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TIMES OF CHANGE IN THE DEMOSCENE
A Creative Community and Its Relationship with Technology

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Abstract

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Digital Culture

REUNANEN, MARKKU: Times of Change in the Demoscene: A Creative Community and Its Relationship with Technology

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The demoscene is a form of digital culture that emerged in the mid-1980s after home computers started becoming commonplace. Throughout its approximately thirty years of existence it has changed in a number of ways, due to both external and internal factors. The most evident external driver has been the considerable technological development of the period, which has forced the community to react in its own particular ways.

A modest body of research on the demoscene already exists, even though several topics still remain unstudied. In this thesis I approach the scene from three different angles: community, artefacts and relationship with technology. The most important frames of reference are subcultural studies, history of computing, game studies, domestication of technology and software studies. The research material is equally diverse, consisting of texts, creative works and interviews.

The study paints an uncommon picture of the scene as a meritocracy that actively and even aggressively debates technological change. Technical prowess does not imply embracing new gadgets uncritically, in particular because their perceived ease is in dire contrast with the shared ethic that emphasises individuals' skill. Practices, interests and relationships to other communities – gamers in particular – are still subject to constant change and, therefore, we should not consider the demoscene as a frozen monoculture, but rather as a group of phenomena that are linked to different periods of time, locations and computing platforms.

Keywords: demoscene, computer demos, digital culture, computer hobby, domestication, home computers

Tiivistelmä

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REUNANEN, MARKKU: Times of Change in the Demoscene: A Creative Community and Its Relationship with Technology (Muutoksen aikoja demoskenessä: luova yhteisö ja sen teknologiasuhde)

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Demoskene on 1980-luvun puolivälissä kotitietokoneiden yleistymisen myötä syntynyt digitaalisen kulttuurin muoto. Noin kolmenkymmenen vuoden olemassaolonsa aikana se on muuttunut monin tavoin, johtuen sekä ulkoisista että sisäsyntyisistä tekijöistä. Ilmeisin ulkoinen muutosvoima on ajanjakson huomattava tietotekninen kehitys, johon yhteisö on sopeutunut omissa puitteissaan.

Demoskenestä on jo olemassa jonkin verran akateemista tutkimusta, vaikka lukuisia aiheita onkin yhä täysin kartoittamatta. Tässä työssä lähestyn skeneä kolmesta eri näkökulmasta: yhteisön, artefaktien sekä teknologiasuhteen suunnasta. Tärkeimpiä viitekehyksiä ovat alakulttuuritutkimus, tietotekniikan historia, pelitutkimus, teknologian kotoutuminen sekä uusimpana tulokkaana ohjelmistotutkimus. Tutkimusmateriaali on samoin monimuotoista, koostuen teksteistä, luovista töistä sekä haastatteluista.

Tutkimuksen myötä hahmottuu poikkeuksellinen kuva skenestä meritokraattisena yhteisönä, joka ottaa aktiivisesti ja usein kärkkäästi kantaa teknologiseen muutokseen. Tekninen kyvykkyys ei johda uutuuksien kritiikittömään omaksumiseen, etenkin kun uusien laitteiden mukanaan tuoma näennäinen helppous sotii yhteisössä vallitsevaa yksilön osaamista korostavaa etiikkaa vastaan. Käytännöt, mielenkiinnon kohteet ja suhtautuminen muihin yhteisöihin – etenkin pelaajiin – ovat edelleen jatkuvassa muutoksessa, eikä demoskeneä siten voikaan tarkastella jähmettyneenä yhtenäiskulttuurina, vaan pikemminkin ryhmänä eri ajanjaksoihin, paikkoihin ja laitteisiin kytkeytyneitä ilmiöitä.

Avainsanat: demoskene, tietokonedemot, digitaalinen kulttuuri, tietokoneharrastus, kotoutuminen, kotitietokoneet

Foreword

Getting to know the demoscene around 1990 shaped my later life in a number of significant ways: my friendships, studies and career path have all been marked – even defined – by the community that I have loved and occasionally hated throughout almost thirty years. This thesis is one of the milestones on that ongoing journey which I'm hoping to continue until the last power failure.

Needless to say, I would not have come this far without the help provided by several people. To avoid finding numerous synonyms for thanks, I hereby extend my gratitude to:

<div align="right">

Markku Reunanen
Helsinki, January 17, 2017

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Chapter 1

Introduction

Like many 1980s kids around ten years of age, I used to play plenty of games on my best friend's Commodore 64. He knew a slightly older boy, who would copy us the latest hits on tapes, so we got to know the classics of the time: *Commando*, *Bubble Bobble*, *Pitstop*, *Rambo,* and many others. We never quite knew where the games originally came from, but copying them was a normal thing to do, and never raised any further questions. Some of the games contained curious-looking screens with moving text and logos, such as TRIAD, but we skipped them as quickly as possible, because we just wanted to play. What is more, some cassettes contained similar screens without any game at all – how useless was that? It took five more years to realise that I had been viewing early crack intros and demos without even knowing what to call them.

The terms *demo* and *scene* have various meanings even when dealing with digital culture alone, so it is necessary to define them before proceeding any further. For some, a "demo" brings to mind preview versions of games or other software, whereas for others a demo might be something aspiring musicians send to record companies (Tasajärvi 2004, 16; Nitsche 2016). Here a demo refers to demonstrations, audio-visual computer programs, which, in general, tend to be non-interactive and showcase their creators' skills. Among their closest relatives are so-called *dealer demos*, used for improving computer sales at stores (Wasiak 2013), software pirates' *crack screens* (Publication 5), *display hacks* (Raymond 2003) and game *attract modes*, which lure players at arcade halls (cf. Reunanen 2010, 58).

The essence of scenes will receive further attention in Chapter 4, but to define the demoscene briefly here, it could be described as the international community of enthusi-

asts whose activities, such as creative endeavours, parties, and online discussions, revolve around computer demos. For sceners themselves, it is obvious what community is in question, so they tend to use the to-the-point form *the scene*. A comprehensive glossary of demoscene slang can be found in my licentiate thesis (Reunanen 2010, vii–x).

Demoscene-related studies have slowly started leaving their initial stages, which were characterised by descriptive introductions to the community and its artefacts. Such overviews have not completely disappeared yet, but there is already a notable trend towards increasingly in-depth analyses representing different fields of study, ranging from art history to software science (see Chapter 3). The big picture is far from complete: several aspects of the scene have gone unnoticed so far. To name a few blind spots, multiple kinds of artefacts, links to other communities, and the actual process of creating demos remain largely unstudied.

The motivation behind my thesis project is to fill some of those gaps, providing a new critical perspective to a still relatively little-known branch of digital culture. When considering the current plurality of what is out there, the demoscene offers a rare if not completely unique possibility to observe the development of a community over the course of multiple decades. Instead of providing a snapshot of an emerging phenomenon, we have the luxury of putting things into a historical context, exploring the dead ends and discovering the important turning points.

1.1   Research Questions and Scope

The core theme present throughout the study is change: *What kind of changes has the demoscene gone through from the mid-1980s to the 2010s?* It is not realistic to try and address every possible aspect of the topic, so I have narrowed the discussion down to the following three subquestions:

1. How did the demoscene come to be? (Publication 3)

2. How do different types of productions emerge and evolve? (Publications 2 and 5)

3. How has technological change affected the scene? (Publications 1 and 4 in particular)

Some further framing needs to be done, as the history of the scene spans three decades, tens of countries and multiple platforms. The focus here tends to be on the mainstream: the community that emerged and bloomed in Western and Northern Europe on the most common computers, such as the Commodore 64, Amiga and IBM PC compatibles. In addition to the mainstream, there are multiple other subscenes, often confined to a certain location or hardware/software platform (see Section 6.2). So far, such local histories have been rare, even though they could be worthy contributions, highlighting the peculiarities of digital culture that emerged in particular contexts (cf. Swalwell and de Vries 2013). Going to the essentials, it is necessary to question whether there exists a monolithic "scene" at all, as we are discussing a colourful set of communities grouped under the same umbrella term.

The changes are by no means over by now – quite the contrary. We are not studying a thing of the past, a frozen entity that can be sliced and inspected as if in an autopsy. The demoscene is still an active community that produces a steady flow of various artefacts, reacts to new hardware and software platforms and whose practices keep evolving. This thesis is, therefore, mostly a historical look back at what has taken place so far, knowing that forthcoming developments will again take the scene into a new, yet unknown direction.

1.2   My Position

The starting points of this study are, first and foremost, personal. My own involvement with the demoscene dates back to 1991, when I founded my first group with like-minded schoolmates. Since then, I have participated in tens of productions, mostly in the role of a coder (programmer) and a graphic artist, created demo-related websites, visited a number of demo parties, and more. Such a foundation cannot be without consequence when trying to study the same topics from an academic perspective, so it is necessary to consider the benefits and disadvantages of a researcher's personal involvement with his/her subject.

On the positive side, these 25 years have let me in on the practices and discourse of the community. A complete "outsider" would need to spend time to understand what demos, groups and parties mean to the community: selecting and viewing a representative sample of demos and related artefacts alone is a considerable task. Likewise, building connections inside a meritocratic, at times even exclusive, community might be challenging (see Huuskonen 2004; Reunanen 2010, 34–36; Publication 3). Without a doubt, an "insider" status has been beneficial in multiple respects.

However, personal participation is not a research method in itself, unless it is done with the same rigour as any scientific work should; merely hanging around is not ethnography. It would probably be easier for an outsider to take a fresh perspective on matters, without the load that has been accumulating over time. In my case, I have experienced what has taken place since 1991, especially in the PC scene, but there is plenty that happened before that and on other platforms. Thus, at times it has been hard to assess the magnitude and importance of phenomena objectively, or to step back to reveal my own blind spots. A Finnish perspective is not likely to be completely off when dealing with other Nordic countries, but moving further than that it becomes increasingly important to understand the economic, social, political and technological conditions that have affected the local scenes.

Another challenge that follows from personal involvement is of the emotional kind: getting to know your peers leads to liking or disliking them on a personal level, producing, again, distorted views. Likewise, the appreciation or dislike of certain productions can be detrimental when analysing them. It is probably impossible to completely drop these attitudes, but constant reflection and distancing – or completely removing – oneself from the research process alleviate the bias.

Similar settings have been described in the field of subcultural studies, when a researcher has been a current or former member of the community in question (Hodkinson 2005). Rhoda MacRae defines three kinds of researcher–subculture relationships: outsider-in, outsider-out and insider-in. The *outsider-in* approach refers to a classic form of ethnography, where an outsider participates in and observes a social group. In contrast, the *outsider-out* approach involves little first-hand contact with the subject, and is based on a theoretically-grounded reading of subcultural texts instead. Finally, in the *insider-in* case, the researcher actually is or becomes a member of the community, although such assimilation may ultimately be hindered by factors such as age, gender, and ethnicity. (MacRae 2007.)

Even though my own position, following MacRae's model, has been distinctly insider-in, that "insider" status was challenged when working with Publication 3. When trying to find respondents and get honest answers from the 1980s software pirates, I found myself as an outsider, someone suspicious who "had not been there". The situation was further complicated by the legally questionable status of cracking and piracy; some things might be better left untold in public. As Paul Hodkinson (2005) notes, the concept of an insider is neither binary nor self-evident.

According to MacRae (2007), the challenges arising from a close proximity to the subject are by no means insurmountable:

> What seems to be essential in realizing the benefits of the researchers' initial positioning, is their ability to reflect critically on the process of knowledge augmentation. [...] I suggest that quality of understanding is more related to the researchers' ability for critical reflexivity rather than their positioning to the group under study.

Hodkinson (2005) describes how he, during his study on the British goth subculture, transformed from an insider to an *insider researcher*. In this case, his personal engagement with the subculture was, indeed, an asset. However, he also warns against "trying too hard", which might cause an equally negative response as being a complete outsider. All in all, Hodkinson views the insider position as advantageous: for example, when a researcher tries to validate his/her findings, there already exists a useful comparison point in the form of own experiences, instead of having to rely on others' accounts alone. In addition, it can be easier to build a trusted relationship with the respondents, and choose a research framework that fits the purpose. Like MacRae, Hodkinson also stresses the importance of continuous reflection. (ibid.)

1.3   Theoretical Context

The theoretical framing of the thesis is decidedly multifaceted, as I have wanted to observe the development of the demoscene from a number of perspectives in order to provide a holistic view of its different properties. Sociologist Norman K. Denzin (1978, 297–301) calls such an approach *theoretical triangulation*, stating that the use of alternative theories on the same data improves the reliability of the findings by avoiding potentially narrow theory-specific explanations. In hindsight, it could have been easier and more straightforward to pick only one, but then again, no single theory or paradigm would have captured all the relevant angles. A tighter scope would also have enabled me to participate in one particular discourse in more depth, as opposed to the current breadth that follows from striving for completeness.

The three main chapters dealing with the three perspectives each come with their own theoretical framework. In other words, the discussion is spread throughout the thesis in the relevant contexts instead of a separate "theory" part – the rationale behind this decision is to make each chapter a self-contained piece of text that can be read and

understood on its own. Table 1.1 is an overview of the most relevant fields of study present in the discussion, coupled with examples of the most notable works and the questions that I sought to study through each lens, presented as a *triangulation matrix* (see Suominen 2010).

Field of study	Questions	Thesis chapters	Examples
Youth and subcultural studies	How do communities work and come to be? What are the relationships between a subculture, society and the market?	4	Hebdige ([1979] 2010), Muggleton (2004), Thornton (2005)
Game studies	What similarities, differences and links exist between game cultures and the demoscene?	4, 5	Newman (2012), Sandqvist (2012), Jørgensen, Sandqvist and Sotamaa (2015)
Software and platform studies	What is a platform? What does it imply that demos are software?	5, 6	Fuller (2008), Bogost and Montfort (2009)
History of computing	When, how and why did microcomputers emerge?	6	Ceruzzi (2003), O'Regan (2008)
Local histories of computing	How were computers used, marketed and distributed in national contexts?	6	Saarikoski (2004), Wasiak (2010; 2014b), Stachniak (2015)
Domestication and diffusion studies	How do people adopt new technology? Why do innovations succeed or fail?	6	Silverstone, Hirsch and Morley (1992), Rogers (2003), Berker et al. (2006)

Table 1.1: Relevant fields of study, questions I sought to answer, and notable representatives.

The categories are partially overlapping; for example, local histories *are* computing histories, and platform/software studies, likewise, tend to include historical discussion. Instead of trying to define fields of study and draw illusory borders between them, the table rather documents the approach present in this thesis. The study of digital cultures, as observed by Jaakko Suominen (2013), tends to be multidisciplinary by nature: each researcher has their own background, be it anthropology or computer science, providing for a number of possible perspectives (cf. Gere 2008, 11–20). Therefore, this thesis, too, is a typical representative of the discipline – not only because of its topic, but also its approach.

1.4   Thesis Structure

The manuscript is divided into seven chapters, out of which the first three are of an introductory nature. Chapter 1 sets the stage, presents the research questions and my personal position in relation to the subject. Next follows a description of the research material used in the study, accompanied by a discussion on the methods that were applied to it (Chapter 2). To conclude the introductory part, Chapter 3 is an overview of existing demoscene-related studies divided by topic and the field of study they represent. This background study is the oldest part of the thesis and, in certain respects, its origin, as the work towards it started already in 2004 with the creation of the Demoscene Research online bibliography (see Chapter 3 for further discussion).

The three main chapters (4–6) correspond to the perspectives presented in Section 1.1 above: the community, its artefacts and its relationship towards technological change. Each chapter is based on its respective research article(s), with additional sources to support the argumentation. As the oldest article dates back as far as 2009, it was evident that some of the discussion needed to be re-evaluated in the light of recent or recently discovered research. The narrative of Chapters 4–6 is built so that first a description of the demoscene (in relation to other similar communities) lays the foundation for understanding the latter topics. As the scene is so fundamentally connected to, represented and even defined by its cultural artefacts, next follows a description of them.

