, Paradox Interactive*, as game developer), arguably, is only complementary, as recognition of the new innovation is normally associated with the new title (of the game) released (and/or registered).

*Service mark* (Schmoch, 2003) remains marginally relevant here (in, e.g., game publishers’ marketing campaigns) because (a) there are very few Swedish game publishers, and most of them are also developers and (b) a game is not a service, but a (software + audio-visual) product, as acknowledged by industry practitioners. Although a newly released game/product is often followed with a variety of services – updates/patches, creating community outreach forums, enabling of user-generated contents (modifications) and merchandising (e.g., making angry birds’ toys) – such services are often attached, rather than having a separate service mark (registration).

*Trade secrecy* is important in the (product) development phase: a good idea – not protected by any form of formal IPR – is maintained as far as possible as a secret until launch;

*Patent* is nearly irrelevant for this industry – the Swedish video (computer) games industry – with exceptions in hardware like consoles, virtual reality glasses/headsets and some technical solutions (e.g., game engines). Console games – dominated by American and Japanese actors on the hardware side (Sony PlayStation 4, Nintendo Switch, Xbox One) – are small in the Swedish video (computer) games sector, contributing less than 10% of revenues, compared to 40% each for PC games and mobile games (Swedish Game Developer Index, 2016). Moreover, console games in general are experiencing a rapid decline following a surge of digitalisation (games going online) (Greenspan et al., 2014).

*Design rights* (*mönsterrättsskydd* in Swedish, *design patent* in the United States) protect the appearance (lines, colours, shapes) of a product, influencing, for example, a game’s character’s visuals, or a map in game models. It is a useful IPR here, but it plays only a (perhaps tiny) complementary role.
A typical digital problem arises when third-party materials (including user-generated content in the virtual world) are incorporated (Anderson, 2014; Jungar, 2016). User-generated content\(^6\) (in the virtual world) is often debated: in video (computer) games it can be ideas and audio-visual/coding expressions generated in forums (the user community), as modifications and in e-sport. The sophistication of the contents can span from amateurs’ small changes to professionals’ complete overhauls (many gamers are often developers themselves). Who owns and profits from these user-generated contents?

4. Pertinent Theoretical Dimensions

In the following, we briefly discuss the theoretical dimensions relevant to the examination of the appropriability in general and IPR usage in particular in the (Swedish) video (computer) games industry. While patents have been extensively studied, this report has a particular focus on copyright- and trademark-related discussions (as IPRs here mainly refers to copyright and trademark rights, as discussed in Section 3). A detailed elaboration can be found in the journal articles and working papers related to this project.

4.1 The Economics of IPRs

“Propertising” intellectual goods (e.g., video [computer] games) can generate economic value. Treating IPRs as an aggregated group, it has three major economic functions:

I) protection (from unlawful imitation);
II) signalling (of, e.g., origin, quality, innovation);
III) exchanging (as a proprietary property).

The balance among these functions – as the underlying logic of appropriability – varies across industry sectors, in different operating markets (i.e., different jurisdictions) and, of course, also across time (e.g., historically or in the digital era). These functions are discussed in fields like the economics of information (Stigler, 1961; Arrow, 1996), funnelling down to

\(^6\) Also referred as “participatory fans” (Jenkins, 2006; p1), “peer production” (Benkler, 2006, chap 3.p56) or “amateur creativity” (Lastowka, 2011. P2).
the economics of IPRs (Landes and Posner, 1987), of trademarks (Economides, 1987), of copyright (Landes and Posner, 1989) and of trade secrets (Friedman et al., 1991).

On the signalling front, trademarks, for example as distinctive signs of the origin and quality (of the product), are introduced to remedy a market failure (Ramello, 2006) that is caused by information asymmetry and uncertainty (Akerlof, 1970 and his market for lemons) embedded in any interaction. For example, *Minecraft* trademark(s) – filed in both figurative and word forms – are associated with the firm *Mojang* and certain sophistication levels of a sandbox video (computer) games (in multiple gameplay modes); IPRs also provide protection against imitations (Hurmelinna-Laukkanen and Puumalainen, 2007), and they provide incentives for producers to invest in the quality of their products (Milgrom and Roberts, 1986). The IPRs can also be traded (Graham et al., 2015).

### 4.2 The Knowledge Traits

In short, the nature of the (technological) knowledge (e.g., product/process, tacit/codified, cumulative/discrete) plays a role in appropriability in general (Merges and Nelson, 1990) and in firms’ IPR strategies in particular (Reitzig, 2004). Consequently, technological platforms – console, PC and mobile platforms – play a role;

### 4.3 The Transaction Cost

The received wisdom is that when transaction cost goes down – when the benefits of internalising the property override the transaction costs generated in that internalising process – the importance of (intellectual) property goes up (Demsetz, 1964, 1967), and there is a need to internalise the (intellectual) property.

In the video (computer) games/computer games industry, there is an observed, stylised fact that transaction cost is going down in the digital era: games moving online, physical retailers getting marginalised (CD-ROM/DVD no longer needed) and (big) publishers being squeezed due to the possibility of publishing games via digital platforms (Steam, Apple Store). Is the importance of IPRs (including trademarks) then going up?
4.4 IPRs and Innovation

Patents are often used as an (intermediate) output measure of innovation (Smith, 2006) in, for example Eurostat’ Community Innovation Survey. Copyright has a similar function, but it is difficult to capture it statistically, since it is often not subject to registration. The role of trademarks in appropriability is more ambiguous. A trademark registration can signal the creation of a new product (Mendonca et al., 2004; Block et al., 2015). Compared with a patent, a trademark is a particularly good way to capture innovations in small and medium-sized enterprises (SMEs) (Flikkema et al., 2014, 2015), in service sectors (Schmoch, 2003; Semadeni and Anderson, 2010), in service transfers (from, e.g., universities) (Schmoch, 2014), in low-tech sectors (Mamede et al., 2011) and in later phases of (new) product creation (shortly before launch) (Hipp and Grupp, 2005).

