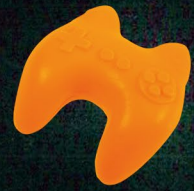




**TURUN
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HOW PLAY MOVES US

Toys, Technologies, and Mobility in a Digital World

Katriina Heljakka





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*It is my view that we are so completely surrounded by, even immersed in play
that we cannot at present know its full involvement in our lives.*

Brian Sutton-Smith, 1980

*To the optimists
and those with a playful heart*

UNIVERSITY OF TURKU

Faculty of Humanities

School of History, Culture and Arts

Digital Culture

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Mobility in a Digital World

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ABSTRACT

The 21st century has been described as the Century of Play. The change in current play is particularly noticeable when looking at technological developments. This thesis deals with the technologization, digitalization, and connectedness of play between 2010–2020. The research explores forms of contemporary play, playthings, and players in a time when digitalization and connectedness have extended to various tools and realms of play — devices, toys, games, apps, and mediated playful environments.

At the heart of the research are playthings and technologies conceptualized here as play machines, players using these tools within their communities and contexts, and, due to technological change, play research that increasingly expands into digital and networked cultures. Interactive digital devices have made play ubiquitous, including play activities related to play machines–toys, mobile technologies, digital cameras, smartphones, digital toys, social media, and social robotics.

The purpose of the thesis is to increase the understanding of what the rapid technologization of play, or what is conceptualized in the thesis as the digital leap of play, means in terms of mobilizing the players physically, cognitively, and emotionally. The thesis opens up prospects for technology-enriched play by presenting a range of empirical studies interested in the mobilization tendencies of current digital devices, toys, and connected media cultures that inform and inspire contemporary play and players of different ages as a form of digital culture that unites players and generations.

The assumption is that digital technology connected to modern play experiences can move players in physical, cognitive, and emotional terms. Through six qualitative case studies conducted in 2018–2022, the thesis proposes to answer the central question: “How has play moved human players of the Western world in 2010–2020 in terms of physical, cognitive, and emotional mobility/movement?” The sub-question inquires what kinds of digital play are encountered in interactions of people of different ages as part of technologically enhanced leisure, learning, and environments where play is increasingly happening with and through machines and social media platforms by asking: “How are the acts of play realized in each instance of digital play through technology use, and what are the functions of the play for the players in each study?”

The thesis seeks to understand the nature and various aspects of the digital transformation of play and balance the prevailing negative assumptions with more optimistic views on the effect of technology-oriented play on the lives of players of different ages.

The scholarly contribution of the thesis is to generate new play knowledge: The publications included in the thesis highlight various play patterns and practices among children of preschool age, adults, and seniors who engage in digital play through the use of digital devices or digital toys, either solitarily or socially, as part of intergenerational play.

The case studies demonstrate how the mobilizing tendency always lives in play. Even screen-based technologies may move the players imaginatively, cognitively, and physically. Play moves us closer to each other, even when we are not physically close. As playthings and technology develop in parallel by feeding each other, play expands into new areas through evolving playthings, devices, and environments.

The findings of the thesis illustrate how changes in the ecosystem of play (primarily made possible by developing mobile technology and social media) are linked to the opportunities for players to engage in creative play activities, their documentation, and their social sharing. The connections of evolving digital technology (for example, digital toys, social media networking, and social robotics) to play are diverse; mobile devices with and without screens are used as an extension of play to enrich the experiences and outcomes of play and to empower the players by allowing them to showcase their imagination, creativity, and ability to connect with peers and other player communities.

In sum, the thesis illustrates the central consequences of the digital leap of play: The mobility of technologically enhanced playthings tends to mobilize the bodies and imaginations of the players. The play of the 2020s moves the bodies and minds of the players cognitively, imaginatively, and emotionally.

The thesis concludes that contemporary technology embodied in digital devices and Internet-connected playthings as the play machines of 2010–2020 allows for the expansion of play into human and toy interactions that non-technological playthings would not support. Technological development thus expands the historical, digital-material, and narrative dimensions of play. Social, technology-supported play triggers cultural processes that support intergenerational interaction in play. Consequently, this thesis suggests that 1) digital technology is a driver for societal changes that affect play, 2) digital technology is a mobilizer of players in a physical, cognitive, emotional, and social sense, and 3) digital technology is an enabling, empowering, and enriching resource for contemporary digital play.