In Chapter 6, the two topics converge, as the scene, its machines and artworks are subjected to an ever-changing technological landscape that forces the community to react in a variety of ways, but react nevertheless. The theme of *change* is most notable in this chapter, even though it is present in one form or another in all the others as well. Finally, Chapter 7, the conclusion, presents the reader with the most important findings distilled out of the previous chapters, my personal reflection on the merits and shortcomings of the study and possible directions for future research.

1.5   Included Articles

The main body of research comprises five published papers from 2009–2015. This section is a description of the topics covered by each article and their relevance to the study at hand, coupled with details on my own contribution in the case of co-authored works. The actual papers are enclosed at the end of the thesis.

The first and oldest publication (1) originates from the History of Nordic Computing 2 conference, held in Turku in 2007. *Demoscene Platforms: A Case Study on the Adoption of Home Computers*, finally published in 2009, was written with Antti Silvast. The same research material, diskmags and early online discussions, were also used in my later licentiate thesis (Reunanen 2010). The main point of *Demoscene Platforms* was to study the transitions between hardware and software platforms in the demoscene. The theoretical frameworks we chose, *domestication* and *diffusion of innovations*, proved fruitful and can be found in later publications, too. Furthermore, the lamer–elite binary was already present in this early writing. My main contribution was collecting the research material, and the analysis and theoretical discussion related to the diffusion of innovations as outlined by Everett M. Rogers (2003).

The second publication (2), *Four Kilobyte Art*, was first published in Finnish as *Neljän kilotavun taide* in 2013, and later translated and republished in English to serve the international audience. The article is, in essence, historically-oriented: I describe the roots and development of the so-called 4k intros – executable files no larger than 4,096 bytes – in relation to related phenomena, such as digital art and history of computing. In comparison to the other articles, there is a strong personal and practical aspect, as I was concretely involved in creating such intros in 2003–2005 as a programmer and designer.

The third publication (3) could be best described as the critical re-evaluation of existing histories. *How Those Crackers Became Us Demosceners* from 2014 takes a new look at the process where the demoscene supposedly drifted apart from its origins, the cracker culture. Starting from the canonical stories told by demoscene historians, I move towards contemporary discussions and interviews to reveal some of the complex reasons behind the separation. In addition to widening perspectives on the rift, I also question how total it actually was. David Muggleton's (2004) work on subcultures was a new addition to the toolbox, inspiring the discussion on the constant change and fluidity of scenes.

Publication 4, *Multiple Users, Diverse Users: Appropriation of the Personal Computer by Demoscene Hackers* (2014) is, in many respects, an evolutionary step from Publication 1. Together with Antti Silvast, I explore similar questions as before, but in more depth and with a more seasoned approach. The concept of a *technological script* (Akrich 1992) was first utilised in this book chapter, owing to my co-author's background in sociology (see Section 6.1). My contribution was again in collecting the research material, applying the diffusion of innovations theory and discussing the machine–user relationship.

Lastly, *Crack Intros: Piracy, Creativity, and Communication* (Publication 5) from 2015 explores another type of artefacts: crack intros, which decorate pirated games and serve multiple purposes in the cracker scene. Together with Patryk Wasiak and Daniel Botz we consider such intros from three perspectives: as cultural artefacts embedded in the practices of the cracker scene, as works of art, and as a communication channel. In addition to tackling a previously little studied topic, there is novelty in utilising three different perspectives in the same study. Considering the whole of this thesis, *Crack Intros* provides a historical foundation predating the demoscene and supports Publications 2 and 3. My main role was in outlining the content and conducting a textual content analysis of Apple II crack screens plus Commodore 64 crack intros.

Chapter 2

Research Material and Methods

To meet the needs of a multifaceted approach to the scene, the research material had to be compiled from a variety of sources. Following the setting described in Section 1.1 – formation of the scene, its artefacts, and relationship with technology – I chose materials that represent each category: texts and interviews for the history, demos and other productions for studying the artefacts, and again contemporary texts for the third perspective. With such content, the analytical toolkit also ended up equally diverse. Following Denzin's (1978, 295–306) terminology, the study involves both *data* and *methodological triangulation*, which, in an optimal case, enable comparisons and let the researcher benefit from the strengths of each method.

Online demo databases and other scene websites were a natural starting point for discovering material owing to their easy accessibility and high amount of available content. Artefacts, in particular, are extensively documented by the community. Large databases, such as *Pouet.net* and *CSDb.dk*, already feature tens of thousands of productions coupled with relevant metadata, such as publication dates, authors, platforms, events and competition rankings (see Reunanen 2010, 12–15). On the two mentioned sites, there are also comments on each release and, following the traits of today's social media, the possibility to "like" or rank them, providing hints on what is popular and why. These days, conversations take place mostly online, which makes finding and analysing them easier compared to old textual sources that are typically buried in demo scrolltexts, disk magazines or long-lost Bulletin Board System (BBS) discussion threads.

There is no strict border between the research material presented in my licentiate thesis (Reunanen 2010) and this study, as the work on the earliest articles included

here started in parallel with the earlier thesis. What sets the two apart is that, initially, I aimed to provide a general big picture of all things scene, whereas later on the framing has been tighter. As an example, disk magazines (see below) were first considered as a mass of text that lent itself to content analysis, but later the analysis has focused on individual topics found on a more limited selection of articles.

2.1 Online Databases

In addition to serving as the most important interface for discovering other sources, online databases were used for charting overarching historical trends. Party competition results, available at *Pouet.net*, provided data for the diagram that depicts the popularity of hardware and software platforms at major events between 1992 and 2002 (Publication 1). Similar figures, based on *Pouet.net* production counts, were later compiled into diagrams by myself (Reunanen 2011), and Bent Stamnes (2015) in his ongoing project to visualise demoscene trends. In this case, the visualisations served not only as illustrations, but also as a research method that made history visible, provoking qualitative questions on the reasons for each development.

Pouet.net, originally founded by the Mandarine demogroup in 2000, is among the most influential demo-related sites currently and, therefore, an important source for this study. The site caters to all demo platforms and features a large collection of metadata plus a discussion forum – actual files are hosted elsewhere. One notable characteristic is the focus on executable files, as opposed to other sites that feature a wider selection of media, such as competition pictures and music. My other main source, *CSDb*, represents the all-encompassing approach allowing, for instance, competition votesheets, paper magazines, and hardware extensions in its database. *CSDb* was founded in 2001 by a group consisting mostly of Danish Commodore 64 sceners.

Even though such repositories are a valuable (and practically the only) source of quantitative information on yearly production counts, the relative popularity of platforms and similar topics, they also have their shortcomings that need to be considered when assessing the reliability of the findings. Production lists are solely based on user-entered data, which may favour popular platforms, events and countries. Demos have been lost, some of them were never widely distributed or formally released, and so on. Non-digital items are generally not part of the archives, which tend to focus on digital artefacts only (see Section 5.2). Therefore, a database can never be fully complete, but only an imperfect approximation of what actually took place.

One more use for databases was to build an understanding on how sceners themselves categorise their cultural artefacts. Taxonomies dividing productions into demos, intros and more are present on most websites, but at times there are revealing differences between them. Furthermore, labelling and classification only represent the contemporary views, and are not necessarily uniform across time. More discussion on categorisation follows in Section 5.2.

2.2 Texts

Disk magazines – *diskmags*, *maggies* or *mags* for short – were the main source for contemporary discussions predating the Internet age. Publications 1, 3, and 4, in particular, draw on articles found on diskmags. Much like their paper counterparts, diskmags are edited collections of texts ranging from news to letters to the editor, and articles dealing with readers' topics of interest (Figure 2.1; see also Reunanen 2010, 71–78). In contrast to paper-based magazines, they are interactive software, which lets the user choose articles and read them by scrolling across the pages. As the name suggests, diskmags were initially swapped on physical floppy disks; the name stuck even if later on the Internet became the main distribution channel.

Figure 2.1: Table of contents, Imphobia #6 (1993), running on MS-DOS.

The first demoscene mags appeared in the late 1980s, but the concept is older than that: companies published similar pamphlets with news and software (ibid.). Another

related concept is the *cover disks* that were a common sight on the computer magazines of the 1990s. The diskmag format was, however, particularly prominent and developed in the demoscene, which retained it in active use until the late 1990s. More direct predecessors to demoscene mags were crackers' paper-based magazines serving similar purposes; a few of issues of *Illegal* were used in this study, too. For a researcher, diskmags offer a wealth of content, as there were hundreds of mags with multiple issues. As of June 2016, the Pouet.net database contains 4,450 issues of diskmag, each consisting of a number of articles.

Choosing from this pool was not a self-evident task, but eventually the aim became to cover as long a timespan as realistically possible with the focus on the dominant demo platform of each decade. The selected diskmags ended up being *Sex'n'Crime* (Commodore 64), *Zine* (Amiga), *R.A.W.* (Amiga), the esoteric *Maggy* (Amiga), *Imphobia* (MS-DOS), and *Hugi* (MS-DOS and Windows), spanning 20 years. A general overview of the themes discussed on the issues can be found in my licentiate thesis (ibid.). Several notable diskmags had to be left out owing to the sheer amount of available content. Instead of trying to do similar generalisations this time, articles were selected based on their topics: the scene's self-definition, historical accounts and opinions on technology (Publications 1, 3 and 4). Even with such framing, the amount of material was still considerable. For instance, 200 articles were analysed for Publication 4.

Parallel, somewhat newer discussions were found on Usenet discussion groups *comp. sys.ibm.pc.demos* and the less active *alt.sys.amiga.demos*. Together with diskmag articles the newsgroup messages were subjected to close reading, which led to a typology of the contents (see Kain 1998). Another analytical tool, particularly well-suited for dealing with conflicts arising from platform migrations, was to search for binary opposites that manifested themselves in the discourse (see Section 6.4).

2.3 Artefacts

Instead of trying to incorporate all the possible artefacts, I focus on two kinds in this thesis: crack intros (*cracktros*) and 4k intros. Crack intros, apart from being interesting as audio-visual works, also represent the first generation of scene productions and provide a view to the practices of the early software pirates. My main responsibility in the study presented in Publication 5 was to analyse the textual content of intros in order to assess what messages they conveyed, and how.

The material consisted of 50 screens found on *Apple II Crack Screens* collection by Jason Scott (2003) and the texts of 100 Commodore 64 crack intros automatically extracted by Pex Tufvesson (2013). Manually extracting or real-time reading the *scrolltexts* of a hundred intros would have been a tiresome task, and having them readily available saved considerable effort. Both sets were chosen randomly to represent the source material as evenly as possible, after which the texts were subjected to content analysis, as outlined by Krippendorff (2003). Instead of straightforward word counting, the analysis was a somewhat higher level interpretative term counting where duplicates, such as "greetings" and "greets", were combined. The results started converging surprisingly soon, after only ten screens and intros, which goes on to show how uniform their content was. The quantitative findings laid the foundation for the qualitative analysis, where individual expressions were lifted from the texts for closer scrutiny.

The treatment of 4k intros represents a different, personal angle. In addition to viewing productions, namely party winners and less successful contestants from 1990–2003, there is a strong notion of authorship, based on the co-creation of three intros during 2003–2005 with Antti Silvast (Publication 2). While three items does not constitute a significant sample in itself, digging deep into the strategies and tools involved in the process built understanding, which would be hard to obtain otherwise (cf. Burger, Paulovic and Hasan 2002; Brodersen Hansen, Toft Nørgård and Halskov 2014). Presenting the findings shortly afterwards back to the community was the first step of reflecting on the efforts (Reunanen 2006). The approach is close to art-based research, even though there was little focus on the experiential side of the work (see McNiff 2007).

2.4 Interviews

The need for interviews stemmed from the interest to learn more about the earliest days of the cracker scene for Publication 3. The oldest textual sources, such as disk magazines, cover a period starting roughly from the late 1980s, whereas crack intro texts tend to deal with only a very limited set of topics (see Publication 5). Second-hand sources provided some understanding of the practices of the early sceners (e.g. Polgar 2005, 42–55; Wasiak 2012; 2014a), but too many questions remained unanswered. Therefore, it was a natural step to try and find early participants and ask them.

The interviewees, six of them altogether, were found through personal contacts and the *C-64 Scene Database*. Personal contacts were the easy case, but to recruit interna-

tional respondents was trickier due to the continuing secrecy around the topic (see also Section 1.2). In the end, there were six semi-structured online interviews of former swappers – users who distribute software to their network of contacts – representing four countries: Finland, Sweden, Germany and the US.

A typology of the responses revealed recurring patterns, such as opinions and manners of speech. Some notable differences became evident, too: the European accounts were largely similar to each other, whereas the American interviewee came from a different background and did not share the European views on, for example, the role of the demoscene. As the respondents had to rely on their memories on events that took place as long as 30 years ago, contemporary diskmag articles on swappers plus existing studies were used as comparison points. For further discussion, see Publication 3.

2.5 Notes on Material Collection and Use

The fragmented and even colourful constitution of the research material required the use of different methods, which was somewhat of a burden in itself, and made it challenging to compare the observations obtained from different sources. At the same time, using multiple sources, some contemporary and others posthumous, lends credibility to the findings. Old texts, such as diskmag articles, retain unfiltered views from decades ago, whereas an interview on the same topic will inevitably be affected by later reflection, possibly even nostalgia.

The amount of interviews is relatively low. Had I been dealing with a completely new topic, there would have been a much higher need for consulting participants in order to understand their mindset, but in this case my personal involvement made up for at least some of it: factors such as the slang, demomaking practices, highly regarded "classic" works and platforms were already familiar to me, which allowed to largely omit the initiation phase, and focus on the less known aspects. Obviously, such personal experience cannot automatically be considered as valid knowledge, but there is a constant need for questioning one's assumptions, as discussed in Section 1.2.

The Internet has made the work of a demo scholar increasingly easy over time. Collecting similar material twenty years ago would have required considerably more effort, as there were no easily accessible, comprehensive databases available back then. Discovering, downloading and viewing demos is easier than ever; video captures and capable emulators alleviate the need to purchase and maintain a large hardware collection. Online forums archive and make available discussions on topics of interest,

and provide means for finding otherwise hard-to-reach interviewees. Such repositories allow for not only qualitative, but also quantitative, largely automated approaches as proposed by Lev Manovich (2009). The only thing missing from these valuable digital means is the experience of standing the first time in a dark party hall filled with fellow sceners and monitor glow.

Chapter 3

Related Work

Existing demo-related studies represent various academic disciplines, ranging from cultural studies to art history. Research interest towards the scene spans at least to the early 1990s (Bader 1990; Eckert et al. 1991), but the vast majority of works has been written only lately, during the 2000s. It has taken considerable time – roughly speaking, twenty years – for the academic community to take notice of the demoscene. In this chapter, I categorise the existing works, and assess their historical relevance with the purpose of providing an overview of the different approaches that scholars have taken.

The discussion here is based on the *Demoscene Research* website, which I co-founded with Antti Silvast in 2004 and have been maintaining ever since, recently together with Gleb J. Albert. The site is an online bibliography focused on aggregating all the scholarly works that deal with the demo and cracker scenes, with some additional material on related topics, such as chip music and software piracy. Owing to the help of several individuals' contributions, *Demoscene Research* has grown to be the largest catalogue of its kind with tens of publications coupled with reviews. (Reunanen, Silvast and Albert 2004.)

Who are typical demo scholars, then? Judging by the corpus of existing texts, demos are mostly studied in the same countries where they have been created: Germany and the Nordic countries. Even though English is the dominant language, significant bodies of work have also been written in Finnish and German. The researchers who have contributed to our knowledge on the scene typically have some close connection to the topic, for example in the form of active participation in demomaking. (ibid.) In

other words, the community has started documenting itself not just on its own but also academic forums. One of the most notable developments over time is the shift from short introductory texts (which still do appear at times) towards increasingly rigorous studies that draw from various theoretical frameworks and address in-depth research questions.

The demoscene overlaps and borders with several other forms of digital culture. Thus, there is a need to consider other closely related studies that provide both comparison points and analysis of topics that have not yet received attention from demo scholars (Section 3.4 below). Similar comparisons will continue in the following chapter, where I focus on the communal aspects of the scene. It is also time to critically revisit my own licentiate thesis (Reunanen 2010), which can be thought of as a prequel and foundation to this, more experienced academic endeavour.