4.5 The Cultural Dimension

There is a cultural dimension that is highly relevant here, and two opposite views are presented. On the legal (reasoning) side, there are two strands of thoughts summarised by Robert Merges (2009, 2011). The first argues that intellectual properties such as copyrights or patents should get out of the way of the things that digital technologies make possible, and implies that the best IPR policy is a minimalist IPR policy (c.f. Benkler, 2006). Merges (2011, 239) labels this line of argument as “digital determinism”. The second dimension goes beyond the technological logic: it addresses the potential for human interaction and the benefit of group-level creativity (c.f. Lessig 2004), and it is labelled “collective creativity” by Merges (2011, 240). In both strands of thought, individual property rights are often seen as part of the problem, rather than part of the solution. The important benefits of openness (via digital media) and the induced collective creativity are acknowledged, if not over-addressed (see Frey, 1997; Throsby, 2001; Scherer, 2012). IPR is argued as culturally alien to creative classes (Bach et al., 2010),

This has relevance particularly to the (indie) culture that is important to understand this industry and consequently to understand its logics of appropriability. This is an industry in which many, at least some, of the firms can and will sacrifice profits for anything else (e.g.,
the freedom to express their ideas in artistic form). The creativities embodied in game development share many similarities with those in the film and music industries and in paintings.

5. The Explanandum

This section is a summary of what we have observed through studies on the quantitative data: the patent (registration) data from the European Patent Office (EPO), the trademark (registration) data from the EUIPO, the firms’ economic performance data extracted from the Swedish Companies Registration Office (Bolagsverket), the processed data on the interlinkages between trademark registration and firms’ turnovers and the survey data on firms’ perceptions of IPRs.

5.1 The EPO Patent Data

We could only make a very crude examination. Lacking an updated concordance between IPR classes and the video (computer) game industrial sector, we used an earlier concordance developed by the OECD (patent) study method development group (Schmoch, 2008; Van Looy et al., 2014; Neuhäusler et al., 2019).

There are three classes – A63F, G06F and G07F – that are relevant in a broad sense. After quickly scanning the Swedish patents registered in these three classes in the EPO data, we decide to drop G06F (too wide) and G07F (apparatus focused), and only to use A63F. We further sorted the A63F patents manually to exclude board games and casino game technologies. Evidently, patent data, closely linked with the hardware needed in game play, does not reflect the Swedish profile (See Figure 5 and Table 3), which is developer- rather than hardware-centred. The search was for the respective country (e.g., SE) in the

application number, publication number, or priority number. That is to say, it included both applications and granted patents.

Figure 5: Number of EPO patents in games (A63F only; in stock) by April 2019. Source: EPO.

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Table 3: EPO data in A63F

<table>
<thead>
<tr>
<th>Country</th>
<th>A63F (by April 2019)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SE</td>
<td>53</td>
</tr>
<tr>
<td>FI</td>
<td>41</td>
</tr>
<tr>
<td>NO</td>
<td>17</td>
</tr>
<tr>
<td>DK</td>
<td>39</td>
</tr>
<tr>
<td>IS</td>
<td>3</td>
</tr>
<tr>
<td>UK</td>
<td>76</td>
</tr>
<tr>
<td>FR</td>
<td>309</td>
</tr>
<tr>
<td>DE</td>
<td>341</td>
</tr>
<tr>
<td>CN</td>
<td>303</td>
</tr>
<tr>
<td>JP</td>
<td>3,833</td>
</tr>
<tr>
<td>US</td>
<td>6,147</td>
</tr>
</tbody>
</table>

Source: based on EPO search.

Among the 53 patents in the A63F class, 24 patents were not relevant (in, e.g., casino technology). The yearly distribution (not the stock) showed no patterns in application (Figure 6); namely, we saw no particular change after digitalisation took off (using 2010 as a proxy for the borderline).

Figure 6: Number of Swedish video (computer) games patents in EPO (in A63F and excluding casino and board games). Source: authors’ calculations based on EPO data.
5.2 EUIPO Trademark Data

The following is based on a working paper produced by this project (submitted also to the journal *Industry and Innovation*).

**Trademark propensity over time**

The timeline summary of the 470 filed trademarks – over the last two decades – is presented in the following three figures. Figures 7 and 8 show the trademark registration – in that particular year – and Figure 9 shows the stock of trademark (filing) to 2016:

![Number of Swedish Video-Games Firms’ Trademarks (Filed) in EUIPO in Each Year](image)

Figure 7: Number of Swedish video (computer) games firms’ EUIPO trademark filings.

Source: authors’ calculations based on searches in the EUIPO database for the firms.
There was a digital take-off of the trademarking filing (Figure 7), and it also took place at the per firm level (Figure 8): the filings picked up the momentum of growth in approximately 2010-2011, when games started to go online. There were only 22 trademark filings (0.3 trademarks/firm) before 2010, and 220 filings after that (approx. 1 trademark/firm excluding King, an outlier). However, this is a survivor list. Thus, only firms that managed to survive to 2016 (with revenues) are listed. This growth is evaluated against the general growth of the number of firms in this industry. The number of firms has quadrupled, with 68 firms documented in 2006 against 281 firms in 2016 (Spelutvecklarindex, 2007-2017). Accordingly, trademark filings have grown faster than the number of firms, with the digital momentum.