KEYWORDS: digital devices, digital play, digital technology, intergenerational play, IoToys, leisure studies, life-long play, life-wide play, mobility, movement, playbor, play knowledge, playful learning, post-digital play, social robotics, technology, toys, toy literacy

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TIIVISTELMÄ

2000-lukua on kuvailtu leikin vuosisadaksi. Viime vuosikymmeninä teknologian käyttö on laajentanut leikin ja leikkillisyyden ilmiökenttää kohti kaikenikäisten ihmisten vuorovaikutusta oppimisessa, työssä ja vapaa-ajalla. Nykyleikkiä määrittävät teknologisessa murroksessa erilaiset leikin jatkeet. Teknologia yhdistyy monien ajattelussa usein erilaisiin laitteisiin ja digitaalinen leikki tarkoittaa vuorovaikutusta näiden leikkikoneiden kanssa. Leikkivälineet ja teknologia kehittyvät jatkuvasti rinnakkain toistensa kehitystä innoittamalla ja ruokkimalla, laajentaen leikkiä uusille alueille kehittyvien leikkivälineiden, laitteiden ja ympäristöjen kautta. Mobiililaitteet, sosiaalinen media, verkottuneet esineet ja -ympäristöt luovat uusia ilmenemismuotoja ja ulottuvuuksia leikille: Nykyleikki ilmenee multimediaalisina tuotannon, jakelun, kulutuksen ja käytön kulttuureina. Leikkijät, joita voidaan pitää sekä luovina että tuottavina, eivät ainoastaan kuluta leluja, pelejä ja näiden yhdessä muodostamia hybridejä, vaan he myös esittävät leikkiään sosiaalisen median alustoilla ja osallistuvat näin aktiivisesti digitaaliseen leikkiin. He käyttävät mediateknologioita digitaalisen leikin luomiseen, tuottamiseen, dokumentointiin, jakamiseen ja katsomiseen, ja ilmaisevat samalla itseään ja mielikuvitustaan moninaisin tavoin. Valokuvausta ja videokuvausta voidaan pitää omina digitaalisen leikin muotoinaan, jotka yhdistävät leikkivälineet digitaalisiin ympäristöihin mobiililaitteiden avulla. Nykyleikki muuntuu ja muovautuu vuorovaikutuksessa erilaisten leikkikoneiden ja mediasisältöjen kanssa.

Tämä tutkimus kysyy, miten nykyajan teknologisoituva, digitaalinen ja verkottuva leikki liikuttaa leikkijöitä?

Nykypäivän teknologisesti rikastettu leikki, jota tässä tutkimuksessa käsitellään digitaalisena leikkinä, tapahtuu yhdessä lelujen, pelien, sovellusten ja internetin, sekä siihen yhdistettyjen lelujen, kuten Lelujen Internetin ja sosiaalisten robottien kanssa. Kuudessa, vuosina 2018–2022 tehdyssä tapaustutkimuksessa keskityttiin perinteisiin (ei-teknologisiin) leluihin, joilla leikkiminen tapahtuu yhteydessä leikkikoneisiin, verkottuneisiin leluihin tai älyleluihin, kuten Lelujen Internetiin, pandemian aikaiseen leikkiin sosiaalisessa mediassa ja sosiaaliseen robotiikkaan, eli leikittäviin robottikumppaneihin, sekä spekulatiiviseen lelufiktioon. Tapaustutkimukset valottavat näkymiä eri ikäisten leikin tapoihin esikouluikäisistä aikuisiin ja senioriikäisiin leikkijöihin, jotka osallistuvat digitaaliseen leikkiin käyttämällä erilaisia laitteita tai digitaalisia leluja osana yksin, yhdessä ja ylisukupolisesti toteutuvia leikkejä. Tapaustutkimukset tuovat esille digitaalisen leikin piirteitä, osoittaen, miten teknologisesti kehittyvä leikki ilmenee nykyajassa. Digitalisaation, verkottumisen

ja sosiaalisen robotiikan yhteydet leikkiin ovat erilaisia; Yhtäältä teknologisia kommunikaatiovälineitä, kuten mobiililaitteita käytetään leikin jatkeina. Toisaalta nykyajan leluihin, kuten lelurobotteihin upotettu teknologia moninaisine tarjoumineen mahdollistaa verkottuneen leikin.