3.1   Overviews

A major part of demoscene-related publications, both popular and academic, are general introductions to the culture and its artefacts. In popular contexts they, arguably, still serve a purpose, as there are always new people to reach. As to the academic world, however, it can be questioned whether there is any longer a need to repeat the same basics if there is no novel, revisionist take on them. In Publication 3, I have aspired to do exactly that: revisit the often repeated birth story where shady software pirates turn into creative demosceners. Next follows an overview of the overviews, which illustrates how demos and the scene have been described and positioned so far.

Sam Inkinen and Markku Salmi's book chapter *Media aseena ja työkaluna – hakkereita, teknohippejä ja koneromantiikkaa uuden median verkoissa* (Media as a Weapon and a Tool – Hackers, Techno Hippies and Machine Romance in New Media Networks) from 1996 is among the earliest general introductions to the demoscene in an academic context. In this case, the scene is presented as an example of technologically-oriented subcultures. Hackers and "techno hippies" connect the scene to other phenomena that had already become iconic in popular culture. (Inkinen and Salmi 1996.) Likewise, Linus Wallej's controversial *Copyright finns inte* (Copyright Doesn't Exist) from 1998 attempts to link demos, crackers and software piracy to the 1990s contemporary discussions (even hype) on themes such as cyberpunk and hacking.

Anders Carlsson's *The Forgotten Pioneers of Creative Hacking and Social Networking – Introducing the Demoscene* is a compact introduction published in a media art

context. In just five pages, Carlsson manages to go through the fundamental concepts of the scene: its history, practices and main artefacts. Rather exceptionally, he emphasises the pioneering aspects of the demoscene and its networking, which was already international before the commonplace availability of the Internet. (Carlsson 2009.)

In contrast to the examples presented so far, non-Nordic authors have also written these overviews. For example, Zelazny's (2004), and Hitzler and Niederbacher's (2010) similar papers were aimed at the German-speaking audience. The former paper represents digital art, whereas the latter portrays the scene as a youth culture among many others. As a curious example of a non-European overview there is Ferreira and Duarte's (2014) conference paper from Brazil, written in Portuguese.

The first ever popular book on the demoscene, *Demoscene: The Art of Real-Time* (Tasajärvi 2004) can, likewise, be considered an overview of demos and the scene. The book is not an academic one, but for example the threefold model of scene history, consisting of old-, middle- and newschool, is already analytical rather than merely descriptive (for further analysis of the model, see Reunanen 2010, 23–24). The other well-known popular book, *Freax: The Brief History of the Demoscene* by Tamas Polgar (2005), is considerably larger and only deals with the Commodore 64 and Amiga scenes. The book represents the scene's own history-writing – a considerable amount of prior knowledge is required to fully understand the text. The future of the following volume, which was to deal with the IBM PC scene, remains unknown.

My own licentiate thesis, *Computer Demos – What Makes Them Tick?* (Reunanen 2010), mostly falls into the "overviews" category, as it deals with a number of scene-related phenomena on a relatively basic level. In hindsight, the aim to encompass each and every topic was too much for a publication of 134 pages, so the outcome ended up scratching several surfaces without the possibility to offer in-depth views. The six years that have passed after the thesis have, obviously, broadened my views on both the subject itself and the possible theoretical approaches that could have been taken.

On the other hand, there is no need to overly criticise the earlier attempt, either. The thesis serves well as a foundation for this one with its comprehensive glossary and compact introductions that help especially an uninitiated reader. The theoretical framework that I chose for the analysis of the adoption of technology, diffusion of innovations by Rogers (2003), still appears fitting when augmented by more recent models (Section 6.3). Judging by the citations the thesis has received during the last few years (e.g. Botz 2011; Hastik and Steinmetz 2012; Tyni and Sotamaa 2014;

Wasiak 2014b), it seems to have found its way to the tiny canon of demo-related scholarly works.

Owing to the different backgrounds of their authors, these demoscene histories represent both insider (from scene to scene, or demoscener turned into a researcher) and outsider (non-participating researcher) perspectives. Jaakko Suominen (2016) has analysed similar histories dealing with digital games and divides them into four different kinds:

1. *Enthusiast histories:* chronicles written by insiders, often non-academic.

2. *Emancipations:* alternative accounts providing unorthodox views on history.

3. *Genealogies:* tracing the origins and family trees of games.

4. *Pathologies:* in-depth archaeological analyses of games (not limited to the temporal dimension alone).

Plenty, if not most, of demoscene histories represent the first approach; coming from an enthusiast background, I run certain risk of writing one myself. Suominen (2016) mentions the pitfall of *monumentalising* history into a stream of influential events and authors, in effect writing the history of the winners (cf. Therrien 2012). In this study, I have consciously tried to steer clear from such heroic milestones in order to say something about the scene as a whole, not only its celebrities. There are already traces of canonising certain productions: for example, *Megademo* (aka. *Red Sector Megademo*) from 1989 has received considerable attention by multiple authors (e.g. Polgar 2005, 106–7; Botz 2011, 145–53; Maher 2012, 184–88). The other three approaches are significantly rarer, even though traces of them can be found on certain publications: gender studies (see Sections 3.2 and 4.4) is an unorthodox – emancipatory – framework for demoscene research, whereas Botz's (2011) thesis could be called genealogical. "Deep excavations" of artefacts, such as Publications 2 and 5 here, fall into the last category, pathologies.

3.2   The Scene as Culture

Moving away from the general overviews, the next "track" of demoscene research is the studies with a cultural approach: the scene as hobbyist, youth or subculture (see also Section 4.1). Some of the publications discussed here do include short introductions to the scene in general, as it cannot be considered common knowledge, so the

line between them and the overviews presented above appears thin at times. Even so, what does set them apart is the focus on the participants and their social interaction. All in all, it seems that even if the demoscene is frequently defined as, say, a *subculture* and several paper titles mention some kind of "culture", actual cultural studies are still relatively scarce.

Patryk Wasiak is one of the most active authors who have discussed the demoscene in terms of (sub)culture. His *'Illegal Guys': A History of Digital Subcultures in Europe during the 1980s* is one of the few scholarly works dealing with the early years of cracking and demos in Western Europe (Wasiak 2012). Another historically significant article by him, *"Amis and Euros." Software Import and Contacts Between European and American Cracking Scene*s, discusses the little documented interchange of "warez" – mostly pirate games – between American and European pirates (Wasiak 2014a). In his other writings, Wasiak frequently offers an Eastern European or, specifically, Polish perspective to the adoption of technology by hobbyists (Wasiak 2010; 2014b), in line with the local histories approach.

Petri Saarikoski has charted the scene in a number of publications ranging from articles to academic dissertations in the early 2000s as part of his research on digital culture (Saarikoski 2001a; 2001b; 2004). His writings are, first and foremost, historically oriented: the scene is put into perspective and positioned as a form of hobbyist culture. His point of view is mainly Finnish with international comparisons. One of the most notable insights is how the demoscene has, by its members, been considered as a serious hobby instead of a stepping stone towards something else (Saarikoski 2004, 205; cf. Tyni and Sotamaa 2014).

Doreen Hartmann's *Zerstört Offenheit den Wettstreit? Über die subkulturellen Werte von Crackern, Hackern und Demoszenern* (Does Openness Destroy Competition? On the Subcultural Values of Crackers, Hackers and Gamers) again connects crackers and demosceners to the hacker context, but offers novel takes as well by considering topics such as motivation and fame. (Hartmann 2012.) The demoscene–hacker comparison will receive further attention in Section 4.2. Hartmann continues to unravel the values and attitudes of the scene in her later article *Animation in the Demoscene: From Obfuscation to Category* (Hartmann 2014), which also relates to the artefact perspective discussed in Chapter 5 of this thesis.

The dominantly male nature of the community has received some specific attention from demo scholars. Sociologist Hege Nordli, whose main research focus has been

female computer hobbyists, analyses gender issues at the largest demo event in Norway in her article *The Gathering – Computer Parties as Means for Gender Inclusion*, also included in her doctoral thesis *The Net is not Enough: Searching for the Female Hacker* (Nordli 2003a; 2003b). Roininen's (1998) MA thesis offers similar perspectives to the Finnish situation in the late 1990s, even though gender is not her only topic of interest.

This section concludes with two more critical takes, which have often been lacking in demo-related texts that have at times even glorified their subject. Heikki Tyni and Olli Sotamaa discuss Assembly, Finland's largest demo (and recently also LAN) party in their 2014 article. Their most notable finding is how the role of the event has changed throughout the years. Business has been a part of Assembly almost from the beginning, for example, in the form of company headhunters scouting for recruits. In addition, they discuss the relationship between the demoscene, game hobbyists and the game industry. (Tyni and Sotamaa 2014.) The complicated gamer–scener relationship will receive further attention in Section 4.3. Another critical point of view is offered by Huuskonen (2004), who mentions how communities such as the demoscene are often self-sufficient and closed off from outsiders.

3.3 Demos as Art and Artefacts

Studies that approach the scene through its main artefacts, demos, constitute another major part of all demoscene research. Some of them represent an artistic angle – demos as media art –, whereas some focus on the technical implementation. Full-size demos tend to be the main object of interest, even though they only constitute a part of the spectrum of demoscene productions (see Reunanen 2010, 45–78 and Section 5.2).

Daniel Botz's doctoral thesis, *Kunst, Code und Maschine – Die Ästhetik der Computer-Demoszene* (Art, Code and Machine – The Aesthetic of the Computer Demoscene), is by far the largest study on demos as an art form. In the dissertation, Botz walks through the aesthetic development of demos from their very roots in the 1980s to the 2000s, revealing the development of different styles, demo formats and effects. (Botz 2011.) Unfortunately, in this thesis Botz's many contributions are somewhat underrepresented due to the language barrier, as there is no English translation of the book yet.

An interesting new take on the visual analysis of demos was presented by Canan Hastik in her recent article *Demo Age: New Views*, where she applies cultural analytics methods to demos. Her work is based on the tools and approach developed by

media scholar Lev Manovich, known for his long-standing research on various forms of new media (see Manovich 2009). Hastik presents various different time-lapse images that summarise and highlight the visual appearance and rhythm of very different demos running on various platforms. An example of such can be seen in Figure 3.1. (Hastik 2014.) In her other work, discussed in Section 5.3, Hastik and her colleagues have developed ontologies for the analysis and preservation of demos from an artefact perspective.
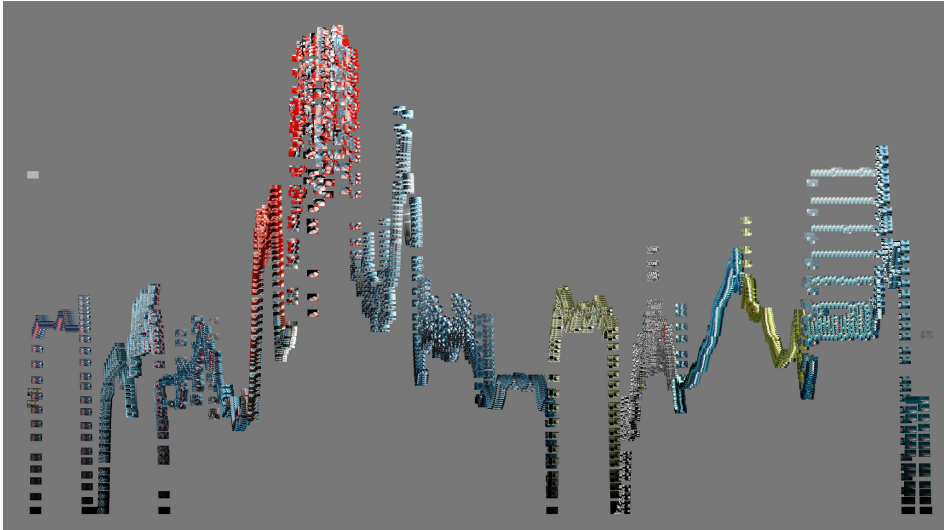

Figure 3.1: A time-lapse view of *Human Traffic* (2011) by Ghostown and Loonies. Time on the x axis, brightness on the y axis. Image by Hastik (2014), used with permission.

Studies on demo music often overlap with chip music research (see Section 3.4 below). However, there are a handful of clearly demo-related musicological articles and theses, in addition to which various overviews mention music among other topics. Hanna Lönnblad's two works, an MA thesis and a research article on tracker music focus on the role of music in demos through a comparative analysis of two demos, *Second Reality* by The Future Crew and *Caero* by Electromotive Force (Lönnblad 1997; 1998). Brendan Ratliff's (2007) MA thesis is a more recent account on demo music, in particular the iconic tracker music, its history and development (cf. Reunanen 2010, 66–70).

A handful of authors have published papers on the technical implementation of demos. While such topics are commonplace in scene-internal discussions, scholarly attention has been limited; one likely explanation to this is that most scholars simply

have not possessed enough technical knowledge to address such an in-depth topic. Burger, Paulovic and Hasan (2002) reflect on their first-hand experiences on the creation of three demos, *Dream*, *Expiration* and *Symbolic Expression*, in their article *Realtime Visualization Methods in the Demoscene*. Curiously, the title also makes a rare connection to yet another field of study, namely visualisation. Brodersen Hansen, Toft Nørgård and Halskov (2014) provide a rare glimpse to the working methods of a demo author with a focus on digital craftsmanship. Publication 2 of this study belongs to the same group, as it is largely based on personal observations as a programmer (see also Scholtz 2007a; 2007b; Peeters 2013).

3.4   Closely Related Fields of Study

Some important contributions originate from other contexts, where the scene may be used just as a case example instead of the main topic of interest. For example, chip music and software piracy are topics that often overlap with demoscene studies due to technical or historical reasons and, therefore, offer useful extra perspective to demo scholars. Two more relevant topics, digital games and their relation to the scene, as well as the question whether sceners can be considered as hackers, are discussed in their respective sections (4.2 and 4.3) in the next chapter.

Chip music or a *chiptune* refers to music created on old hardware, such as the Commodore 64 or Nintendo Game Boy or, alternatively, music that only sounds like it. For further elaboration on the problematic distinction between the two categories, coupled with questions of authenticity, see the study by Marilou Polymeropoulou (2014). As there are still active scenes on old hardware platforms, there is a clear overlap with demo research – plenty of demo music *is* chip music by definition. One of the most active writers on chip music has been Anders Carlsson, whose MA thesis and other texts shed light on the essence of chiptunes, also in the case of the demoscene (Carlsson 2008; 2010;cf. Driscoll and Diaz 2009; Hakkarainen 2011).

The studies mentioned above highlight how chip music is, on the one hand, about sound and technology, and, on the other hand, cultural activity. Walter Karila's (2013) MA thesis focuses on community building and meaning making on the Internet, where chip musicians actively distribute their works and chat about their hobby. Sebastian Tomczak's (2011) doctoral thesis represents the technical end of the spectrum, with a number of low-level case studies on old sound chips, their interfaces and sonic properties.

Tracker music or *mods*, created with trackers, is another paradigm highly character-istic to demos even today, although it has been recently contested by mainstream music production tools (see Reunanen 2010, 66–70). In addition to the aforemen-tioned studies by Lönnblad (1997; 1998) and Ratliff (2007), which deal directly with the demoscene, trackers have been studied by Jimmy Maher for his *Platform Studies* book on the Commodore Amiga, *The Future Was Here* (Maher 2012, 191–99). There is significant overlap between chip and tracker music in the composition paradigm as well as the style (small chiptunes are a long-standing subgenre of MOD music), which is why the two are frequently mentioned in the same publications.