It may also be argued that this (trademark) filing growth may not be that impressive, since exit actors’ trademark filings are not captured in this survivor list. For example, there were 68 branch firms documented in 2006 in the archive, while only 12 firms in the survivor list were established in 2006. Presumably, this is not a big problem, not only because the base (number of firms) was very low, but also because of a structural change in the ownership over IPRs in this industry, alongside the rise of digital distribution. In the past, developers often had to give away their IPRs – to (international) publishers – in exchange for financing, marketing, and publishing (resources), which is not necessarily the case today. Publisher ownership over IPRs is less of a default today.
There is an outlier among the 470 filed trademarks of the 281 firms – King (Digital Entertainment) – the developer of Candy Crush Saga (established in 2003, first filing in 2011 and acquired by US-based Activision Blizzard in 2016). This is a hits phenomenon common in the music and film industry. King alone owns 228 trademarks in EUIPO (nearly half the Swedish trademark filings). For this reason, we present graphs – relevant only for filings after 2010 – in two columns, namely “King included” and “King not included”. For the remaining data, the distribution seems to be more reasonable (with linkage to firm size).

Who are the survivors (in an industry with a high rate of entry and exit)? Is there any connection between their survival and their trademark filings? Figure 9 gives a ratio, with the number of firms with trademarks filing today as the numerator and the total number of firms as the denominator, indicating that there is a linkage between firms’ survival and their trademark filings.

Figure 9: Percentage of firms established before 2009 but with a stock of trademark filings today (to 2016). Source: authors’ calculation based on searches of the firms in the EUIPO database.

The quantitative trend – of a digital take-off (Figures 7-9) – is in line with the interview data: Firstly, the threshold for trademark (filing) is low. Copyright – which is not subject to registration – safeguards a game by protecting the software (the code), the artwork and the
sound (and music). It is, however, not easy for small firms to gain a valuable (copyright) license for making derivative works. Derivative works, common in this industry, refers to new works derived from existing (often copyrighted) work (*Shrek*, initially a film, was developed into a game). “In the very early years when we were small, it was extremely difficult to license in good names such as *Star Wars*.... We have tried some, but [we] did not succeed. Only the big ones can do that. For trademark [registration], there is no such limit” (interviewee’s comment). Size also matters in the balance between the usage of trademarks and copyrights. The theoretical implication here is that a trademark is a good indicator for SMEs’ innovations (c.f. Flikkema et al., 2014, 2015), not only because SMEs do not patent (much), but also because SMEs do (can) not copyright license (in-and-out) much.

Secondly, the increased importance of trademarks is essentially for the following summarised reasons (based on interviews):

I) the rise of digital distribution (via, e.g., Steam and the Apps Store), including mobile gaming, has contributed to the recent exponential growth of games, sophisticated as well as simple ones. Game titles are easily lost in the (online) crowd, and trademark registration – of the game titles – is one way to make the games visible;

II) The increasing M&A activity – common in this industry – brings an awareness of the values of the trademark;

III) While infringements on the demand side (e.g., illegal downloads and torrenting in the earlier years) have been mitigated somewhat due to developments in technology (e.g., two-factor authentication, in-game purchases), infringements on the supply side (e.g., cloning of game concept/ideas) do intrude on customer’s associations. Innovators need formal IPRs ownership evidence to inform, for example, platform owners (e.g., Twitch) when they issue a takedown notice, and consequently, they favour trademark registrations.

There are two theoretical elements here, one related to the *signalling function of trademarks* (Section 2.1) and another related to the *emergence of property rights* (Section 2.4):
Firstly, and from the signalling perspective, digitalisation, on the one hand, boosts an exponential growth of (product) offerings, and, on the other hand, it aggravates the information asymmetry (Akerlof, 1979), the uncertainty (Arrow, 1996) and the variety (not necessarily the quality) (Economides, 1987). This is detrimental to consumers, who have to pay search costs (Landes and Posner, 1987), and it detrimental to suppliers, as distinctiveness in a digital crowd is harder to build up and easier to lose (compared to the situation in the past).

Secondly, and from the property rights perspective, digitalisation (by, e.g., avoiding physical retailers) has not only lowered transaction costs and increased the share of revenue going to developers (in appropriability), but also returned much of the IPR control to the hands of developers (from the publishers). (Formal) ownership of IPRs (a trademark) is important not only in attracting investment, a function also discussed by Seethamraju (2003) and Flikkema et al. (2014) independently of the digital context, but also in its exclusivity (e.g., as a formal proof to issue a take-down notice to platform owners).

Trademarks are gaining increasing importance in the Swedish video (computer) games industry. There is an observed (Harold) Demsetzian (1964, 1967) path of IPR development in this industry in the digital era. Game developers are deciding to internalise the value of title recognition, as the gains from internalising the value outweigh the costs of the measures needed to exclude others.

**Trademark distribution over firm sizes**

While firm size, as well as the types of innovation (e.g., product/process), are classic parameters explaining patent propensity (Scherer, 1983; Arundel, 2001) and (implicitly) also trademark propensity (Flikkema et al., 2015), what is the situation in video (computer) games?