Tutkimuksen tieteellinen kontribuutio on uuden leikkitiedon tuottaminen. Tapaustutkimukset havainnollistavat miten teknologisoituva leikki alkaa erilaisten teknologisten tarjoumien hyödyntämisestä, vuorovaikutuksena ruutujen kanssa tai ilman ruutuja, joko vapaa-ajan leikin tai leikillisen oppimisen yhteydessä, hyödyntäen leikkivälineitä, joiden ensisijainen rooli on toimia leikkikoneina, tai joilla leikkiminen on mahdollista älylelujen, pelien ja sovellusten avulla, tai leikin jatkeina käytettävän teknologian hyödyntämisenä (jolloin teknologian rooli leikkikoneina on toissijainen—ne ovat mobiililaitteita ja välineitä, joilla (lelu-)leikkiä kuvataan, videoidaan, äänitetään ja muokataan digitaalisesti).

Teknologia mahdollistaa leikin ja voimaannuttaa leikkijöitä: Tämä ilmenee leikkijöiden luovissa ja tuottavissa tavoissa käyttää leikkikoneita. Teknologiaa hyödynnetään leikin tallentamiseen ja mediasisältöjen tuottamiseen. Digitaalinen leikki on usein dokumentoitua leikkiä—leikkijät tallentavat toimintaansa samalla kuin leikkivät. Teknologia mahdollistaa leikkiin liittyvän sisällön jakelun verkostojen kautta (esimerkkinä verkottuneet älylelut). Teknologia rikastuttaa leikkiä: Lelujen verkottuminen tarkoittaa, että ne tarjoavat leikkijöille jatkuvasti päivitettyä sisältöä, joka voi olla valojen, liikkeen, äänen ja puhutun kielen avulla kanavoitua viihteellistä tai opetuksellista sisältöä tai niitä yhdistelevää opetusviihdettä. Digitaalinen leikki voi olla yksinleikkiä, mutta siihen sisältyy myös sosiaalisen median alustojen käyttö, joka mahdollistaa sisällön jakamisen ja siten verkostoitumisen, yhteisöllisyyden ja sosiaalisen leikin. Digitaalinen leikki kehittyy verkottuneeksi leikiksi, kun internetiin yhdistettyjä älylaitteita, esimerkiksi Lelujen Internetiä käytetään leikissä. Digitaalinen leikki käyttää lisäksi sosiaalista robotiikkaa, ja viimeisimpiä leikkivälineitä tällä alueella edustavat robottieläimet, esimerkiksi robottikoirat.

Teknologinen leikki liikuttaa leikkijät lähemmäksi toisiaan, vaikka tämä läheisyys ei ilmenisi fyysisenä läheisyytenä tehden leikistä sosiaalisempaa: Teknologia mahdollistaa leikkivien yhteisöjen vuorovaikutuksen sosiaalisen median alustojen kautta. Digitaalinen ja verkottunut leikki on myös sosiaalista ja yhteisöllistä — leikkijöiden mahdollisuus taltioida ja jakaa toimintaansa on vaikuttanut suuresti nykyajan leikkiin tehden siitä näkyvämpää, katsotumpaa ja luovuuteen kannustavaa. Leikkijät muodostavat yhteisöjä, joissa kommunikoidaan niin ihmisten, laitteiden kuin sisältöjen vuorovaikutussuhteissa. Tapaustutkimukset esittävät, miten mobilisoiva taipumus elää aina leikissä. Jopa ruutuihin perustuvat teknologiat voivat edistää leikkijöiden fyysistä, mielikuvituksellista ja kognitiivista.