Historical studies on software piracy shed light on the early stages of the demoscene due to its roots. Even though the concept of "illegal" pops up frequently when dis-cussing software piracy, it is necessary to bear in mind that, depending on the country, there were not necessarily laws in place against copying software in the 1980s or early 1990s and, thus, pirates' activities were not illegal per se (cf. Wasiak 2012; Publication 3). To curb piracy, game companies relied on increasingly complex copy protection schemes, turning cracking into a kind of sport (see Wasiak 2012). Jukka Vuorinen's (2007) comparative study on the software distribution models and ethics of crackers, hackers and the proprietary world provides an important theoretical foun-dation that can be easily applied to the demoscene as well. Most notably, Vuorinen observes how interlinked the cracker and proprietary modes are, as opposed to the hacker model that originated in a completely different context (further discussion in Section 4.2 and Publication 5).

In addition to Vuorinen, the practices of the warez scene have been studied by Alf Rehn (2004), who discusses the warez scene in terms of an *honour economy* that is based on competition, in many respects similar to the demoscene. Both Vuori-nen and Rehn maintain a neutral position to software piracy, which is often not the case in public debates surrounding hacking and piracy (e.g. Thomas 2002; Yar 2008; Lindgren 2013). Likewise, I aim for neutrality in this thesis: observing instead of condemning or glorifying the activities of "warez dudes" and "illegal guys".

Chapter 4

A Scene Among Others

Calling the demoscene a *subculture* has been among the most common ways to describe it (e.g. Karaiste 2008; Wasiak 2012; Hastik 2013). While such a definition anchors the scene to a well-established field of study and helps the uninitiated reader to understand the exclusive nature of the community, it also suggests other parameters that do not necessarily fit. Most notably, a subculture requires a *parent culture* – a relationship which has received next to no attention. Would the parent culture be game culture, Western European computer culture or society at large? In his critique of the use of the term David Chaney (2004) goes as far as to say it has already become redundant, as any late-modern culture entails the same characteristics. Other authors, representing different backgrounds, have utilised other frames of reference that, likewise, come with their own assumptions and implications.

Already when reading Dick Hebdige's well-known *Subculture: The Meaning of Style* ([1979] 2010), I noticed that subcultures, as described by him, do not quite appear like the demoscene. Among the factors that seemed out of place were dresscodes, shared musical tastes and the locality of subcultural activities. To simplify a little, you cannot recognise a demoscener by looking at his clothing or music collection, let alone meet them at a certain bar at the weekend. The often-criticised Marxist interpretation of subcultures as a form of class struggle did not ring a bell, either, as the scene does not seem to share any single political agenda, or to noticeably rebel against a parent culture (Reunanen 2010, 48–49; cf. Muggleton 2004).

Other proposed candidates for a classification have been a *hobby* (Saarikoski 2004, 190–206), *youth culture* (Roininen 1998, 80–87) and *community of practice or interest* (Marisca 2013). Aune (1998) calls Amiga groups *clubs* in her *The computer in*

everyday life: Patterns of domestication of a new technology. Out of these options, the term hobby is descriptive, but at the same time it does have a potentially belittling tone, as in "just a hobby", which does not capture the dedication involved. Youth culture, in turn, might have suited the purpose better in the 1980s and 1990s but, as already Roininen (1998, 82) noted, a large portion of sceners were so old that they hardly represented the youth. Skimming through the party photo site *Slengpung.com* further suggests that today's active sceners tend to be closer to 40 than 20 years of age, so we are talking about a *former* youth culture at best.

In my own work, I have tended to use the word *community*, a group of connected people, in its everyday meaning. The term does, however, come with its own connotations, as in the context of sociology it refers to the community–society (Gemeinschaft–Gesellschaft) dichotomy coined by Ferdinand Tönnies (1887). Steven Brint (2001) provides an overview of the historical use of the concept, including the controversies concerning its multiple latter definitions, with the aim of rejuvenating its use and updating it to fit contemporary discourse. He, in turn, defines communities as:

> [...] aggregates of people who share common activities and/or beliefs and who are bound together principally by relations of affect, loyalty, common values, and/or personal concern (i.e., interest in the personalities and life events of one another).

Shared common activities, in particular, suit the discussion on the demoscene, as so much is defined by doing. Common beliefs are much less characteristic, at least in the case of politics or religion (Chapter 5), but if we consider values, such as views on technology and authorship, the definition does indeed strike a chord (Section 4.4). In his hierarchical tree-shaped typology, Brint divides communities into two types, geographic and choice, based on their primary context, followed by further divisions based on the reasons and kinds of interaction involved (ibid.). According to his typology, the demoscene could be labelled as a *dispersed friendship network*: a geographically scattered choice-based community with shared activities and some face-to-face interaction, yet, keeping in mind the theme of change, the classification might not have been as accurate in the pre-Internet times.

The related term *community of practice* originates from the field of learning studies, where it refers to a group that has formed around a shared profession or goal (Lave and Wenger 1991). Henri and Pudelko (2003) place it on a continuum starting from an

informal *community of interest,* and ending at a professional and cohesive community of practice. On the one hand, the process of moving from a novice to an expert in a community fits well the initiation phase taking place in the demoscene, while on the other hand, the sharing aspect that Henri and Pudelko emphasise is not as evident at all: concurrently competing with others can lead into a completely opposite outcome (see Section 4.2). As part of their activities, sceners do acquire new skills, but as of now, the learning aspect has not been considered in the existing publications. Lave and Wenger's (1991) tripartite model consisting of domain, community, and practice would provide an easily applicable starting point for such studies.

The concept of a "scene" is by no means limited to demo enthusiasts. There are various popular music scenes, intertwined with clubbing scenes and the zine scene, and the goth scene, to name just a few (Straw 1991; Brill 2007; Gelder 2007, 47–65; Duncombe 2008). In fact, scene has been proposed as an alternative theoretical construct that would better capture the fluid nature of today's communities. Michaela Pfadenhauer (2005) provides the following general definition for a scene in *Ethnography of Scenes* (see also Publications 3 and 4):

> Thus we refer to a thematically focussed cultural network of people who share certain material and/or mental forms of collective self-stylisation and who stabilise and develop these similarities at typical locations at typical times as a scene.

The self-stylisation and locality included in the definition initially stand in contrast to the externally invisible and internationally connected demoscene. However, if we consider only the psychological side of self-stylisation, the definition becomes better applicable. The self-stylisation present in demos and other artefacts, the slang, and the ways of using computers are, indeed, collective and largely stable. If we think of location as something that can also be virtual in addition to physical, the demoscene can be considered a scene by Pfadenhauer's terminology, too (cf. Brint 2001). Local subscenes are an even easier case, as they involve a concrete physical location.

4.1 Sub- and Youth Cultural Perspectives

Regardless of whether the demoscene is a subculture or youth culture by definition, the comprehensive body of research dealing with them offers us readily applicable theoretical and methodological starting points. Instead of repeating the history of

subcultural studies from the Chicago School to Birmingham Centre for Contemporary Cultural Studies (CCCS), I refer the reader to existing histories (e.g. Gelder 1997, 1–15; Hodkinson 2007) and focus on the most important concepts that I adopted myself, and their implications for this study.

Dick Hebdige, perhaps the best-known representative of Birmingham culturalists, was an early source of inspiration when I started getting acquainted with subcultural studies. Even when taking into account the considerable later criticism of his and the CCCS approach in general (e.g. Bennett and Kahn-Harris 2004; Muggleton 2004, 19–25), there are certain findings that have stood the test of time. *Subculture: The Meaning of Style* dedicates plenty of pages to clothing and music, but especially the concept of *incorporation* offers a valuable point of view to the interplay between commerce, parent culture and subculture (see Hebdige [1979] 2010, 92–99).

Incorporation, as defined by Hebdige, refers to the mechanisms that the parent culture employs in order to render the complexity and perceived deviance of a subculture into an understandable and manageable form. The first of the two main mechanisms is *commodification*, where style is frozen into a product, which brings the subculture back to the mainstream, or at least forces it to reinvent itself. The second one is the *ideological form*, where media, in particular, trivialises or sensationalises subcultural activities. The two mechanisms are not separate, but work in parallel, supporting each other. (ibid.) Gary Clarke warns against understanding incorporation too trivially, as the connection between subcultures and the market is not a one-way street. Moreover, the purported authenticity and creativity of the initial members can easily be over-emphasised. (Clarke 1981.)

As the demoscene is hardly deviant, unless in its relationship to technology, it has not been the target of similar incorporation attempts as, for instance, network hacker culture, which has an inherent element of threat in it (see Taylor 1999; Thomas 2002, 177–219; Alper 2014). The scene does not constitute a notable market, either, so its artefacts have not been productised – even if the skills acquired in scene activities have been put into commercial use, as noted in Section 4.3 and in Publication 3. Traces of ideological incorporation can be observed in mainstream newspapers and websites, where parties have occasionally been portrayed in a somewhat condescending manner in the lines of "thousands of nerds gathered to play games" (some Finnish examples: MTV 2007; 2009; Digitoday 2013).

David Muggleton's (2004) *Inside Subculture: The Postmodern Meaning of Style* was the natural next stop. Compared to Hebdige, Muggleton paints quite a different pic-

ture: instead of well-defined subcultures with their authentic members, we meet people who identify with more than just one group, mix styles and, at times, grow out of a certain style. Muggleton's work represents a new wave of research that has been called *post-subcultural*. Post-subcultural studies typically criticise the CCCS approach, emphasising fluidity and diversity instead (e.g. Clarke 1981; Muggleton 2004, 22–24).

What could a demoscene researcher take home from post-subcultural studies? At least the fundamental thesis that demo-related activities are not the only thing sceners are involved in or identify with: as one example, my previous study shows how graffiti, techno and other types of popular culture have found their way to demos, becoming part of a shared aesthetic (Reunanen 2010, 60–62; cf. Botz 2011, 289–386). A scener's life is no more static than anyone else's: they, too, grow older, move on the socioeconomic ladder, and operate under "real life" pressures, all of which inevitably affect the relationship to the community.

Taking after Muggleton (2004), I wish to bring up the rarely asked question "Who belongs to the scene?". In most studies it seems evident that there are sceners, who subscribe to its values and practices, and then the outsiders. The border between the insider and outsider is necessarily fuzzy, as members join and leave the scene and, at times, come back. What about hangarounds who do not create anything but just visit parties? Does belonging result from a mere personal decision, or does the individual need to be accepted by others first?

One more lens offered by subcultural theorists is the Bourdieu-inspired concept of subcultural capital, which helps to understand how status – in the case of the demoscene, practically equal to fame – is acquired. According to Sarah Thornton (1995):

> Subcultural capital confers the status of its owner in the eyes of the relevant beholder. [...] Just as cultural capital is personified in 'good' manners and urbane conversation, so subcultural capital is embodied in the form of 'in the know', using (but not over-using) current slang and looking as if you were born to perform the latest dance styles. Both cultural and subcultural capital put a premium on the 'second nature' of their knowledges. Nothing depletes capital more than the sight of someone trying too hard.

This short definition alone contains multiple relevant perspectives. First of all, subcultural capital is valuable only in its relevant context: learning to program or getting the latest computer will earn you capital among your peers, but not necessarily anywhere else. Even if "capital" is not part of the scene vocabulary, similar value accumulation can be observed, for instance, in the lame/elite dichotomy and ranking lists (see Section 4.4 and Publication 4).

In his critique of Thornton's work, Sune Qvotrup Jensen (2006) emphasises that social hierarchies need to be taken into account when considering participants' relationship with a subculture. In other words, subcultures cannot be regarded as separate realities where factors, such as one's economic means, gender, and ethnicity, could be omitted. The role of gender in the demoscene has received at least some attention by scholars, whereas other socioeconomic factors less so (see Section 4.4).

Judging by my fieldwork experiences with the Commodore 64 scene, as discussed in Section 1.2, even inside the demoscene there are multiple zones with their own subcultural capitals. The skills and knowledge that I had accumulated, mostly on the IBM PC during the 1990s and early 2000s, did not account for much when dealing with the pioneers who had experienced the formative years of the scene in the 1980s. This example suggests two factors, platform and age, as two axes in the formation of the "zones". Location is likely to be one more, especially in the case of national sub-scenes that may have been little connected to the outside. Thornton (1995) mentions gender as another parameter, but even if the demoscene is a heavily gendered community (Section 4.4), the exact effects of gender are not well known yet: women are not necessarily taken seriously, while at the same they may receive disproportionate attention simply for being female (Roininen 1998, 67–71; Nordli 2003a; Reunanen 2010, 26).

Thornton argues that subcultural capital can be converted into economic capital. She mentions DJs, club organisers, clothes designers, journalists and record industry professionals as examples of occupations where hipness turns into income. (Thornton 1995.) While there are rare examples of commercial demos (Wasiak 2013) and demo competitions can sport first prizes of thousands of euros – not necessarily much considering the required effort –, a more relevant case of capitalisation is the connection with the ICT industry, where underground skills are put into commercial use (see Publication 3). One of the best known links, sceners as game authors, receives further attention in Section 4.3.

4.2 Hackers or Not Hackers

Demoscene activities have frequently been portrayed as and connected to *hacking*, and its members labeled *hackers* (e.g. Saarikoski 2004, 190; Carlsson 2009; Publication 4). However, can such juxtapositions actually be justified, or do they rather rise from a need to explain the scene to the public or connect it to an easier recognisable phenomenon? As a starting point, we can look at a selection of definitions for a "hacker", taken from *The Jargon File* 4.4.7, collected by Eric S. Raymond (2003):

1. One who programs enthusiastically (even obsessively) or who enjoys programming rather than just theorizing about programming.

2. One who enjoys the intellectual challenge of creatively overcoming or circumventing limitations.

3. [deprecated] A malicious meddler who tries to discover sensitive information by poking around. Hence password hacker, network hacker. The correct term for this sense is *cracker*.

The bipolar and elusive nature of the word is evident in these three definitions alone. The programmer-centric one hardly fits the demoscene as a whole, since many participate in other ways than programming. The second one matches the scene ethic of "doing the impossible" rather well: minuscule 1k and 4k intros (Section 5.2) or pushing the limits of an obsolete computer definitely fit this description – like a myriad of other activities ranging from miniature painting to building ships in a bottle would. The third definition refers to the way hacking is commonly depicted in public discourse: harmful and illegal (cf. Taylor 1999, xi–xvi; Thomas 2002; Alper 2014). Notably, crackers are labelled as network intruders here, whereas in the demoscene discourse the use of the term tends to be confined to copy protection removal alone.

Quite obviously, there cannot be a definite answer to whether demosceners are hackers; by one definition yes, by another no. A more fruitful line of thought emerges if we focus on the relationship between the demoscene and the hacker community. No discussion of hacking culture would be complete without Steven Levy's *Hackers – Heroes of the Computer Revolution* ([1984] 2001), which draws a line from the 1950s "true hackers" to the free software movement. It is questionable whether Levy's "game hackers" actually fit the continuum, but that sidetrack will be omitted here.

I analysed *Hacker Ethic*, as outlined by Levy ([1984] 2001, 39–46) already in my licentiate thesis (Reunanen 2010, 27–28) and concluded that some of the principles seem alien from a demoscene perspective. Most notably, free information sharing in the form of demo source code is rare; a magician never reveals his secrets to the audience (cf. Krysa and Sedek 2008). On the other hand, artistic computing, meritocracy and positive change do ring a bell. It is also important to remember that we are dealing with Levy's interpretation: there was no such "Hacker Ethic" taped on the wall at Stanford or MIT for the original hackers' reference.

In contrast, the roots of modern-day open and free software movements can be easier traced to the first hackers (e.g. Levy [1984] 2001; Raymond 1992). Even if the demoscene has been discussed in relation to open source (Ratliff 2007; Carlsson 2008), there is a certain disparity between the practices and values of the two communities. In addition to source code sharing, there is a clear difference in the relationship towards commercial software: while the free/open software movement champions the use of Linux and similar free alternatives, the demoscene has mostly followed the mainstream of computing, sticking to the most common platforms (Reunanen 2010, 100–1; see also Chapter 6).