Using the six-class definition of the sizes of Swedish video (computer) games/computer game firms, as explained in Section 3, the results are displayed in Table 4 and Figures 10 and 11:
Table 4. Swedish video (computer) games firms’ trademark registration distribution by firm sizes

<table>
<thead>
<tr>
<th>Firm size</th>
<th>1 (&lt; 2 MSEK)</th>
<th>2 (2-10 MSEK)</th>
<th>3 (10-50 MSEK)</th>
<th>4 (50-100 MSEK)</th>
<th>5 (100-500 MSEK)</th>
<th>6 (500+ MSEK) Incl. King</th>
<th>6 (500+ MSEK) Excl. King</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nr. of trademarks</td>
<td>19</td>
<td>13</td>
<td>13</td>
<td>39</td>
<td>76</td>
<td>310</td>
<td>82</td>
</tr>
<tr>
<td>Trademarks/firm</td>
<td>0.11</td>
<td>0.24</td>
<td>0.48</td>
<td>3.55</td>
<td>8.44</td>
<td>51.67</td>
<td>16.4</td>
</tr>
<tr>
<td>Nr. of firms</td>
<td>173</td>
<td>56</td>
<td>27</td>
<td>11</td>
<td>9</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Nr. of firms with filings</td>
<td>16</td>
<td>7</td>
<td>10</td>
<td>9</td>
<td>6</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Percentage of firms with filings</td>
<td>9%</td>
<td>13%</td>
<td>37%</td>
<td>82%</td>
<td>67%</td>
<td>83%</td>
<td>80%</td>
</tr>
</tbody>
</table>

Figure 10: Swedish video (computer) games firms’ trademark registration distribution by firm size. Source: authors’ calculation based on data from Bolagsverket and searches in the EUIPO database for the firms.
Figure 11: Swedish video (computer) games/computer firms’ trademark filing propensity by size class. Source: authors’ calculation based on data from Bolagsverket and searches in the EUIPO database for the firms.

Linking back to the discussion in Section 4 on the tension between collective creativity and the benefits of internalising the IPRs, we may observe that a Demsetzian (1964) wake up – an internalisation of IPRs – occurs surprisingly late: it starts to pick up as late as Class 3, and bigger firms tend to have more trademark registrations.

This result confirms the conventional wisdom on the positive correlation between firm size and IPR (patent) propensity (Scherer, 1983): it holds in the field of trademarks too. Triangulating with the interview data, two main explanations – one related to firms’ resources and another related to firm cultures – are offered: while growing, firms start to introduce/strengthen the business function, rather than only operating with a few software engineers and graphic designers. Moreover, there is also a cultural/ideological position taken, particularly by micro firms: the founders, often with a technological background, choose to ignore the infringers (of ideas). In other words, while there is a general need in the digital era to develop from a hobby-based (and indie-dominated) culture to more business-
minded operations, varieties of that digital transformation exist, and a Demsetzian wake up has a close linkage with firms’ sizes: size matters in trademarking, as it does in patenting.

**Trademark distribution across technological platforms**

It is argued that the types of innovation (product/process, cumulative/discrete) also play a role in IPR propensity (Merges and Nelson, 1990). What does that mean in the Swedish video (computer) games industry? We examine the trademark registration distribution across technological platforms (Figures 12 and 13):

![Swedish Video-Games Trademark Filing Distribution Across Technological Platforms (Excl. King)](image)

Figure 12: Swedish video (computer) games trademark filing distribution across technological platforms (excluding King). Sources: authors’ calculation based on searches in the EUIPO database for the firms and data from Dataspelsbranschen.
Figure 13: Swedish video (computer) games trademark filings per firm across technological platforms (excluding King). Sources: authors’ calculation based on searches in the EUIPO database for the firms and data from Dataspelsbranschen.

Evidently, there are no significant differences across PC-based, mobile-based and other platforms (including publishers and consulting) in trademark registration propensity, but console-based game developers are less active in trademark registration.

To clarify, the platform here refers to the primary platform, and it is based on the industry association’s categorisation. We are aware of the fact that cross-play over multiple platforms is becoming increasingly common today, namely that many of the Swedish video (computer) games are operated on more than one technological platform (for example Minecraft has both PC and mobile versions). As we learned from the interviews, the rise of the independent (rather than in-house) game engines (e.g., Unity, Unreal) – in an era of online gaming – has essentially enabled this development by providing tools and helping to shorten time to market. To simplify and to examine whether platform plays a role in trademarking, we allocate only the primary platform to the firms. That is to say, in our data, each firm is only identified with its primary/initial technological platform, so the data is exclusive at the platform level. Moreover, the others category includes not only under-suppliers, such as consultant firms, but also tool developers and, most importantly, the publishers (who are few). As discussed earlier, THQ Nordic, a publisher also discussed in Section 4.2, while primarily affecting trademark filings prior to 2010 (by owning developers’
IPRs), still holds 5% of the total filings after that period, which in turn, pushes up the filings in the others category.

Why do the differences of the trademark filing across technological platforms exist? Triangulating the interview data, there are big differences:

I) over the scale and the cost of the game development across technological platforms. “[A] PC-based game project can involve 1000 people and [it] takes 36 months of time to market” (interviewee’s comment). So do many console games. While the complexity of a mobile game design and the game features can vary a lot, the time to market is usually significantly shorter, possibly within one month, with an involvement of 1-2 (experienced) developers and graphic designers; consequently, there is an exponential growth of mobile games and of developers. A new online (mobile) game is rarely highly visible. The signalling function of a trademark, as discussed in Section 2.1, thus becomes particularly important;

II) in how the games (and the parts) are connected: many PC games (e.g., strategy games), after the first release, are complemented with various expansion packages (i.e., downloadable contents), while (small) mobile games are often stand alone, and they are released frequently in a separate manner. Consequently, and for mobile games, there is not such a stable user base. Each new game has to be communicated/signalled – via, for example, trademark (filing) – separately.

To summarise, the trademarks in the mobile game sub-sector are discretely (rather than cumulatively) connected. The Merges and Nelson (1990) taxonomy on cumulative versus discrete patents also applies to trademark data.