Yhteenvedona tutkimus osoittaa digiloikan keskeiset merkitykset leikille: Leikkikoneiden — laitteiden ja teknologisten leikkivälineiden siirrettävyydellä ja liikkuvuudella on taipumus saada leikkijöiden kehot, mielikuvitus ja tunteet liikkeeseen: 2020-luvun teknologisoituva leikki liikuttaa niin leikkijöiden kehoa kuin mieltä kognitiivisesti, mielikuvituksellisesti ja emotionaalisesti. Teknologia laajentaa leikin historiallisia, materiaalisia, digitaalisia ja kerronnallisia ulottuvuuksia. Sosiaalinen, teknologian tukema leikki vauhdittaa kulttuurisia prosesseja, jotka vaikuttavat myös ylisukupolviseen vuorovaikutukseen leikissä. Väitös ehdottaakin digitaalisen teknologian toimivan ajurina leikin muutoksille yhteiskunnassa. Digitaalinen teknologia liikuttaa leikkijöitä fyysisessä, kognitiivisessa,

emotionaalisessa ja sosiaalisessa merkityksessä ja digitaalinen teknologia on leikin digiloikan mahdollistava, voimaannuttava ja rikastuttava voimavara.

AVAINSANAT: digitaaliset laitteet, digitaalinen leikki, digitaalitekhnologia, elinikäinen leikki, elämänlaajuinen leikki, jälkidigitaalinen leikki, leikillinen oppiminen, leikin ympäristöt, leikkitieto, lelulukutaito, liike, lelut, liikkuvuus, sosiaaliset robotit, teknologia, vapaa-ajan tutkimus, verkottuneet älylelut, ylisukupolvinen leikki

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Mika. You know that I don't believe in the 'forevers' of this world, yet we're still we. Should you have known what goes on in the professional mind of your other half, you would have had your doubts, I'm sure. But You also know so well, how rationalism just does not do it with me. Rather, it is life's precious randomness that does the trick. It is the colorful, curious, and creative freedom that inspires us to move, play and love, much like in surfing — we keep looking for the waves that come next. Life is about replaying the best moments again, and again, while seeking new ones. Couples who play together, laugh through the tears and stay together. Living the search, we must, 'til we move no more.

Lumi. The last time when I wrote a text of this kind, you were not around. Yet, somehow, I knew you would be there someday. And here you are.

You stand as my Luminary, the light-bearer in play. You continue to represent the Illuminati of Play and sometimes, allow me glimpses to your secretive play worlds — the one, only children are granted access to. For that I am eternally grateful. Despite that my work is play You have said that I know nothing about it, and that You know everything about it. But aiming to know, I must.

Thank you for introducing a completely new playground for me, and allowing me to step inside your magic playdom, filled with unicorns and fairy dust but at the same time Yyteri sand aplenty (and some Lumo Stars, Paw Patrol, MLP, Pokémon and the like, just to be fair!). Up until this time, I could only dream of such a play-verse. Remember though that 'momsters' toys are her own, and if I want to borrow your plushies, props and paraphernalia, I promise to ask first. But play together, and share our toys—organic, DIY, traditional and tech — we shall. Keep opening the doors to your sparkling play worlds, and I'll follow, You bright and luminous light of my life.

Katriina, Kati, toy and play researcher, toy and play expert, playful learning advocate, entrepreneur/future playpreneur?

Toyer, dreamer, explorer and player extraordinaire, from here to ∞

On Irja's day
the 30th of January, 2024
Katriina (Kati) Heljakka

Katriina Heljakka



Doctor of Arts (visual culture), Master of Arts (art history), M.Sc. (economics) Katriina Heljakka (b. 1975) is a researcher of toys, play, and playful learning at the University of Turku. She received her doctorate of arts at the Aalto University in 2013 and has since worked in the Academy of Finland-funded projects Ludification and the Emergence of Playful Culture, Hybrid Social Play (together with Business Finland), and most recently, the Centre of Excellence in Game Culture Studies. In 2021-2022 she acted as the Play Expert for the Mannerheim League for Child Welfare. Her current research interests include playable technologies and playful learning in work and higher education. Photo: Petra Laurila