Jukka Vuorinen's (2007) article *Ethical Codes in the Digital World: Comparisons of the Proprietary, the Open/Free and the Cracker System* offers an insightful point of view to the ambiguous relationship between open source and the scene. Even though Vuorinen deals with crackers, not the demoscene, the model is still largely applicable because of the shared roots of the two. He notes how crackers, in turn, adopted practices from the software industry instead of the hacker tradition, which flourished in a different context (cf. Publications 3 and 5). The commercial side of demomaking and cracking would warrant further study – how do economic principles manifest themselves in hobbyist scenes?

4.3   Gamers: a Complicated Relationship

Sharing the digital domain with other hobbyists has not always been easy for the demoscene, which can especially be seen in its complicated relationship with computer games and game players. In public discourse and academic studies, the scene has often been discussed in the context of digital games – yet another example of a simplified narrative that relates to a topic most people recognise –, while sceners themselves might, at times, have been downright hostile towards gamers. Attitudes

towards games have also varied significantly during the last thirty years, so there is not one single truth on the issue.

As stated in Publication 3, cracker culture is inherently linked to commercial software production: without a constant influx of your fundamental artefact, games to crack, there would be little to keep the community going. Games were not an alien topic in early diskmags either, which featured reviews along the same lines as computer magazines (Reunanen 2010, 121). Based on diskmag discussions, the need to draw the line between the scene and gamers increased together with the growing self-consciousness of the community (ibid., 29–30). The need to distance demoscene activities from game piracy was affected by legal factors as well (Publication 3).
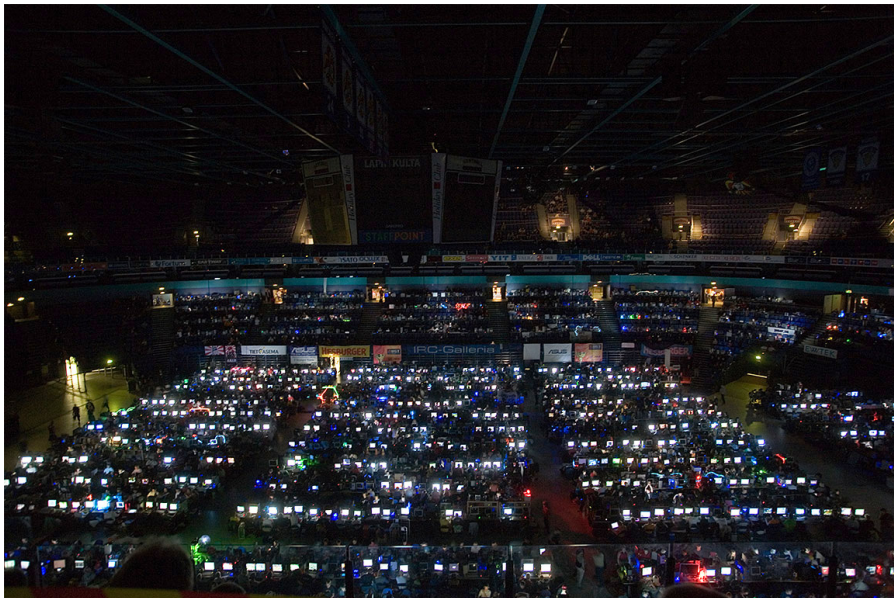
Figure 4.1: The party hall of Assembly 2006 held in Helsinki, Finland. Image courtesy of Nasu Viljanmaa.

Demo parties, with their roots in so-called *copy parties* where early hobbyists swapped software with each other (Wasiak 2012), are among the most long-standing and fundamental forms of demoscene culture (see Nordli 2003; Reunanen 2010, 37–39; Tyni and Sotamaa 2014). Figure 4.1 is an example of how a party place looks like on the inside. Game enthusiasts, in turn, gather to *LAN parties*, which focus on playing networked games, first-person shooters, in particular (Jansz and Martens 2005). Some events that started as purely demo-related have drifted towards LAN parties, which has then led to a kind of power struggle and at least verbal conflicts between the two

groups (Roininen 1998, 126–7; Nordli 2003, 71–91; Reunanen 2010, 37–39; Tyni and Sotamaa 2014). The following quote illustrates the rift as perceived by one scener:

> I'm talking about our beloved species of gamers. Well, the hardcore-gamers, those people we usually call more exactly lamers. (Styx/HcR in Hugi #23, 2001)

The use of the derogatory term *lamer* dates back to the 1980s. It has been used to denote multiple inappropriate characteristics, ranging from people with little skill to wannabes and game players. Traditionally the binary opposite of a lamer has been an *elite*. One apparent sign of change is the nowadays relaxed and even opposite use of the two words, which used to have deep and serious connotations back in the day. (Publication 4.) Levy ([1984] 2001, 115–8) mentions a similar division into *winners* and *losers* among the early hackers.

One more well-known connection between the scene and games comes from the game industry. There is plenty of evidence concerning the demoscene roots of a number of notable game companies, such as Remedy, Housemarque and DICE (Saarikoski and Suominen 2009; Reunanen, Heinonen and Pärssinen 2013; Sandqvist 2012; Jørgensen, Sandqvist and Sotamaa 2015), so the link surely exists. Along the same lines, popular discussions repeatedly mention sceners' successful careers in the industry (for some examples, see Kauppinen 2005; Lappalainen 2015, p.11). Even the influential *Pouet.net* and *CSDb.dk* websites, which do not otherwise focus on games, feature categories for games created in the context of the demoscene. Furthermore, parties have served as recruitment opportunities for ICT companies (Tyni and Sotamaa 2014).

While some demoscene members, indeed, joined the game industry and founded their own studios, many others did not. One of my main points in Publication 3 is that the narrative leading from the unknown digital underground to a respectable career is a trivialisation, which reduces demoscene activities to something that they are not by nature. The question "What became of demosceners?" might not even be relevant here, as it is based on the assumption that the years spent on scene activities were merely a passing phase. Demos have meaning and value to their creators and audience on their own, without any need to present them as a preschool for the industry (cf. Saarikoski 2004, 205). Such easily digested explanations can be considered as a form of incorporation, as discussed in Section 4.1 above.

4.4 Defining Features

There are certain defining, interrelated features that have coloured most demoscene activities throughout the three decades. I provide here an overview of some of the most central ones in order to provide a foundation for later topics. One characteristic trait is high regard for skill (Publications 1 and 4). The most obvious skill is programming, fundamental for demos' existence in the first place, but also "softer" abilities, such as graphic design and music composing are valued and necessary. There seems to be a certain tendency to favour and emphasise these three skills, which all represent authorship; according to the laconic comments by equally hard-working swappers, their competence has been less appreciated (Publication 3).

If there were a "Scene Ethic", in the lines of the Hacker Ethic as described by Levy ([1984] 2001, 39–46), it would certainly encompass hardware pushing and doing the impossible; such themes pop up in all of the articles that constitute this work. In particular, Publication 2, dealing with four kilobyte intros, shows how much effort has been put into the tools and techniques needed for creating those minuscule artworks. Hardware pushing is much less of an issue on today's powerful computers, but it still continues on the old school platforms, such as the Commodore 64, Amiga and ZX Spectrum, and alternative devices, such as game consoles and embedded computers (see Section 6.2).

Proving oneself requires a do-it-yourself attitude and display of mastery. Using Sherry Turkle's (1984, 104–10) model, control-obsessed *hard mastery* seems to be better aligned with the demoscene's views than the more subjective *soft mastery*. Cutting corners by using others' code and content with and especially without permission – *ripping* – has traditionally been condemned (Publications 1 and 4), which is also another example of how sharing in the demoscene should not be lightly equated to the free/open software ideology. On the other hand, the focus on activity, concrete doing, is not unlike hacking with its obsessed programmers and hardware hacks, more recently branded also as *DIY* culture (Levy [1984] 2001; Schäfer 2011).

It is hardly exaggeration to call the demoscene a *meritocracy*. Competition, hierarchy and fame can be observed in diskmags' ranking lists, party competition results, and demos' greetings lists alike. (Reunanen 2010, 33–36.) Competition does not take place only under the hood, but it is made explicitly visible and commonplace. Similar attitudes have been observed in other forms of male-dominated digital culture, such as hackers and gamers (Levy [1984] 2001, 43–45; Thompson 1984; Turkle 1984,

210; Håpnes 1996, 136; Jansz and Martens 2005). Turkle (1984, 201–2) and Roininen (1998, 65–66) propose obsession and competition as two factors that sway women away from such social circles.

As shown in previous studies, the scene has traditionally been a male domain (e.g. Roininen 1998, 65–70; Saarikoski 2001a), like computer hobbyism, in general (Haddon 1990; Thomas 1991, p.xvi–xvii; Saarikoski 2004, 167–86). Such imbalance has unavoidably affected its values and practices in a number of ways. As mentioned above, competition is one factor that is frequently present in male computer use – at the same time keeping in mind that there is no evidence that women, too, would not compete in their respective hobbies. Other depictive examples can be seen, for example, in the imagery produced by the scene; *Freax: The Art Album*, a collection of visual artworks, illustrates how masculine male and seductive female figures keep repeating throughout the years (Vigh and Polgar 2006). At the same time, the representations mirror contemporary popular culture, which is already gendered and eroticised in itself (e.g. Nikunen, Paasonen and Saarenmaa 2005).

It is challenging to count the number of people who have been involved in the scene; there is not enough information to begin with, and the very definition of who is or was a participant is a complex issue on its own. In spite of the problems involved, it is still valuable to at least try to estimate the magnitude of the phenomenon. Again referring to online databases, *CSDb* features (as of July 2016) 26,879 sceners and 8,289 groups, whereas *Pouet.net*'s figures are 21,456 and 11,922. The Amiga-centred *ExoticA* has 1579 groups in its collection. There is, obviously, heavy overlap between the three, but based on these numbers it seems reasonable to say that we are talking about tens of thousands of people at minimum.

When considering other relevant demographic factors, nationality comes next. United States is the home of a significant number of computer and game console models, and also the cradle of several forms of digital culture. Because of that, it is tempting to emphasise the American perspective to historical developments. To counter an unbalanced Americentric view, local histories focus on other, less studied geographical regions (e.g. Wasiak 2010; Alberts and Oldenziel 2014; Stachniak 2015). The danger in demoscene research is rather the opposite: as we are dealing with a mostly European phenomenon (see Reunanen 2010, 24–25), it could be easy to fall for Eurocentrism and overlook the importance of external influences that have left their mark here. As an example, Wasiak (2014a) has shown that there were active connections between at least the US and Europe during the formative years of game piracy.

International networking was part of demoscene practices even in the pre-Internet days and even more so nowadays. To facilitate communication, English became the lingua franca of the scene, as can be observed on its websites, disk magazines, party advertisements, and usenet discussions (Reunanen 2010, 42–43). Having said that, contents produced in local languages, such as German, Russian or Finnish, are not rare either, especially if the intended target audience is local. The roots of the internationalism are not hard to track: cracker culture ran on swapping, and games needed to move across borders – even the Iron Curtain (Jakić 2014; Wasiak 2014b; Stachniak 2015). As the practices and channels were already there, the demoscene inherited them as it started becoming increasingly independent (Publication 3).

Chapter 5

Artefact Point of View

Studying the demoscene without looking at demos could be compared to studying impressionism without looking at paintings; even if artefacts are not the main focus of this thesis, omitting them would be unthinkable. The very name of the community, the *demo*scene, suggests an intimate connection between the community and its artefacts. It is also important to understand the plurality of demoscene productions: in addition to demos there are intros of various sizes, music, short films, graphics, disk magazines and games, just to name a few. From a research point of view all of them can be thought of as small repositories where internal meaning-making manifests itself. These "lesser" works have received little attention from scholars so far, in spite of their continuous popularity. Publications 2 and 5 aim at closing this gap by describing two kinds of artefacts in depth.

Susan M. Pearce defines artefacts as "objects made by man through the application of a technological process" in her book *Interpreting Objects and Collections*. She adds that in practice the term is reserved for movable pieces and inorganic or dead materials. (Pearce 1994, 125–32.) The definition represents a museological angle and is tied to physical objects, which software, consisting of intangible bits controlling a computer is not (cf. Schäfer 2011, 64–66). Traditional storage media, such as cassettes or floppy disks, do have a physical dimension to themselves, but even in that case we are interested in their content rather than the construction of the medium itself – with the exception of disk cover art (for examples, see Vigh and Polgar 2006, 17–34).

As noted already in one of the first academic papers on the scene, George Borzyskowski's (1996) *The Hacker Demo Scene and Its Cultural Artifacts*, demos are cultural

artefacts, which reflect the changing values and practices of the community. Even though his perspective of the demoscene as a form of cyberculture mainly echoes the 1990s contemporary discourse, Borzyskowski rightly brings up the communicative role of demos. Likewise, crack intros, as discussed in Publication 5, are cultural artefacts that serve almost identical purposes, with the extra dimension of software piracy.

Demos are not created in a vacuum; in addition to reflecting the particularities of the community, they are also heavily affected by the technology and popular culture of their time. Out of the two external factors, it is somewhat easier to observe technical changes: the capabilities of contemporary machines and authoring tools, augmented by creative misuse, can be traced in the audio-visual works produced by the scene (see Reunanen 2010, 79–96; Botz 2011, 45–288). As one concrete example, circumventing the colour limitations (often called "colour clash") of the Sinclair ZX Spectrum is characteristic for demos and still images on that particular platform. For some instances of such artworks, see *Freax: The Art Album* (Vigh and Polgar 2006, 173–84) or the *Demotopia* site (Westcott 2001).

Analysing the effect of pop culture trends on demos is not quite as straightforward, even if on the surface we can easily observe heavy metal and graffiti inspired logos, references to movies or games, and the appearance of various musical genres, in particular electronic music. Compared to a handful of different computing platforms with their technical properties, popular culture is a vast phenomenon, whose indirect, synthesised and subconscious traces in demos cannot possibly be revealed in their entirety. In addition to Botz's (2011) extensive thesis, there are a handful of other attempts at revealing the aesthetic origins of the scene (Carlsson 2009; Menotti 2009; Reunanen 2010, 57–62; Peeters 2013; Hartmann 2014).

A road even less travelled is studying the effect of social and political factors on demoscene artefacts – or the community itself, for that matter. Again, as rather exceptional cases we can find demos with a "message" (Figure 5.1), but in general the scene has been notably apolitical. At this point, I can only offer initial thoughts as to why: youth cultures generally tend to distance themselves from their parent culture, where politics also belong, and, in the case of the demoscene, political arguments could also be detrimental to its international nature. Even in the presence of recognisable, charged symbols it is not necessarily evident whether they represent authors' actual opinions or just stylistic play (Reunanen 2010, 48). The most common politically-coloured theme addressed in related research has been the interaction between West

Figure 5.1: Political messages in demos. On the left *Red Storm* (1992) by Triad criticising the Swedish prime minister. On the right retelling Estonian history in *Fairytale* (1994) by On the Oath of Styx.

European and Eastern Bloc countries during the Cold War, in the form of software piracy and, to a lesser extent, the demoscene (see Section 6.2).

5.1 Demos Are Software

We know by now that demos are computer software that runs real-time. Breaking down and moving beyond this simplistic definition reveals new dimensions in them and opens new possible directions for research. What does it imply that demos are "real-time"? How are they created, and what are their building blocks?

When trying to explain the essence of demos, the real-time aspect is often mentioned as a defining trait. Demos have at times been compared to music videos (Scheib et al. 2002; Saarikoski 2004, 190), and the two formats do, indeed, share certain properties: both are typically non-interactive audio-visual presentations that last for a few minutes. For an outsider, some demos might well pass for music videos, as they share the same aesthetic as their MTV counterparts. The real difference is on the inside: videos are edited and rendered offline and played back as a sequence of still images, whereas demos display their audio-visual content on the run, as the execution of the program proceeds. This difference alone sets the two formats far apart in both technical and conceptual terms.

That said, the distinction between offline animation and real-time graphics is not always trivial and, as Doreen Hartmann (2014) has shown, it is also subject to constant renegotiation. The demoscene ethic manifests itself in this dichotomy; offline rendering does not provide for a similar display of wizardry as accomplishing the same

visual effects in real-time on limited hardware or in limited size. In practice, most size-constrained productions categories make it downright impossible to incorporate pre-rendered images or music, let alone video (Publication 2).