5.3 The Linkage to Growth

*Trademarks in explaining appropriability*

This is an industry with a rapid expansion, both in the number of firms and in its total turnovers. How is trademark registration linked with firms’ turnover? We run a correlation test – between firms’ trademark registration and firms’ turnover in 2016 – and we reach the following results (Tables 5 and 6; inclu./exclu. King):
Table 5. Correlation between trademark registration and 2016 turnover by size

<table>
<thead>
<tr>
<th>By group</th>
<th>All (branch level)</th>
<th>Size = 1 (&lt; 2 MSEK)</th>
<th>Size = 2 (2-10 MSEK)</th>
<th>Size = 3 (10-50 MSEK)</th>
<th>Size = 4 (50-100 MSEK)</th>
<th>Size = 5 (100-500 MSEK)</th>
<th>Size = 6 (500+ MSEK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of firms</td>
<td>282</td>
<td>173</td>
<td>56</td>
<td>27</td>
<td>11</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>Corr. (no King)</td>
<td>0.5775 0.3964</td>
<td>0.0662 0.0584</td>
<td>0.1527 0.5872</td>
<td>0.5913</td>
<td>0.3009</td>
<td>-0.1998</td>
<td></td>
</tr>
<tr>
<td>Number of firms with filings (no King)</td>
<td>53</td>
<td>16</td>
<td>7</td>
<td>10</td>
<td>9</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Corr. (only on firms with filings) No King</td>
<td>0.5719 0.3630</td>
<td>0.0381 -0.4479</td>
<td>0.0320</td>
<td>0.4590</td>
<td>0.987</td>
<td>0.2789 -0.3058</td>
<td></td>
</tr>
<tr>
<td>Sources: authors’ calculation based on searches in the EUIPO database for the firms and data from Dataspelsbranschen and Bolagsverket.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 6. Correlation between trademark registration and 2016 turnover by time of establishment and by technological platform

<table>
<thead>
<tr>
<th>By group</th>
<th>≤ 2009</th>
<th>≥ 2010</th>
<th>Console</th>
<th>PC</th>
<th>Mobile</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corr. (no King)</td>
<td>0.8774 0.5029 (a survivor bias?)</td>
<td>0.5184 -0.1621</td>
<td>0.5259 0.995</td>
<td>0.9073</td>
<td>0.9522</td>
<td></td>
</tr>
<tr>
<td>Nr. of firms</td>
<td>70</td>
<td>212</td>
<td>11</td>
<td>95</td>
<td>104</td>
<td>70</td>
</tr>
<tr>
<td>Corr. (only on those with trademarks) (no King)</td>
<td>0.9722</td>
<td>0.4925 N/A (only two observations)</td>
<td>0.4679 0.9952</td>
<td>0.9951</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nr. of firms with trademarks filing</td>
<td>20</td>
<td>33</td>
<td>2</td>
<td>20</td>
<td>18</td>
<td>13</td>
</tr>
<tr>
<td>Percentage of firms with filing</td>
<td>29%</td>
<td>16%</td>
<td>18%</td>
<td>21%</td>
<td>17%</td>
<td>18%</td>
</tr>
<tr>
<td>Source: authors’ calculation based on searches in the EUIPO database for the firms and data from Dataspelsbranschen and Bolagsverket.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This is a correlation test only, between firms’ trademark filings and turn-overs (Tables 2 and 3): trademarks appear to be a viable indicator explaining appropriability at the branch level (0.5775), in Size Class 4 (0.5872) and Size 5 (0.5913), and for mobile-based game developers (0.9522) (with a small sample size in Classes 4-6).
On the size front, the importance of (filing) trademarks starts to be visible in Class 3, and it remains high within Classes 4 and 5, but it declines in Class 6. This means when firms grow to a certain size (Class 6; 500+ MSEK), the extent to which that trademark registration explains appropriability becomes limited. Other mechanisms come into play again (not necessarily the same as those in Classes 1 and 2 though).

What are the other mechanisms? Triangulating the interview data, three factors – offsetting the importance of the protection function of a trademark – may be relevant. The first two are related to the nature of the (technological) knowledge dimension and the third is related to the digital culture dimension discussed in Section 2.4: (I) unlike film and music products, where finished products are sold, in game-play there is a high level of interactivity involved. That allows certain (technical) monitors after the release of the products; (II) the business models are therefore also different. According to a PC-game developer, “We make money mostly from the expansions [downloadable supplements to an existing game]”. The same logic applies to mobile games: in-game-purchasing – of small items (weapons, clothes) – is one of the most common monetisation modes following an initial Freemium (free-to-play) game. Finished products (without supplements) exist too in games (e.g., adventures), but techniques like two-factor authentication, commonly also used in software upgrading, are introduced as a remedy. Summing up, there is already a Teeceian (1986) (relatively) tight appropriability regime in the (online) video (computer) games industry and firms, from a technical standpoint. The legal standpoint of the appropriability regime (e.g., filing trademarks to protect) is then of secondary importance; (III) culturally, both collective creativity and digital determinism (a minimalist IPR policy is the best IPR policy [Benkler 2006]; see Section 2.4) are present and starkly visible in start-ups, as one interviewee formulated: “EUIPO/PRV behövs inte … [the patent registration office is not needed]”. There is, however, no explanation identifiable – from the interviews – for the declining importance of trademarks in Class 6. Presumably, the house mark plays a role there.