Table of Contents

Acknowledgments	9
List of Figures and Tables	15
Preface: Play travels where it wants to go	16
1 Introduction	19
1.1 Background: The transforming nature of play	49
1.1.1 Digital culture	54
1.1.2 Digital play	55
1.1.3 Digital (and hybrid) play environments	57
1.1.4 Digital players	59
1.1.5 Digital toys	60
1.1.6 Affordances	68
2 Positioning Play in Theory and Society	71
2.1 The Meaning of Play.....	72
2.2 Play and its state in society	78
2.3 Play of children and adults	80
2.4 Play in leisure, learning, and productive endeavors	82
2.5 Toward Post-Digital Play	91
3 Methods	94
3.1 Playful approaches to qualitative research methodology	96
3.1.1 Triangulation	98
3.2 Research participants, materials, and research questions.....	98
3.3 Research ethics.....	99
3.3.1 Recruiting subjects and requesting their permission	101
3.4 Responsible data management	102
3.5 Data analysis.....	103
4 Case studies	104
4.1 Author's role in the design, execution, and reporting of studies	104
4.2 Description of articles	105
4.3 Limitations of Studies	107

5	Findings	110
5.1	Article I: Playing with the Camera.....	111
5.2	Article II: Playing with Connected Toys	122
5.2.1	Screen-based or screenless toys?	124
5.2.2	Guided digital play and hybrid playful learning	125
5.2.3	Studying the affordances of loToys.....	126
5.3	Article III: Playing with the Smartphone	134
5.4	Article IV: Playing with Screens with/through Social Media ...	142
5.5	Article V: Playing with Social Robots.....	151
5.6	Article VI: Playing with Speculative Toy Fiction	163
6	Discussion	170
7	Conclusions: Toward paidic understandings of play in the post-digital era	184
7.1	Future paths for research	198
7.1.1	Players.....	198
7.1.2	Playthings	199
7.1.3	Play(ful) environments and assemblages.....	201
7.2	Finally.....	202
	List of Original Publications.....	206

List of Figures and Tables

Figures

Figure 1.	The focus of Articles I-VI: Various approaches to technologies as play machines	72
Figure 2.	Facets of digital and Internet-connected play: Play as part of leisure, learning and productive endeavors as investigated in the thesis (and detected opportunities for future research)	91
Figure 3.	A word cloud was created to give an overview of the most common words identifying the main focus of the research publications—play	95
Figure 4.	Findings of the case studies summarized	110
Figures A-G	(AI generated images on pages 49, 111, 122, 134, 142, 151, 163)	
Figure 5.	Portrait of the researcher by Studio 1851 / Tuomas Sinkkonen	205

Tables

Table 1.	Research data, analysis methods, and critical questions summarized	100
Table 2.	A summary of the main findings, scholarly contributions, and future research ideas per publication	168

Preface: Play travels where it wants to go

Sail away from the safe harbor. Explore. Dream. Discover. (Mark Twain)

This thesis is the result of many playful interventions involving many forms of collaborations, collegial work, research themes, and subjects. The overarching theme is to frame the topic of play with digital technology and technological development significant to play over a particular period of time: the second decade of the 21st century. Undoubtedly, the project has been both multidisciplinary and international.

Researching play involves risk-taking, but experimentalism is essential to play. Play is exploration as much as it is self-expressive—people play to discover expanded versions of self (Henricks 2015a, 11). Researchers play to discover something previously unknown. Play is a pathway to new knowledge. The player always reveals aspects of his or her identity in play; players share ideas about their aesthetic preferences, skills, and proneness to competition or lack thereof while participating in play.

Mainly, this thesis was conducted because I wanted to know more about the subject. Movement has always inspired me—the movement onward, not backward or upward. During the research, I have come to see that going forward seems more rewarding to me than moving up (on the career ladder). A fascination with newness and the unexplored is one of the greatest motivators for me to conduct research, as well as being able to stretch the flexibility of the mind by trying to see outside of the box. Being considered highly creative is a competitive advantage in any field of design work, or in that certain entrepreneurship required in advanced scholarship. This capability has proved to be a useful skill throughout the years of research, especially when considering the area of expertise in play research. Understanding play is a powerful capacity to encompass, and being able to detect how exactly play moves us physically, cognitively, and emotionally is surely a 21st-century skill for anyone interested in growing and flourishing in today's world.