Digital programs stored on a floppy or other medium only come to life when they are run: the files themselves are a "demo" only in a narrow sense, as the actual experience springs from executing them on a suitable hardware and software platform. Even seemingly minor changes, such as a different version of the operating system, might stop the production from working (Publication 2). This sort of fragility, inherent in developing technologies, is by no means unique to demos: similar challenges have been met in business software and games alike (e.g. Newman 2012). Possible solutions to these problems receive further attention in Section 5.3 below, where I discuss demo preservation efforts and strategies.

The distributable form is only a part of the lifecycle of a demo. In almost all studies so far, the focus has been on the "final" outcome as seen by the audience, and the development process has been omitted (for some opposite examples, see Brodersen Hansen, Toft Nørgård and Halskov 2014; Kemppainen 2014; Publication 2). That a demo first exists in a human-readable source code format, before being compiled to an executable file, provides unexplored angles to their analysis (cf. Krysa and Sedek 2008). In effect, such an approach would fall under the emerging paradigms of software and critical code studies, as proposed by Manovich (2001, 48; 2013, 10–20), Marino (2006) and Fuller (2008). According to Manovich's (2001, 48) definition:

> To understand the logic of new media we need to turn to computer science. It is there that we may expect to find the new terms, categories and operations that characterize media that became programmable. From media studies, we move to something which can be called software studies; from media theory – to software theory.

In his later account, Manovich (2013,10) steps back from pure computer science and adds the effects of cultural, social and economic factors to the scope of software studies. Likewise, *Software Studies: A Lexicon*, a collection of critical essays from 2008 shows how different perspectives are possible when discussing software (Fuller 2008). Schäfer (2011, 65–66) goes even further in his *Bastard Culture!*, stating that it is nearly impossible to separate technology and culture when dealing with software, as they are both so fundamentally connected to users' activities.

In addition to code, there is a need for music, still images, 3D graphics and other media objects, also known as *assets* in other contexts of content production. The tools and processes involved in their creation are as little documented as programmers' efforts so far. I took a glimpse at the tool aspect in my licentiate thesis (Reunanen 2010, 97–99), but the sample represents only one moment in time – for instance, software used in the 1980s was completely different. In spite of technological change, the long-standing tripod of demo making, code–graphics–music, is embedded in the scene's practices in various ways: credits for a demo chiefly refer to these duties, and competitions at parties let sceners compete in these particular skills. Other roles do exist, but they are hardly as definitive and stable (ibid., 32; Publication 3). How you identify yourself is, first and foremost, defined by what you *do*.

5.2 Dual Nature of Categories

There is a clear and somewhat understandable tendency to focus on demos when discussing the scene and its artefacts, but at the same time such simplification occludes the actual variety of works. "Demos" alone can be divided into subcategories, in addition to which there are images, music, animations, group t-shirts, party flyers and many other artefacts produced by the enthusiasts; some digital, some physical. In this section I look into the taxonomies created by the scene, their origins and effects, and other possible ways of classifying the works, in particular the ontologies developed by Canan Hastik and her colleagues.

Let us start with a concrete case, the taxonomy of productions as seen in the active *Pouet.net* website, which I have divided into subcategories (in bold) for better readability:

- BBStro

- **Collections**

    - artpack, demopack, diskmag (disk magazine), musicdisk, slideshow

- Cracktro (crack intro)

- **Demos**

    - demo, dentro (demo-intro), fastdemo

- Demotool

- **Fixed-size intros**

  - intro, 256k, 128k, 100k, 96k, 80k, 64k, 40k, 32k, 16k, 8k, 4k, 1k, 512B, 256B, 128B, 64B, 32B

- Game

- Liveact

- **Party-related**

  - invitation, report, votedisk

- Procedural graphics

- Wild

Pouet.net only accepts executable productions, with the exception of videos, so music, images or other non-executable works are excluded. The categories are not mutually exclusive; for instance, an *invitation* can also be a *demo* or an *intro* at the same time. At least the following three factors can be observed in the taxonomy: size, content and function. For those entries that do not fit any other category, there is a "miscellaneous" slot, *wild*, featuring mostly videos, but also hardware hacks and other hard-to-classify experiments. Another relevant detail is how *Pouet.net*, too, recognises the cracker–demoscene connection by including crack intros as one production type.

Other sites follow their own criteria, and at *CSDb* we can find several other categories and subcategories not seen in *Pouet.net*: paper magazines, game cracks, still images, and even BBS software. The differences partially reflect the personal choices of the website maintainers, but more notably the practices of the Commodore 64 scene. The presence of piracy-related content is evident both in their production taxonomy and the possible roles the users can choose for their profile. Crackers, importers, original suppliers and NTSC-fixers who modified American games to run on European machines are all rooted in the reality of the 1980s international software piracy (see Wasiak 2014).

How are these taxonomies formed? First of all, it is necessary to keep in mind that they are never stable or final. The community negotiates and renegotiates the definitions when the technological landscape changes, and new types of artefacts emerge

and establish themselves. Some of the categories presented above are posthumously defined, as the original authors did not necessarily think of their work in the same terms. I present one case of such labelling in Publication 2, which deals with 4k intros. The first "4k intros", as categorised by *Pouet.net* users, were neither 4,096 bytes nor created with such a title in mind. A great number of crack intros would technically satisfy the requirements of a 4k intro, but due to their different cultural context and purpose, they go with a different label.

In contrast to posthumous definition many, if not most, productions are created to specifically meet the criteria of an existing category. I call this the *dual nature* of demo categorisation: an emerging activity is canonised, after which the definition takes a life of its own and starts dictating the activity. Demo parties have played an important and active role in these definitions, as they publish beforehand their competition rules stating the allowed file sizes, platforms and, on a general level, the content (e.g. racism or pornography may be forbidden). Referring again to Publication 2, competition rules are also subject to change: initially, 4k intros were silent, but later music became an integral part of the intros when the rules started allowing sound. Likewise, the maximum acceptable size for a demo has been on the rise throughout the history of the scene (Reunanen 2010, 46). Later on, taxonomies have been defined and refined by online archives to facilitate structured browsing.

Demo researchers have, by and large, taken the existing taxonomies at face value, which is also justifiable if the interest lies only in how the participants themselves view the artefacts. The most notable exception comes from Hastik, Steinmetz and Thull (2013), who propose an ontology for real-time audio-visual art, demos in particular. Their starting point is the standardised *CIDOC Conceptual Reference Model* (CRM), defined in ISO 21127:2006 and further revised in ISO 21127:2014. Their ontology consists of similar entities as stored at, for instance, *Pouet.net* (production name, platform, authors, group etc.), but their relationships are also clearly defined: something that might appear evident for an "insider", but needs to be done for systematic archival. When trying to address all the properties of a demo, the shortcomings of the *CIDOC CRM* become evident, as it cannot encompass the required hardware platforms or the real-time aspects of computer software. (Hastik, Steinmetz and Thull 2013.)

5.3   Demo Preservation

30 years in the digital domain is a little eternity – it is hard to comprehend the difference in the computational power, communication networks and storage media that

were available to consumers now and then. Quickly evolving technology has rendered old platforms and their software mostly useless for everyday purposes, but at the same time it has also enabled us to better preserve the old in the form of archives, emulators and reliable long-term storage. From this perspective, demos are no different to any other software. Digital games are a close relative as they, too, are audio-visual software running on the same hardware. Therefore, the tools, methods and discourse dealing with game preservation offer a valuable comparison point. Another closely related topic is the preservation of media art, even though demos mostly run on standard platforms, as opposed to physical installations that cannot be archived by simply duplicating their bits.

The scene, being a self-conscious community, has actively preserved its own digital cultural heritage for quite a while already. Such efforts are crucial for the researcher, since otherwise there would be little hope of accessing the artefacts, but they also reveal how the community values its own history and tries to ensure its continuity. These days the archives are, naturally, online and accessible to anyone who is interested and knows where to look. Some repositories host both information and files, while some are pure file archives or demo databases by nature. Another difference is that some sites are platform-specific, while others aim at covering all the platforms. The following, non-exhaustive list describes some of the most notable preservation sites I have come across during this research (some of them are already inactive):

- *Amp.dascene.net – Amiga Music Preservation*, a database of Amiga music and musicians.

- *Csdb.dk* – A Commodore 64 specific site with productions, information, discussion and scener profiles.

- *Demozoo.org* – A demo database which, unlike *Pouet.net*, also includes music and graphics.

- *Exotica.org.uk* – The host for multiple retro computing related subprojects, including Amiga groups and demos, and Commodore 64 groups.

- *Files.scene.org/ftp.scene.org* – A large file archive hosting demos and related artefacts for multiple platforms.

- *Intros.c64.org* – A site dedicated to Commodore 64 crack intros, coupled with files and discussion.

- *Pouet.net* – An active multiplatform demoscene site with discussions and a large demo database.

- *Zxdemo.org* – Aka. *Demotopia*. A Sinclair ZX Spectrum scene specific database.

Even if all of the above sites in effect contribute to demo preservation, they are not necessarily history-oriented per se. Distributing and discussing contemporary productions might be their primary purpose, and the preservation more of a by-product. The physical, non-digital heritage of the scene has not been conserved even nearly as extensively, but the recent *Got Papers?* initiative by Gleb J. Albert (2015) is specifically focused on that.

In addition to Hastik and her colleagues' work, there is little academic research on systematic demo preservation. In my licentiate thesis (Reunanen 2010, 102–3), I briefly address the topic, based on the views of Bruce Wands (2006), Mark Tribe (as quoted in Paul 2007), and the UNESCO-published *Charter on the Preservation of the Digital Heritage* (2003). Borrowing from Wands and Tribe, who both represent the field of media art, I consider the following four approaches to demo preservation:

1. Migration to new platforms

2. Emulation

3. Documentation

4. Recreation

Kam Woods and Geoffrey Brown's *Virtualization for Preservation of Executable Art* charts the possibilities of emulation in the case of executable art, demos in particular. At the same time, their work also represents a rare American perspective on the scene and its artefacts. Based on the evaluation of 250 demos created for various legacy hardware (and software) platforms each, they highlight the importance and high quality of open-source emulators. Already in 2008 most tested productions ran fine on C-64, Amiga, and Atari ST(E) emulators, while the results for the IBM PC compatibles were less impressive. They also discuss the challenges involved in automatic metadata extraction, as demos are not distributed in uniform file formats and the information stored with them is not necessarily machine readable. (Woods and Brown 2008.)

Another common practice in place today is rendering demos into standard video files, which facilitates their viewing on modern-day devices without the actual hardware or software. As can be seen on *Pouet.net*, *YouTube* is currently the most popular channel for distributing the videos. Not only productions running on exotic or retro hardware receive such treatment, but new demos, too, are frequently captured for non-real-time viewing. While this approach is practical and preservation oriented, it goes against the long-standing notion of demos as real-time art. Furthermore, watching a 30 fps (frames per second) video capture on today's 60 Hz flat screen is far from an authentic experience if the original work was created for a 50 Hz CRT-based video monitor (cf. Lowood 2013).

There has hardly been a need for *recreating* old productions on new platforms, due to aforementioned high-quality emulators and video captures (cf. Woods and Brown 2008). The most common old demo platforms were sold in millions and, thus, have not yet disappeared in spite of their ageing (see Section 6.2). There are, however, some curious examples of remaking demos for other, less capable machines in the name of homage and showing off, which, instead of recreation, we could label *retrocreation*. The purpose of such remakes is clearly not preservation, as the target platforms themselves are technically outdated from today's perspective and, therefore, do not make the content any more future-proof than the original production. Figure 5.2 is an example of how *Second Reality*, an iconic PC demo, was remade for the Commodore 64 and Atari ST. In addition to the remakes, there are also parodies of the demo, such as *Sqrt(2) Reality* (1996), created by the pseudonym "Future Screw".
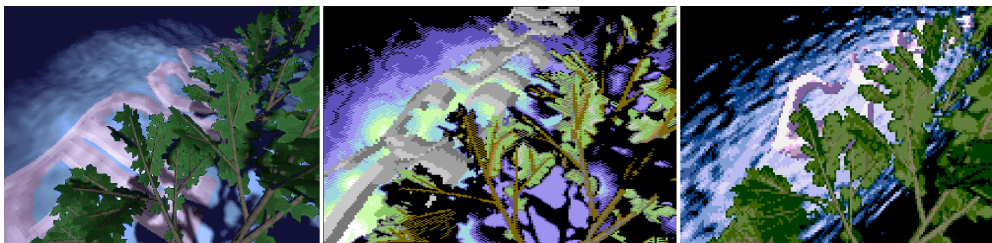
Figure 5.2: *Second Reality* (1993) by the Future Crew running on IBM PC compatibles, *Second Reality 64* (1997) by Smash Designs and The Obsessed Maniacs for the C-64, and *Second Reality 2013* by Checkpoint for the Atari ST.

In the current absence of conclusive demo-focused takes, it is necessary to look into related contexts for theoretical discussion. James Newman's (2012) *Best Before*, dealing with digital game preservation, serves as a good foundation because of its comprehensive approach. Computer and video games are in many respects similar to demos,

even though they also contain unique factors that do not concern us: elaborate packaging, instructions and interactivity are usually of little concern when dealing with the latter. With the exception of so-called *dynamic demos,* scene productions generally display the same content each time, whereas a game experience only comes to be through interaction and is not identical to each user. A walkthrough video of a game is, therefore, a considerably poorer representation than a similar capture of a demo.

The most evident challenges, deteriorating storage media ("bit rot") and dying hardware, are only one part of the picture, and not equally relevant for productions of different ages. These days, as demos reside in mirrored online archives, such as *Scene.org*, the possibility of completely losing an artefact is extremely low compared to a pile of floppy disks that have matured 30 years in a garage. Compared to games, demos do not suffer from disappearing online content because they tend to be self-contained, whereas games face the risk of becoming obsolete when a company decides to take unprofitable servers offline (see Newman 2012, 22–26). Another notable difference springs from the commercial and proprietary nature of video games: to curb piracy, game companies introduce various Digital Rights Management (DRM) measures, which are further supported by stringent copyright legislation that makes it legally impossible to create archival copies (Anderson 2011; Newman 2012, 137–9).

Current game preservation efforts have largely been undertaken by hobbyists. On the one hand, Newman recognises the crucial importance of fan efforts, but on the other hand, he is also critical of them, as the activities are chiefly personal motivation driven, which is a potential risk for their longevity. (Newman 2012, 26–31.) I have observed similar traits when compiling the *Videogames.fi* database on commercial Finnish games: hobbyists collect and preserve what they find interesting to themselves (Reunanen, Heinonen and Pärssinen 2013). In the case of the demoscene even more so, since there is little commercial gain involved, coupled with equally little recognition from memory institutions so far.

Chapter 6

Facing Technological Change

Over its three decades, the demoscene has undergone considerable technological transitions: starting from the 1980s home computers with 64 kilobytes of memory, processors of a few megahertz, and BASIC interpreters, we have seen a move to gigabytes, gigahertzes, 3D accelerators, and sophisticated graphical user interfaces. The development is far from over, so today's computers, too, will eventually face obsolescence and appear as hopelessly underpowered compared to the platforms to be. At the same time, the same "obsolete" hardware obtains an aura of nostalgia, coloured by personal memories and history that new machines do not yet possess (see Suominen 2008).

Already at the beginning of my research, I came to think of the demoscene as an example of the adoption of microcomputers (also known as *appropriation*, *diffusion*, or *domestication* depending on the context). The already a notable body of research on how people adopt technology and innovations in general provided a fitting frame of reference for analysing similar processes in the case of the demoscene and its machinery; the original hardware engineers could not possibly have anticipated all the uses their designs were put into. The computers were also not built with a thirty-year lifespan in mind. As many of the original manufacturers are long gone, and the platforms in question have not been commercially viable in quite a while, it is only due to the efforts of dedicated hobbyists that a machine survives to this day.