On the platform front, the correlation between trademark filings and turnovers is particularly strong in mobile-based games (0.9522), and less so in PC (and presumably console) games (0.5259). Why is the technological platform playing a role? Triangulating the interview data, the differences in the nature of the (technological) knowledge plays a role
again: in mobile games, where development costs are relatively small, the individual product is more important than the link to previous products made by the same developer. It is then, for mobile games, practically necessary to register a new trademark (e.g., a game title) towards the end of the product’s development period, rather than relying on the house mark (as in console and partially in PC games). The well-known distinction between discrete (e.g., chemicals) and cumulative (e.g., semi-conductors) patents across industries (Merges and Nelson, 1990) may apply in trademarks too. Mobile games (and game titles) are more discretely connected than done cumulatively (compared to console and PC games). The more fragmented the (sub-)industry products are and the less known the developer is, the better signalling effect a trademark (filing) can have. Expressly, the industry heterogeneity (e.g., Flikkema et al., 2015) has also within-industry and cross-platform variations. Unlike our (technological) products and knowledge focus, another kind of fragmentation, namely a low-market concentration, is discussed by De Vries et al. (2017), confirming this close linkage with trademarking.

5.4 The Survey Data: Attitudinal Dimensions

In the following, we briefly present the results of the survey data (only some of the results are presented).

Copyright, trademark and trade secrets are the most important IPRs for Swedish video (computer) games companies when considering economic value (a mean value higher than 3). Patent and design rights are consistently considered less important (Figure 14).
There is no significant within-variables variation regarding main platform. The findings do, however, indicate a relationship between size of company (in terms of yearly turnover) and subjective value of IPRs. Bigger companies generally tend to place higher economic value on IPRs than smaller companies (Figure 15).

Figure 15: Total mean of economic value of IPR, by turnover size. Source: authors.

When looking at the companies by size, it also becomes apparent that patent and design rights are pretty much irrelevant for all but the biggest companies. The importance of trademark increases linearly with size. Copyright is important for smaller companies. More of the companies in the 2-10 mil group have at some point out-licensed to another
company. This could, however, be due to the overrepresentation of others in this size group, as we see that others are more prone to out-licensing as a business model (Table 7).

Table 7

<table>
<thead>
<tr>
<th>Size</th>
<th>Have out licenced</th>
<th>Have not out licenced</th>
<th>Total n</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 2 mil</td>
<td>8</td>
<td>34</td>
<td>42</td>
<td>19%</td>
</tr>
<tr>
<td>2-10 mil</td>
<td>5</td>
<td>7</td>
<td>12</td>
<td>42%</td>
</tr>
<tr>
<td>10-50 mil</td>
<td>2</td>
<td>5</td>
<td>7</td>
<td>29%</td>
</tr>
<tr>
<td>50-100 mil</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>50%</td>
</tr>
<tr>
<td>&gt; 100 mil</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>50%</td>
</tr>
</tbody>
</table>

Game developers are not concerned for the safety of their IPRs. As seen in Figure 16, respondents generally feel that the threat to their IPRs is low. On a scale from 1-5 (5 being the highest threat level) the thing that feels most threatening is clone games, with an average value of 2.74. This supports the concept of IPRs as a marketing/signalling tool. IPRs in video (computer) games are not used mainly as a way of protecting IPRs, but for signalling the innovations (Figures 16-18).

Figure 16: Mean reported threat level on a scale of 1-5, with 1 being the lowest perceived threat and 5 being the highest.
Figure 17: The reported likelihood of taking different actions against IPR infringers, on a scale of 1-5 (5 being most likely).

Figure 11: Reported likelihood of taking different actions against IPR infringers on a scale of 1-5 (5 being most likely) by turnover size. Bigger companies are generally more likely to take action.
The changing usage of complementary assets

The question we asked was: “What is the importance of other means for determining competitive outcome in the market (on a scale from 1 to 5: 1 being not important and 5 very important)”. There were six categories, but since there are similarities between some of them, we concentrated on three categories; complementary sales, complementary services and enabling user-generated content:

![Graph showing total mean importance of other business aspects (complements) (n = 71)](null)

Figure 12: Reported value for market success of different assets, industry mean.

On the balance between using IPRs and using complementary assets

Even though the digitalisation of the industry has had an impact on both the value of IPRs and the value of complementary assets, there is still a balance, based on the results of this study. Most companies (46%) answer that they are equally important (see Figure 20). However, when looking at the balance in Figure 21, there are more companies saying that complementary assets are more important than the other way around.
6. The Explanans

This section is primarily based on qualitative data, namely firm-level interview data.\textsuperscript{11} It is aimed at understanding the cogs and wheels of the changes occurring in technological knowledge and changes throughout the value chains, after digital distribution. It is also aimed, to provide (at least some) qualitative explanations on the phenomena observed in section 5.

6.1 High Interactivities and Boundaries of Innovation

A high level of interactivity, induced by digital distribution and embedded in both supply and consumption, is observed (see Figures 21 and 22 on the chain of interactions). The term interactivity here differs to its traditional connotation – in game studies – which refers to gamers’ (psychologically immersive) experiences, contrary to what is experienced in the consumption of other media, such as movies, music and newspapers (Garite, 2003).\textsuperscript{12} This is a demand side of the view on interactivity. Interactivity in this study is primarily changes that occur on the supply side (Figures 21 and 22).

\textsuperscript{11} Section 6.2 is an exception. It is a triangulation of quantitative and qualitative data.

\textsuperscript{12} Gamers are given a certain degree of freedom through their ability to affect their experience directly.
Figure 21: Digitally induced complementary sales and services after initial game release I (on platforms).

Figure 21 (on platforms) and Figure 22 (on free-of-charge versus monetised services) illustrate the chains of activities and occasions through which today’s (game) suppliers can interact, in a direct way, with gamers, after the first release of the games. The new digital offerings – the ones developed after digital distribution taking place - are highlighted with Bolt in Figure 21, and in grey in Figure 22.
Figures 21 and 22 illustrate (new) myriads of activities that today’s game supply can affect, contrary to the linear model of earlier game products (from alpha to beta to released version). In other words, in the digital era, there is no single product in game supply (except some adventure games). A game is broken down into many rounds or generations of (sub-) games on the one hand, and it is complemented with a myriad of network-based services on the other hand.