Words are powerful, just like gratifying play, as they set our minds in motion. Think about the following: “Research that advances the frontiers of academic knowledge differs from research that is focused on delivering solutions to societal problems” (Hicks et al, 2015; Leiden manifesto 2015, 430).

The aim of this work has not been to solve problems but rather to increase understanding of the phenomenon of digital play and its multiple relations to mobility when associated with digital technology and the uses of devices as play machines. I have worked toward seeking answers to how play moves us while remembering that “there can never be *the* answer to a question” (Firat & Venkatesh 1995, 261). As the thesis demonstrates, there are many ways to investigate technologically enhanced play in the lives of players of different ages. The studies presented in the thesis at hand represent merely a handful of examples of how play moves us. Yet, they are children of their times, each describing their specific mobilization techniques and affective persuasion through the means of digital technology.

Claude Shannon, the man who “invented the Information Age, has said that he lacked that strange and wonderful creative spark that makes a good researcher” (Soni & Goodman 2017, 84). Shannon was also interested in the mechanics of toys, which makes his work highly aspirational to me. Just like Shannon, I have worked with toys both in a literal and metaphoric sense:

Mathematicians worry about spending time on problems of insufficient difficulty, what they derisively call “toy problems”; Claude Shannon worked with actual toys in public! Time and again, he pursued projects that might have caused others embarrassment, engaged in questions that seemed trivial or minor, then managed to wring the breakthroughs out of them. (Soni & Goodman 2017, 278)

The research done for this thesis represents my “toy problems” (more about toys than actual problems for me), but based on my work with play inside and outside academia, I reckon there are others who would also like to know *How Play Moves Us through Toys, Technologies, and Mobility*.

Pesce (2000, 267) philosophically asserts that “each age has a truth, an explanation appropriate to itself and its relation to the world.” So is the case with a doctoral thesis as well. Researcher and Finnish artist Astrid Joutseno has said: “I think that in all research, there is also an autobiographical thread. Even researchers, who study the smallest of viruses, write a bit of themselves into their research” (Parmala 2020). Similar to Astrid Joutseno, I have surely weaved an autobiographical thread in the thesis at hand.

Soni and Goodman (2017, 187) write of Claude Shannon’s qualities as “a kind of playfulness of spirit, a curious combination of creative skill and the ability to stand apart from the prestige-soaked, ladder-climbing world of elite academia.” This kind of spirit has inspired the time spent on this project and has urged me to move forward and advance. I hope that both my creative spark and playful personality come across in the research I conducted. In any case, I played it my way.

1 Introduction

Movement is miraculous. Finnish artist Jorma Uotinen

Western societies are quickly moving into a post-digital era, where digitality and connectedness have become ubiquitous and unquestionable facets of everyday life — work, education, leisure — and play. Relations with technology have significant consequences for the human experience, including play. Play is undergoing a radical expansion in association with the use of technologies. In addition to the increasing role of visibility and entertaining content, contemporary play is intensely colored by using various extensions for play, such as technological tools, i.e., devices and media.¹

One of the strongest motivators to research the relationships between technology — digital technology in particular — and play was to overcome some of the concerns and false assumptions linked with a belief in the erosion of play in the digital era. This thesis section positions the research within digital culture by addressing key dimensions of play involving toys, technologies, and mobility in a digital world. In this introduction, I will explain the connections between digital technology, media, devices, and toys. Moreover, I will highlight some concerns regarding screen time and adult governance of play in relation to current, technologically oriented play, which has motivated me to investigate digital play's positive dimensions.