By a strictly technical definition, a computer is a piece of programmable hardware that is capable of executing its dedicated software. At the same time, it is much more than that: a cultural artefact laden with history, practices, meanings, memories, users, and their communities. Before a computational device became all that, it had to go

through a series of transformations that concurrently shaped both the machines and their users. Studying the demoscene and its relationship towards its computers, we can build one more perspective on this co-construction in a specific context coloured by competition, creativity and constant technological change.

6.1 Becoming a Home Computer

The general history of computers and video game consoles has already been discussed by a number of authors (e.g. Ceruzzi 2003; Forster 2005; Gere 2008; O'Regan 2008). In the historical perspective the demoscene is clearly a child of the home computer boom, which started in the late 1970s in the form of the Apple II, Commodore PET, and TRS-80, all introduced in 1977 (see Ceruzzi 2003, 264–6). A necessary prerequisite for the advent of personal computers was the invention of the integrated circuit by Jack Kilby in 1958, which later on led to the first commercially available general-purpose microprocessor, the 4-bit Intel 4004, in 1971 (ibid., 183, 220).

In a matter of just a few years, the home computer market became populated by a colourful selection of mutually incompatible offerings from different manufacturers, most of which would disappear equally fast. Computers had already found their important uses in a variety of technical and commercial tasks, but it was less evident what an ordinary household could do with one. According to Saarikoski (2004, 88–90), early ads emphasised that learning to use a computer would be an essential skill in the future. Such rationalisation was obviously aimed at conscious parents in order to legitimise the purchase, although, in reality, games were a common use for the machines (Haddon 1988; Saarikoski 2004, 211; Lean 2014).

Leslie Haddon's *The Home Computer: The Making of a Consumer Electronic* from 1988 is among the earliest critical takes on the history of home computers. Starting from a technical history that led to the creation of microcomputers, Haddon moves on to the roles of enthusiasts, retailers, the press and advertising in shaping what would eventually become the home computer. In the transformation, the manually assembled "black box" of early technically capable hobbyists was turned into a purportedly user-friendly, affordable commodity for the masses, and sold with prepackaged software. (Haddon 1988.) The juxtaposition between productivity vs. "useless" entertainment bears striking resemblance to the demoscene's discourse on different platforms, and has most likely influenced the latter at least indirectly (Section 4.3, Publications 1 and 4).

Along the same lines, Christina Lindsay emphasises the role of the user community in preserving and expanding the Radio Shack TRS-80, one of the earliest commercially produced home computers. The TRS-80 was introduced in 1977 and discontinued in 1984. From early on, enthusiasts participated in the construction of the potential uses and group identity using the Apple II, another popular contemporary, as their reference. After the commercial obsolescence of the TRS-80, only a small portion of the early users stayed in the community – but they did. (Lindsay 2003.) Even if the TRS-80 never was a popular demo platform, Lindsay's findings resonate with my observations on the demoscene and its machines, as discussed in the following sections.

When considering the imaginary, potential and actual uses for a computer, the concept of a *technological script*, originating from the field of semiotics, offers a suitable theoretical lens that brings together artefacts, designers, users, and the context of use – owing to Latour's actor–network theory, technological objects are considered as participating actors among others in a network. As defined by Madeleine Akrich in *The De-Scription of Technical Objects* (1992): "[...] technical objects define a framework of action together with the actors and the space in which they are supposed to act." Designers make assumptions on users' needs and behaviour, which is why the outcome of the design, the product, contains a "script" that purports a certain kind of use (ibid.).

Users are not confined only to the possibilities that have been scripted into an object, but they, too, actively participate in shaping technology – if it were not so, we could observe curiously uniform patterns of use with next to no innovation from the user side (see also Section 6.3 for discussion on reinvention). To casually expand on the concept, marketers and educators, likewise, "re-script" products following their own agenda, as is evident on Haddon's (1988) account on the introduction of the home computer. Finally, the end users and their communities construct their own scripts in ways that the original designers had no way of anticipating, like in the case of text processors, learning tools and games machines that were turned into platforms for demos.

6.2 Demo Platforms: What, Where and Why

The software piracy that emerged on the Apple II in the US during the early 1980s already featured a number of familiar traits that can be observed later in the European cracker and demoscenes: instead of their real names pirates used handles, they formed

groups, and modified game title screens for their own purposes (Figure 6.1). There is some evidence that the later American Commodore 64 pirates were aware of their predecessors, but the link from Apple II piracy to the European circles has proved hard to establish (Publication 5). Based on the memoirs of Kevin Savetz (2012), a formerly active game swapper, game copying was equally common on the Atari 8-bit computers, such as the Atari 800.

Figure 6.1: A defaced game title screen from the *Apple II Crack Screens* archive (Scott 2003). The "Racketeers" logo has been added to the bottom of the screen.

In spite of the popularity of Apple, Atari and Sinclair computers, when it comes to the early demoscene, there is one company above all others: Commodore International. Founded in 1954 as a typewriter manufacturer, Commodore moved on to calculators and eventually into the computer business, producing the PET line of personal computers, the VIC-20, C-64, and finally the Amiga series (Bagnall 2005). The iconic C-64 was widely popular both in the US and Europe, and by and large the cradle of organised cracking and the demoscene. The Amiga was a natural upgrade to Commodore fans, in particular when the affordable A500 model was introduced in 1987 and followed the C-64 as the most active demo platform until the early 1990s (Reunanen 2011; cf. Maher 2012, 171–205).

The growing pressure from the IBM PC compatibles (at times labelled "PC clones"), coupled with internal struggles led to the bankruptcy of Commodore in 1994 (Bagnall 2005, 536–48). The bankruptcy was a clear turning point for the demoscene, let alone the worldwide Amiga community. Even if the scene did not immediately aban-

don the Amiga, the writing was on the wall: either stay with your aging computer or move to the new dominant platform. Almost coincidentally the old competitor, Atari, ceased its computer business in order to focus on the failed Jaguar game console (1994), which ended up being its last attempt in the hardware business (Forster 2005, 150–51) – the home computer age had come to an end.

Demos and crack intros on the PC compatibles date back to the 1980s, but they gained popularity as demo machines only towards the mid-1990s. It is problematic to even talk about "the PC" as a single entity, since its original hardware from 1981 is so vastly different to today's. A similar gap exists on the software side: the rudimentary command line of MS-DOS has been replaced by a WIMP-based graphical user interface with direct manipulation (see Shneiderman 1996) and several layers of abstraction sitting between the user and the underlying hardware. The gap also is reflected on *Pouet.net*: MS-DOS and Windows productions are placed in separate categories, even if the hardware was exactly the same for multiple years when the two overlapped in the market.

Ian Bogost and Nick Montfort, the editors of the *Platform Studies* series, approach the problematic of defining a "platform" through a layered model consisting of platform, code, form/function, interface, and reception/operation, all of which reside in a cultural, social, economic and historical context. They acknowledge the dual nature of the term: both hardware and software can be considered a platform, "the abstraction level beneath code". (Montfort and Bogost 2009, 145–50.) Another definition, found on their *Platform Studies: Frequently Questioned Answers*, is simply "[an] underlying computer system" – again reflecting the same layered way of thinking about platforms (Bogost and Montfort 2009).

As of June 2016, *Pouet.net* features productions for as many as 90 named platforms. Among the most commonly known machines and operating systems there is also a number of exotic ones with a handful of productions. To name a few, demos have been created for the Soviet-built BK-0010 computer, the NeoGeo Pocket and Nintendo Pokémon Mini handheld consoles, and even the built-in script language of the *mIRC* chat software. Furthermore, the "Wild" category contains various unique hardware hacks or marginal gadgets with perhaps just one production, so the actual number of demo platforms is likely noticeably larger than 90. While the majority of demos are made for mainstream computers and operating systems, there is also clear push to conquer more marginal ones, although such efforts tend to remain isolated curiosities.

Even if they are not part of the focus of this study, there is no denying that commercial and political factors have played an important role in, first of all, where the demoscene was born: Commodore strongholds largely overlap with especially the early cracking activities, but much more can be said on the locality of scenes. For example, The Netherlands, where MSX compatible computers had a high market share, fostered a local scene with its own particular practices (Reunanen 2010, 41). A much more notable watershed was, however, the Cold War with its Iron Curtain that hindered, yet did not completely stop, the exchange between Western and Eastern enthusiasts until the early 1990s.

The Coordinating Committee for Multilateral Export Controls (CoCom or COCOM), founded shortly after the Second World War, was the Western Bloc's instrument for controlling the export of high technology to the Soviet Union and its allies. Computers were among the CoCom regulated goods, which severely limited the sales of high-performance devices, including Japanese products, to the East. (Cain 2005.) The restrictions were not, however, static, and sufficiently old technology could be exported, which created curious pockets around computer brands and models that had either failed in or already faded from the Western market. Some examples of those, as seen on *Pouet.net*, are the Hungarian Enterprise and Commodore Plus/4 scenes, and the Polish Atari 8-bit scene.

In addition to state-run shops, many Eastern hobbyists got their computers through technically illegal channels, for example from flea markets and "bazaars" where you could purchase machines and software that were unofficially imported from the West (e.g. Jakić 2014; Wasiak 2014b). Another way of coping with the low availability of personal computers was to build one on your own: makeshift companies, clubs and capable individuals designed and built both hardware expansions and complete kits, again giving rise to curious local scenes, some of which still exist. Western home computer designs were often used as a starting point, such as in the case of the Russian Sinclair ZX Spectrum clones (Lean 2014; Stachniak 2015).

Much remains unknown about the East–West interchange of games, demos and hardware during the Cold War. In the big picture such connections are part of a larger phenomenon of unofficial distribution channels, black markets and Western media consumption in Eastern Bloc countries (e.g. Kern and Hainmueller 2009; Loveless 2009). It is only recently that scholars have started to unearth and analyse the digital underground, as exemplified by the *Hacking Europe* compilation consisting of various studies on the topic (Alberts and Oldenziel 2014). From a demoscene point

of view the emergence of the Eastern European scene, with its similarities and differences to the Western one, highlights the international nature of the community and its strict – but not altruistic – focus on its own activities instead of world politics.

It is worthwhile to consider a demo platform a *process* rather than a piece of hardware or software with its technical characteristics. The complex mechanics of the market make a platform available in a certain context, where a community evaluates the product's compatibility with its needs, values and practices, and, eventually adopts or discards it. The narrative that started emerging from the study of the demoscene seemed by no means unique to it, so the next logical step was to look into theories of how people adopt technology in general.

6.3 Models of Adoption

The *diffusion of innovations* theory, proposed by Everett M. Rogers (2003), is the framework that has most shaped the analysis of technology adoption in this study. First published in 1962 and revised multiple times after that, the diffusion theory offers a number of models that holistically deal with the factors involved in an adoption process, including the properties of an innovation, different stages of adoption, the role of change agents, and interpersonal networks where the innovations spread. Even though an innovation may refer to a concrete commercial product, as is typically the case when the theory is applied, it can equally well be of an immaterial nature, such as a new farming method. According to Rogers' definition (ibid., 5):

> *Diffusion* is the process in which an innovation is communicated through certain channels over time among the members of a social system. It is a special type of communication, in that the messages are concerned with new ideas.

Probably the best-known models developed by Rogers are the bell and s-curves of adoption (ibid., 273, 281), which depict the phases and rates of diffusion, and the kinds of adopters that hop in at different times. A small group of *innovators* experiments with the innovation, followed by *early adopters* that influence the deliberate *early* and sceptical *late majority*. *Laggards* are the last, relatively small group of adopters. It should be noted that even though "laggard" may sound pejorative, it should not be considered as a negative term: laggards preserve the old ways of doing

things, which may prove fruitful to the community if an innovation fails. Furthermore, the reasons why some need a long time to adopt, or never do, provide valuable feedback that can be used for improving the innovation in question. (ibid., 282–85; cf. Wyatt 2003.) As shown in Publications 1 and 4 dealing with platform adoption, demosceners do not represent only one of these categories, but all of them.

Variables Determining the Rate of Adoption of Innovation serves as a useful starting point and checklist when considering the various reasons as to why an innovation is adopted faster or slower. Quite evidently, the properties of the product or idea count, but several social factors are involved in the process as well. Decisions are not always made by individuals, as the adopting unit might be an organisation or as large as a nation. The social system in question has its own norms that affect the perceived acceptability of the innovation. Communication channels ranging from interpersonal to mass media are the necessary prerequisite for the distribution of new ideas and products. The last variable is the efforts of the change agents trying to further their own agenda, be it commercial, educational or governmental. (Rogers 2003, 222–59.)

The concept of *reinvention* is highly relevant when considering the demoscene and its use of computers. As defined by Rogers (2003, 181) it refers to "[...] the degree to which an innovation is changed or modified by a user in the process of its adoption and implementation." As we are dealing with a commercially marginal sector of consumers, it is unlikely that their needs would be considered when designing new computers for the mass market. Demo viewing and creation are by no means common uses for digital devices, yet that is exactly what the enthusiasts do, thereby reinventing the purpose of the product. Eglash (1997) breaks reinvention (although calling it appropriation) into three categories: reinterpretation, adaptation and reinvention, which reside at different points on the consumption–production axis.

Like any theory, diffusion too has received its share or critique, some of which is addressed in the later editions of *Diffusion of Innovations* itself. One recognised shortcoming in diffusion studies has been the tendency to side with change agents, positivistically focusing on successful adoption and omitting the imperfections of the process (Rogers 2003, 106–26). The theory of diffusion has also been criticised for being linear and overtly rationalistic, which was one of the reasons for the emergence of the largely European *domestication* discourse that tries to address the shortcomings (Berker et al. 2006). For a more in-depth discussion on the origins and development of the concept, see Silverstone (2006).

Without the need to pick sides I, on the one hand, recognise the reasons why Rogers' theories can be labelled as rationalistic: presenting overarching models of how adoption takes place runs the risk of simplifying the endless complexity of human behaviour, while on the other hand, the models offer an exceptionally holistic view to the topic and make the process clearly understandable. Domestication studies, which are typically of qualitative nature, come with their own models – plenty of them – but there is no underlying grand theory that would be shared by the authors representing the paradigm. As the name suggests, domestication research is more focused on personal use and the domestic scope, whereas diffusion aspires to address adoption by organisations and other large social systems as well.

Starting from the late 1980s and early 1990s, multiple domestication researchers have looked into how digital technology is received and appropriated by its users. Margrethe Aune's *The Computer in Everyday Life: Patterns of Domestication* (1996) describes how information technology arrived in Norwegian homes. She divides the interviewees into categories, such as "extenders", "explorers" and "game-freaks", based on their activities and style of work. Even if not called that, Amiga sceners and crackers are mentioned as part of the "game-freaks" category. A notable gap between male and female users is evident in her study: enthusiasts were mostly men in the early 1990s. (ibid.)

Another representative of Norwegian domestication studies is Tove Håpnes' *Not in Their Machines: How Hackers Transform Computers into Subcultural Artefacts* (1996). Keeping in mind that hackers are not quite the same as demosceners (Section 4.2), Håpnes' paper offers a relevant point of comparison. She recognises how the meanings that users assign to computers are not inherent or given, but created through a *negotiation process*. Many other findings sound familiar as well: for instance, the users that she calls "real hackers" considered themselves as a unique group that operated outside the mainstream of computing. The creative aspect, embraced by the demoscene, was present in her hackers, too. (ibid.)

Not unlike diffusion, domestication studies emphasise how cultural adoption is, above all, a process (e.g. Aune 1996; Håpnes 1996; Lehtonen 2003). Silverstone, Hirsch and Morley's (1992) influential four-phase model of domestication is a foundation several later works have built on:

1. *Appropriation:* the artefact is acquired by an individual or a household.

2. *Objectification:* the artefact becomes part of the physical environment it is in.

3. *Incorporation:* the artefact is integrated into the routines of the household.

4. *Conversion:* the artefact is reflected outside the boundaries of the home.

When applying the framework to demos and the demoscene, we immediately face the question of what is the artefact in the first place – a demo or the computer it is running on? In Chapter 5 demos were the object of interest, but in this context it must rather be the computer, even if it would be conceptually interesting to try to consider an essentially immaterial object, a piece of software as the artefact that is being domesticated. The vast importance of software today provides added motivation for such a take.