What does this high level of interactivity mean? And what does this change imply for the logics of appropriability in general and the importance of IPRs in particular?

Firstly, the supply side meets and interact directly with the demand side, meaning that products and services are becoming more open and transparent to consumers. Gamers are
no longer just interacting with other gamers and games, as the term interactivity in game studies originally connoted, but also interacting with game developers (and third parties), and, most importantly, in a networked manner. In many games, these interactions are enabled by supplier-controlled servers, downplaying the transaction hazards. The appropriability regime, consequently, is becoming tight for suppliers, as the players not only have more knowledge about the products, but are also more engaged and even locked in to a certain extent, as their feedback is integrated into the games. Imitation/copying is difficult, and IPRs as a means of protection are consequently not needed to the same extent.

Secondly, a game is broken down into rounds of offerings and services, challenging not least the very definition of the boundaries of innovations and of what is termed as core novelty in appropriability. Today’s games are to a lesser extent an experience with a clear beginning and an end, but they are consumed over time. Digitalisation has fundamentally changed how games are supplied and how games are consumed. The tight updates, expansions and networked services – displayed in Figures 21 and 22 – on the one hand enable protections on the technological front (e.g., two-stage authentication via mobile), and on the other hand, they make imitation/copying difficult, because it is demanding and economically non-viable to keep track of the tight (big and small) updates. The importance of IPRs is therefore also truncated.

Moreover, this changes the very nature of the technological knowledge in game products (see Section 4.2). Games (Game A to Game B) are not only discretely connected (in, e.g., some adventure games), but also cumulatively connected (e.g., Europa Universalis III and IV), if Merges and Nelson’s (1990) dichotomy “discrete versus cumulative technologies” (in distinguishing knowledge traits) is used. Game knowledge is broken down into bits and bytes, and the core novelty in appropriability is dynamically defined. It is not ex ante clear which bits or bytes are the core. The Schumpeterian temporary monopoly – often appropriated by means like market lead – is therefore also questioned, particularly in the case of freemium. Complementary assets (Teece, 1986) are getting more important today, but in very different forms.
6.2 Industrial Dynamics Observed

What has occurred in the Swedish video (computer) games industry on the technological development front (which is pertinent to the use of appropriability strategies), and on the actor front?

Technologically, the video games industry has experienced bursts of innovations, not least at the enabling platform front. The improvements in platform technologies used for developing computer games over time are illustrated in Figure 23:

![Figure 23: Waves of innovation: Performance of established and invading technologies in the computer games industry. Source: adapted from firm-level interviews; in the spirit of Utterback (1996), p. 160: “Mastering the Dynamics of Innovation”.](image)

A detailed presentation on this may be found in the ISPIM conference paper included in this project (see reference list Long, 2018.)
On the actor front, Figure 24 indicates that the number of firms has tripled since 2007. By breaking down the survivors list and comparing it to the archived firms, we can see that this is an industry sector that has not only experienced a growth, but also a reshuffle of the actors: there is an entry and exit that comes along with digitalisation (Figures 24 and 25).

Figure 24: The entry and exit of Swedish computer game firms. Source: authors’ calculation based on Spelutvecklareindex.

Figure 25: Swedish Computer Game industry: Number of newly established firms by size (measured by 2016 turnover). Source: authors’ calculation based on Spelutvecklareindex and data from Bolagsverket
Who are the actors that emerge? Figures 26 and 27 indicate the rise of mobile platform-based development in the Swedish industry, in terms of both number of firms and turnover contributions (since 2007):

Figure 26: Swedish video game industry: Number of newly established firms across technological platforms. Source: authors’ calculation based on Spelutvecklareindex.

Figure 27: Swedish video game industry: Turnover contributions from three technological platforms. Source: authors’ calculation based on Spelutvecklareindex.
Mobile gaming was a technologically inferior solution from the outset. It was a low-end platform, an underdog, so to speak, interesting only to casual players. In this way, the rise of mobile gaming fits in the classic Christensen (1997) description of the disruptive innovation in which the disruptors are from the outside and from below the radar. Digitalisation offers opportunities not least to small (indie) developers and mobile platform-based developers.

From the industry dynamics perspective, this is an industry that is re-entering a fluid phase of innovation. There is a rapid growth of products and (small) firms (e.g., the rejuvenation of indie culture), as well as a high proportion of entries and exits. There seems to be an escape from the consolidation of the console (platform) and the AAA standard era (at least in the Swedish case).

As to the appropriability, this implies that innovations that have already managed to reach the market (e.g., Candy Crush) should enjoy a Schumpeterian (temporary) monopoly, and that the digital (network) economy has not eroded (much of) that kind of rent. This seems to explain the growth linkage of Section 5.3.

6.3 Value Chain to Value Web

Who are the actors throughout the value chain? Is there any digital change occurring at the value chain front? Figures 28 and 29 illustrate:

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14 For details, see the ISPIM conference paper.
To elaborate, three changes can be observed in the value chain:

Firstly, there is a transition from a value chain to a value web: the earlier vertically independent chain of actors (Figure 28) is now connected in an intertwined way, and it is organised around the digital platforms (Figure 29). Variations exist; for example, there are 50-70 platforms for PC-based games, and for mobile-based games, the Apple Apps Store and Google Play are the dominant platforms.
Secondly, there is also a structural change in the chain-to-web actors: (a) one actor (the physical retailer) has nearly disappeared: physical distribution channels are marginalised, if not disappearing; (b) the size (impact) of each type of actor is changing: one particular type of actor – the consumer – is gaining greater and greater importance in development (innovation), and in changing the general pattern of consumption (community-based; the installed user base plays a role in appropriability).