In the beginning, there are toys and a digital camera. I, a fortysomething adult toy player, use the digital camera to capture my toys in the domestic interiors I have created myself. To my thinking, they are displays and dioramas — spatial arrangements in which the toys are at home. For me, the act of toy photography represents photoplay. In photoplay, character toys — dolls, action figures, figurines, and plush toys — are made to appear alive. When represented in serial form, they become doll dramas, continuous toy stories. In association with traveling toys, or toy tourism (even toyism!), photoplay is conducted with smartphones, mobile devices with a camera function in outdoor environments, on staycations or in lands far away. In these instances, the snapshots are taken in touristic locations to document play, which is then often shared on social media to narrate the toys' adventures. When the pandemic takes over the world, it suddenly halts the mobility of characters with wanderlust — both human and toy. At this time of physical social distancing, our toys are displayed behind window screens, and we humans are glued to our digital screens. In both cases, to stay safe, sustain hope, and experience togetherness despite health concerns. To imagine a better future for ourselves, and the toys.

1 Media works as environments and media technologies are important extensions of humans (McLuhan 1964).

My daughter, a preschooler at the time of research, has discovered the IoToys and robotic dog at my studio, with which I have conducted case studies with my colleagues with other preschoolers. These Internet-connected toys are used with and without screens, but the robotic dog has a natural interface and no screen at all. The technology is fully integrated into the toy as the dog is an embodied social robot. Notably, in all the examples above, our playing is enabled by digital devices, defined here as play machines. In all instances, play in a technological and digital sense moves us. Play moves us physically, emotionally, and cognitively, and we play for the sake of leisure, learning, and playbor. In play, we advance, make progress, and become more social. In play, we move closer to each other, befriending the play machines. This is what speculative toy fiction also tells us: While watching a movie on a future version of a connected toy robot, we are offered a glimpse into what may come — a perspective on what post-digital play with new toy friends might look like one day, perhaps in the not-too-distant future.²

As described above, the evolution of technological innovations parallels evolving patterns of play, meaning new forms of play innovated in association with digital play. For example, connected technologies enable new ways of human communication through social play, creative play, and object play — or play with things. Children, like adults, are leading digital, connected lives (Hall et al. 2022, 2). Still, the fear of erosion, even the disappearance of (childhood) play, lingers around conversations regarding contemporary digitalizing play.

Play means “mobilizations that work across domestic, virtual, and publicly networked spaces” (Jayemanne & Nansen 2016), and “play, as a mode of experience, is mobilized across dimensions of hardware and software” (Moore 2011, 373). In other words, play moves between players, play machines, and various play environments, and in turn, the technological devices act as play machines (also perceived as ‘toys’), moving us in many ways.

In their article on the classification of digital play, Marsh and colleagues (2016) accentuate that the nature of play in the digital age is changing and that this change is foregrounded by how the resources available for play are deployed in various forms of play (also see Bird & Edwards 2015; Herr-Stephenson et al. 2013; Marsh & Bishop 2014; Plowman & Stephen 2014). Through these resources, the thesis seeks to investigate, and therefore bring to the fore, positive ideas about the impact of *devices* used in play, which will later be referred to as *play machines*.

To add another layer of inquiry to the studies conducted, the concept of (human) *movement* is a thematic thread that runs through the case studies and is a common

2 This passage, as a reflective piece, summarizes my own experiences of digital play with play machines.

denominator for the research examples explained in this thesis. Philosophically, play is movement that manifests between order and chaos (Sicart 2014, 3 citing Nietzsche 1872/1993). The Oxford Learner’s Dictionary (2023) gives multiple definitions to the term movement, including “changing position: an act of moving from one place to another or of moving something from one place to another.” Here, the term encapsulates mobility from a variety of perspectives, including physical (bodily), spatial (geographical), cognitive (educational), and mental (imaginative and creative) movement that happens in play as it manifests through the use of technology.³ By acknowledging the manifold dimensions of human movement, my goal is to approach digital and connected play from perspectives that are wide rather than narrow. As illustrated in the following discussion, theoretical ideas address movement from many directions.