6.4   Times of Change

Publications 1 and 4 discuss the ways demosceners have backed, opposed and, eventually, adopted new software and hardware platforms. Some of the most visible turning points have been the Amiga–PC clash of the mid-1990s and the MS-DOS–Windows transition of the late 1990s, which affected not only the scene, but computer hobbyists in general. Similar, equally fiery cases have been observed among gamers, who have fought so-called *machine wars* between different computer models and games consoles (Saarikoski and Reunanen 2014).

The emotional tone of the discussions reveals how, for a technologically-oriented hobbyist, a platform is not just a piece of hardware or software, but notably more than that: a part of their identity, as observed early on by Turkle (1984). Binary juxtapositions of, for instance, powerful–too easy, sceners–gamers, and insider–mainstream polarise the discussions and call the participants to choose their sides, as if there could be only two (Publications 1 and 4). Harsh language, downright aggression, conservatism and predictions on the death of the scene are all ultimately mechanisms that the community puts into use when its safe status quo is shaken by an external change that is too significant to be ignored. Using Rogers' (2003) terminology, it is a process of evaluating the attributes (relative advantage, compatibility, complexity, trialability, and observability) of an innovation (cf. Håpnes 1996; Lehtonen 2003).

A number of non-technical factors are in play when a new platform is being evaluated by the scene: in addition to the personal relationship to a machine, possibly coloured by nostalgia, there is a community of other users that has grown around it (cf. Lindsay 2003). The effort invested in learning the finest details of one computer

or building a software collection may be next to worthless when the rules change. To put it in other words, the subcultural capital acquired on one platform might not readily transfer to another, a loss which sparks understandable hesitance (Publication 3).

After enough negotiation and external pressure, the majority – if there is such a thing – does eventually adapt to the new situation. The statistics gathered from *Pouet.net* serve as one indicator of how the most popular (home) computer or operating system has systematically also become the dominant demo platform (Reunanen 2011; Stamnes 2015). Nowadays Amiga or Commodore 64 hobbyism may represent an alternative niche, but 25 years ago the same machines were at the very core of mainstream computing. Rogers' (2003) model of different stage adopters seems to fit the demoscene well: initially, a new platform is tried out by innovators, after whom influential opinion leaders, such as famous groups, pull the majority in. Some "laggards" choose to never adopt, preferring the past alternatives for the above reasons (Publication 1).

The adoption process is not necessarily one-way, as can be observed in the continuing and even increasing popularity of retro computers (e.g. Suominen 2008; Suominen, Reunanen and Remes 2015). 30-year-old machines have diverged so far from today's offerings, that comparing them feature-wise is hardly meaningful; their worth lay elsewhere than practical everyday use. In her study on modern-day TRS-80 users, Lindsay (2003) reveals some factors that resonate well with retro (also known as *oldschool*) demos: simplicity, control, challenge, mastery, elite community and nostalgia (see Section 4.4; Turkle 1984, 207–13).

Not all retro is equal: in his presentation at Kultura Gier Komputerovych in 2015, Pawel Grabarzyck introduced the concept of *born retro* demos, referring to the difference between productions created at the heyday of a platform and later endeavours. For example, an intro from 2016 might look audiovisually identical to its 1986 counterpart, but was created in a completely different context, which is why the two cannot be evaluated on equal terms. On the one hand, the available tools and knowledge have improved during the 30 years, and on the other hand, the meaning of the artefact to the community is also different. Another factor is that for quite some platforms there has not ever existed an "indigenous" scene, but all the productions are actually made several years after the computer disappeared from the market.

As seen above, adoption is not necessarily ever complete and total, for active users extend the lifespan of a past computing platform far beyond its practical viability. Even the most outdated and marginal machinery survives in local contexts thanks to

the community that formed around it. In spite of the presence of a dominant platform, there is never a standstill when everyone fitting under the wide umbrella of "the scene" would use the exact same tools and computers – quite the contrary, as old gadgets refuse to die and new ones are added to the ever-growing list of target platforms.

Chapter 7

Conclusion

Apart from learning about the demoscene, looking into its history has been a cross-section of contemporary technology and media, with traces of politics, other enthusiast communities, and social change. When I first set out to study demos in 2006, I had rather few assumptions on the direction the work would take, but now, after more than ten years, it is evident how I have been exploring a rich case of the cultural adoption of technology all along. Constantly affected by its surroundings, yet at the same time independent and exclusive, the scene has repurposed a computational device and the associated production tools to fit its own agenda, the creation of digital works of art that adhere to its own particular standards.

Technological change, in particular, can be easily observed on the timeline, as new platforms appear and, if successful, also become the dominant player; a seemingly simple process on the surface, but much more complex on the inside. While it is easy to criticise technological determinism, the line of thought does not appear quite as alien when talking about the micro level instead of the society at large. An individual or a relatively small group of people, such as the demoscene, with negligible market potential or political impact, cannot in general affect the technological landscape, but rather only react to it. In contrast, the relationship between the cracker scene and the game industry has been much more bidirectional from the start. The alleged economic impact of warez distribution quickly led to extensive countermeasures from the industry side, not unlike graffiti artists or punks, whose deviance has been curbed in various ways by society.

New computing platforms are an external force that sparks discussion and even fighting with their mere presence. External pressures, such as the bankruptcy of Com-

modore in 1994 or the tightening copyright legislation of the early 1990s, act as triggers. The panic caused by police raids and the – realistic or not – prospect of being stuck with a useless computer are like a rock thrown into a quiet pond: the frogs wake up and create more splashes on their wake. To put it in other words, it is not the outsiders who directly cause sceners to change, but rather the shared reaction of the participants themselves.

Demosceners are undoubtedly a group of active and technically capable computer users, which might, on first thought, suggest that they are among the first adopters of new gadgets. Publications 1 and 4 disprove any such notions: rather than naively adopting the latest computers that would, in absolute terms, best facilitate artistic creation, there is often a considerable lag, critical evaluation and opposition before any large-scale migration takes place; technical competence can both inhibit or speed up adoption. In addition to the know-how that lets capable users make informed decisions, increased processing power goes against the long-standing principle of proving yourself and is, at least initially, incompatible with the values of the community.

Instead of appearing from somewhere, a scene rather *becomes* one after passing various phases. The most imminent example, present throughout this thesis, is the interplay between crackers and the demoscene: an initially uniform community eventually took two different directions due to both internal and external forces. At the same time, shared history, practices and distribution channels kept the two together for a number of years, and in recent years we may even observe a kind of nostalgic convergence, as cracking and crack intros have been incorporated back into the demoscene discourse. The interest is mostly of a safe historical kind, since today's online piracy does not affect the scene in any observable way; in all likelihood some connections still exist, but they are not reflected on the public discourse.

The early 1990s saw a rapid rise in the self-consciousness of the community, a significant turn in of the process of becoming. Emphasising creativity, loss of interest in cracking, coining the first scene histories and parties growing to international events of thousands of visitors were among the most notable indicators of this change. In addition to cementing its practices, many of which still remain today, the scene was building its own narratives that became a shared way of understanding the digital domain: the incapable gamer and the creative scener, lamers and elites, raunchy party reports, and heroic achievements all part of them. Based on the latest observations, it seems that at this point the community has already passed its serious and even aggressive self-definition. The current phase is rather characterised by an increasingly

relaxed atmosphere and sarcastic, self-referential takes on old clichés, suggesting the following preliminary lifecycle model:

1. *Gravitation:* individuals find like-minded others.

2. *Self-definition:* cementing the main practices, defining the borders.

3. *Settling down:* an active plateau.

4. *Distancing:* self-referentialism and sarcasm instead of personal involvement.

5. *Stagnation:* loss of interest, turning into a relic.

The two first phases were quick and finished by the early 1990s, after which followed a stable stream of productions, which started to fade in the early 2000s. The death of the demoscene has been predicted several times early on, and by now the narrative has already turned into a humoristic cliché itself. Back in the 1990s, the tone was not, however, as humorous: technological shifts and generation gaps were the most common reasons for stating that the end was nigh (or already there). Realistically speaking, the scene is certainly not going to disappear anytime soon, but it remains to be seen how attractive it stays in the tough competition of increasingly colourful digital culture.

In spite of the low public visibility of the scene, outsiders have also built their own narratives. The slightly funny nerds who gather for a weekend to play games and drink Coca-Cola are the actors in a storyline often seen on newspaper articles describing local parties, that renders the unknown harmless and understandable – in particularly deep contrast to the drinking, smoking and generally reckless behaviour that constitutes a major part of the scene's own accounts on the same events. The influx of American nerd imagery, no matter how alien it might be in a European context, has provided stereotypical representations that are used as an anchor here. The other common narrative, the enthusiast turned into a successful game programmer, is partially grounded on reality, but still equally incorporative, and even more positivist, as the underground years lead to a desirable outcome: joining the adult cadres as a respectable moneymaker.

7.1   Looking back

The academic contribution of the thesis can be divided into three parts as per the research questions. Firstly, questioning the simplified narrative of how the demoscene

came to be revealed a network of contributing forces that led to the divergence of cracking and demo-related activities – and how the rift was not as complete as often claimed. Such tracing of the lineage goes on to show how enthusiast communities do not simply emerge out of nowhere, but how they reinterpret their predecessors. Secondly, the cultural history of two previously little-studied artefacts, 4k and crack intros, received analytical treatment, as opposed to a merely descriptive take. Lastly, observing demosceners as consumers and adopters of technology is a new perspective that sheds light on how the unwritten ethics and attitudes of a technically sophisticated community can affect the domestication process in both negative and positive ways.

The five-stage lifecycle model presented above is my first take on the topic. It is founded on the observations made during these ten years of research, so it is likely not far detached from reality. At a minimum, the model serves as a conversation piece and a starting point for a more refined one. As the demoscene is still an ongoing phenomenon, the last stage cannot be observed; verification would be easier done by applying the schema to already disappeared communities.

The research material of the study mostly originates from mainstream Western European and Nordic sources, which is inevitably reflected on the findings as well. Other, marginal or geographically distant subscenes do not share all the same traits, and, to be on the safe side, it is also correct to question whether the Western main branch has actually been a monoculture. As for the generalizability to other similar communities – digital subcultures if you may – I am even more cautious, as they do not share similar origins and history. There is certainly some universality in the underlying human (male) behaviour, but at the same time it is easy to point out fundamental differences that undermine one-to-one comparisons. For instance, the deviance and public visibility associated with network hackers are factors of low importance when discussing the demoscene, whereas gamer communities revolving around commercial titles are, in comparison, more intimately linked to consumption.

Game studies turned out to be an unexpectedly big influence, which is hardly surprising in hindsight, since games are digital artefacts rather closely related to demos and have given rise to enthusiast communities, such as dedicated fans or modders, which could be labelled as scenes of their own. A notable portion of existing demo studies have been published in a game studies context, which is one more indicator of certain thematic overlap. The amount of research conducted on games must be at least two orders of magnitude larger than on scene-related matters, and, thus, there is a sizeable pool of studies that readily offers useful perspectives to demo scholars.

7.2 Looking ahead

Trying to fill the gaps of existing research had the effect of discovering many more relevant angles that have not been covered yet. Any analytical in-depth studies are still most welcome, as the corpus of demo-related studies is not large, but certain topics have received either little or no attention at all. Next follows some reflection on the possible research questions and approaches for future studies, which I wish to undertake later on.

In the lines of recent subcultural studies, there would be a need to consider the scene as a fuzzy rather than clearly defined community. While we can easily recognise phenomena that clearly fall inside the scene or outside of it, there are still grey areas where binaries do not apply. For instance, who *is* a scener? Apart from dedicated enthusiasts (insiders) and people who have never even heard of demos (outsiders), there are others, who are not quite either: a hangaround who visits parties but never made anything him/herself, an old cracker who has not been involved in the last 30 years, or, perhaps, a chip musician who only uses tools developed by the demoscene. As another example: when does a game become a scene game? Is it because of the venue where it was released or are its authors the deciding factor?

Apart from a few personal accounts, the process of demomaking remains largely unstudied; demo creators themselves know what is involved, but the tools, practices and attitudes are hardly ever externalised so that outsiders, too, could grasp them. In addition to standard media production tools and workflows, the scene develops its own to suit its particular needs: assemblers, paint programs, musical applications, executable compressors, and converters for a myriad of file formats are among the most common examples of in-scene tools (see the *Pouet.net* collection of "demotools"). Various productions ranging from diskmags to 256 byte intros are little known outside the scene, owing to most publications' heavy focus on full-size demos only. Studying demos as software would come with the added benefit of linking them to the *software studies* paradigm, which has recently been gaining momentum in the humanities.

The formative years of the cracking scene warrant further attention, as they are the least documented period of scene activity. The defining practices, such as international networking and copy protection removal, are known on a general level, but the details are still missing. One potential approach would be to follow the path of a game starting from the original creators to the hands of the cracker, network of swappers, and, eventually, to a non-knowledgeable "end user" enjoying the game in a living room somewhere. Some feasible perspectives would be to consider the meanings,

legal status and worth the item in question accumulates or loses on each leg of its journey.

A critical and even revisionist take could be achieved by observing the connections between the scene and business. Apart from the well-known and even overemphasised career path leading to the game or other ICT industry, there are other, less visible links: commercial demos created for companies, demo party economics, and the interplay between the music industry and the scene, just to name a few. In this thesis I have studied the effects of the ever-changing computer market, but it is only one of the multiple commercial actors that affect the demoscene at least indirectly, as the community does not exist in a vacuum.

After stressing multiple times how there are local, often platform-specific subscenes scattered around Europe, it appears natural that they receive specific attention as well. Such studies are, arguably, best conducted by local researchers, due to their understanding of the context and, as a very practical reason, the language. It is not easy to talk even about the Western and Northern European scenes as a uniform whole, and even less so when taking into account the other side of the Iron Curtain, where access to affordable computing was not given, and where media consumption was notably different at least until the 1990s. Examples of local scene histories have started emerging relatively recently, and there is certainly room for more, as they paint a completely different picture of the events and remind us to avoid unfounded generalisations about computer culture.

As a researcher, I recognise the value of unearthing facts, discovering patterns, and generally making the academic world more aware of demos and the demoscene, but as a participant I am still undecided: what good is research to the community itself? Describing an ongoing phenomenon runs the risk of freezing it in time and canonising something that is only one of many possible interpretations. As a positive prospect, a study like this can offer possibilities for self-reflection by placing one's own recollections into a wider historical frame. I expect – and invite – the scene to be a critical audience for this thesis, knowing others have experienced the events quite differently. *That's not how it went!*

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Enclosed Publications

The following five articles constitute the main body of this thesis. Their contents and my personal contributions are outlined in Section 1.5. Articles 1 and 4 reprinted with permission from Springer.

1. Reunanen, Markku, and Antti Silvast. 2009. "Demoscene Platforms: A Case Study on the Adoption of Home Computers." In *History of Nordic Computing 2*, edited by John Impagliazzo, Timo Järvi, and Petri Paju, 289–301. Berlin: Springer.

2. Reunanen, Markku. 2013. "Four Kilobyte Art." *WiderScreen* 2–3/2013. http://widerscreen.fi/numerot/2014-1-2/four-kilobyte-art/.

3. Reunanen, Markku. 2014. "How Those Crackers Became Us Demosceners." *WiderScreen* 1–2/2014. http://widerscreen.fi/numerot/2014-1-2/crackers-beca-me-us-demosceners/.

4. Silvast, Antti, and Markku Reunanen. 2014. "Multiple Users, Diverse Users: Appropriation of the Personal Computer by Demoscene Hackers." In *Hacking Europe: From Computer Cultures to Demoscenes*, edited by Gerard Alberts, and Ruth Oldenziel, 151–63. Berlin: Springer.

5. Reunanen, Markku, Patryk Wasiak, and Daniel Botz. 2015. "Crack Intros: Piracy, Creativity, and Communication." *International Journal of Communication* 9:798–817. http://ijoc.org/index.php/ijoc/article/view/3731/1345.