Thirdly, there is a functional change in the chain-to-web actors: for example, today’s publisher is less important in financing (due to the possibilities of crowdfunding in, e.g., early access games), but more important in marketing, than in the situation before digital distribution took place.

Figure 30: The video games publishers’ three functions and the digital changes.

What does this change in the value chains imply for appropriability in general and the usage of IPRs in particular? Some of the impact derived from the direct linkage between supply and demand has already been discussed in Section 6.1, namely the innovators’ appropriability regime has been tightened in the digital era.

Two concrete consequences may also be elaborated: (I) the publishers’ control over IPRs is no longer a default. Game developers now have chance of self-publishing through digital stores like Steam, the Apple Store and YouTube; (II) developers’ own control over IPRs also signals innovation, an important factor to enable games to stand out in the digital crowd. This explains the rise of the importance of IPRs (perception) in general (see Section 5.4), and the importance of trademark (registration) in particular (see Section 5.2).
Theoretically, the changes in the value chain question the very definition of the complementary assets and of who has access to them. In other words, complementary assets are to be re-interpreted together with a value-chain change analysis.

7. The Appropriability Pie in the Digital Era

What has changed, in the digital era, in the appropriability pie? Using the Teece (1986) approximation of the appropriability pie, which discusses why innovators often fail to capture a significant proportion of rents, a crude statement related to the digital change is expressed in Figure 31:15

![Figure 31: The digital extension of the Teece appropriability model in the video (computer) games industry.](image)

Figure 31 – the digital evolution of the appropriability pie – is an approximation. To elaborate, it seems that digitalisation has tightened the appropriability regime; namely, it is the innovators and the customers who have benefited most from the digital transformation,

15 A detailed elaboration can be found in the ISPIM 2018 conference paper (Long 2018) and a book chapter (Long 2019) included in this project (see reference list).
with an increasing share in the appropriability pie. Comparably, the appropriability room for the imitators and the middlemen has shrunk. This digital change (Figure 31) can be explained by the tightened supply-demand connection, the increased interactivities along a chain of sub-innovations – complementary sales and services – in which the innovators can exert controls in the digital era. In short, a high level of interactivity – embedded in today’s game’ supply and consumption – brings much certainty to suppliers, and less room for imitators. A detailed elaboration can be found in Sections 6.1 and 6.3. Figure 31 – the digital evolution of the appropriability pie – is a crude statement, based on studies of the Swedish video (computer) industry only. Further studies are needed if a broader generalisation is to be made.

This result is contrary to the assumption we had at the onset of this project that it is easier for imitators to capture rents in a digitalised world when openness becomes the norm, technologies get diffused rapidly and an exponential growth of information in society potentially causes the learning curve (of the imitators) to shallow.

8. Conclusion

Through a study of an industry sector – the Swedish video (computer) games industry – where copyrights are important in derivative works and trademarks function as an important innovation indicator, this study contributes to a meso (industry)-level understanding of the changing complexity of the general appropriability conditions in the digital era on the one hand, and the role of IPRs in that (appropriability) on the other hand.

Combining analyses on EPO patent data, EUIPO trademark data, firm-level interviews and survey data, we find, empirically, that (I) there is, surprisingly, a clear digital take-off of IPRs’ propensity, namely firms tend to be more active in registering trademarks and valuing their copyrights; (II) firm size matters: bigger firms are generally more active in filing trademarks than their smaller counterparts are (not a linear linkage though); (III) technological platform also matters: trademark filing appears important in explaining the appropriability in mobile-based games, and less so in PC-and-console-based games.
Analytically, we identify three counterbalancing forces in effect here: (I) the increased interactivity – embedded in game supply and consumption – provides an ironclad protection of the innovation from a technical standpoint, downplaying the importance of IPRs (when legal protection is concerned); (II) culturally, the openness and the induced collective creativities are highly valued in this industry (i.e., profits can be scarified), which downplays the importance of IPRs; (III) the digital offering of a single product (a game) has been broken down into many parts, namely there are many rounds of offerings (of a game) (see Figures 21 and 22). Firms capture rents mostly from so-called expansions (later-released downloadable contents), in-game-purchases and/or in-game advertising and services (communities, patches), rather than from market leads (freemium/discount instead) and contractual royalties. Theoretically this either fits into the description of the Hirshleifer case (Hirshleifer, 1971), as phrased by Winter (2006, p. 1105), that “the innovator can appropriate gains by a timely move to take a long position in the complementary assets”, or it questions the very definition of the boundaries of innovation. For the latter, the supporting evidence is an observed shifting of positions between the so-called product and its complements, in an era where freemium (free-to-play) dominates. In any case, this digital breakdown of a product (game) offering has tightened the supply-demand connection, and it consequently downplays the importance of IPRs.

There is a paradox here: on the one hand IPRs – particularly trademarks – are gaining increasing importance in the Swedish video-game industry. There is a development similar to Harold Demsetz’s (1964, 1967) cattle raiser (to herd, to privatise) story. On the other hand, the digital traits – digitally induced high levels of interactivities (between supply and demand) and the digital division of a product (in provisions) – provide strong protections (to the innovation) from a technical standpoint, which offsets the importance of IPRs.

Then what are IPRs for, in a technologically tight appropriability regime? This study further identifies that the increase of the importance of IPRs is not derived from IPRs’ protection function, but from their signalling function. In the digital era, new products easily disappear in the digital crowd, and IPRs can act as an important remedy by signalling the origin and quality of products as well as new innovations.
This study provides a snapshot of the digital complexity pertinent to the issue of appropriability. While most of the digital changes presented in this study are ripe for theorisation, in this report, we have only briefly summarised the empirical highlights we have identified.

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