“Play is the free space of movement within a more rigid structure” (Zimmerman 2004). In fact, “play moves in space” (Frappier 1976, 164). In the context of the studies undertaken for this thesis, in play, movement/motion and emotion arise between and within physical space and the players’ physical and mental stances in that space. This movement results from a combination of actions between players, toys, and digitally enhanced *play machines*, which all exist primarily as entities in the physical world. This means that the explorations of digital play that happen exclusively within the virtual space have been left out of the investigations.⁴

Movement also encapsulates another meaning — that of “a slow steady change in what people in society do or think” (Oxford Learning Dictionary 2023). An additional agenda for the thesis at hand would then be to advance the reader’s thinking about how play moves us in association with play machines and the ongoing changes in today’s world of digitalizing play.

Sutton-Smith (1986) has, on the one hand, written of the toy as both a bauble and an intellectual machine. On the other hand, the play machines discussed in this thesis represent a dimension of playful technologies, which have a purpose, goal, or function (Sicart 2014, 31–32) outside of play, “but the behavior and attitudes toward them [...] invoke the characteristics of play.” Therefore, they are first and foremost, ‘intellectual machines,’ whose quality manifests in acts of play.

3 In order to not be trapped in Cartesian Dualism, originating from the work of René Descartes (1596–1650), separating body and mind (see, e.g., Watson 2023), I acknowledge that these perspectives intertwine in play experiences. However, some aspects of mobility are accentuated more than others in the case studies presented in the publications of this thesis, depending on the context the research was conducted in and on the players, whose activities the research sought to explore.

4 However, the final study included in the thesis (Article VI), Playing with speculative toy fiction, involves actions depicted in a physical yet still speculative and imaginative space of the future world.

Already in 2004, Goldstein, Buckingham, and Brougère highlighted that beyond the “standard toy,” the video game console and computer could be counted in the “curriculum of the overall toy culture” as recreational objects (2004, 3). Obviously, the computer game console is meant to be used in and for play, but the computer, much like the digital cameras, smartphones, and tablets, is an example of a play machine that caters to uses beyond play. At the same time, these devices are essential for the existence of digital play.

Digital play is, first and foremost, a result of *digitalization* — a buzzword within the evolving technological landscape — which, as a phenomenon, may be viewed as a driver for effectiveness and automation. Again, the digitalization process refers to the evolution of matters into a digital form and computerization, which means using a computer to do something done by people or other machines before (Cambridge Dictionary 2023). In her book, *The Place of Play. Toys and Digital Cultures* (2009, 8), Maaïke Lauwaert stated that “technology is at stake in toys, games and playing,” pointing to “the increasing technologization and digitalization of both toys and play.” Digitalization predominantly originates from the field of information technology, but it has made its way to other research traditions, such as media and cultural studies. While Lauwaert’s work is situated in media studies, in this thesis, digitalization is treated as a matter of interest in (digital) play culture at the intersection of toys, technologies, and human mobility.

Play mobilizes and moves *homo ludens*, the playing human being, a term coined by Johan Huizinga (1938). Moore (2011) points out how Huizinga, one of the most acknowledged theorists in play, has declared the mobile quality of play: “Play, he argues, ‘moves’” (Huizinga 1970 [1938], 28).

The thesis title has a dual meaning, both literal and metaphoric. Movement in play occurs in many forms, from physical mobility to cognitive advancement and, finally, to emotional enjoyment, reactions, and responses to play. Indeed, understanding of play that moves us must also consider the emotional aspects of play. Emotions are considered a subset of the broader term *affect*, which also encompasses moods (Zhang & Li 2005). Emotions can be defined as “an affective state[s] induced by or attributed to a specific stimulus” (Zhang 2013, 251). The term usually reflects an individual’s subjective feelings toward objects, environments, people, and events (Russell 2003). “All social play has a mixture of the affective components of hardship and enjoyment by its very dialudic nature,” writes Sutton-Smith (2017, 129). And, “the positive emotions associated with play seem likely to promote the ontogeny of cognitive abilities that will facilitate the playing individual’s ability to successfully navigate its way through its physical and social worlds” (Kuczaj & Horback 2013, 106).

Why is research on the physically mobilizing and emotional tendencies of play needed? Ruckenstein (2010, 502) highlights the importance of mobility in a physical and computer-generated sense, as “mobility is valued over stability.” However, “play

has a mobility of its own that often goes unacknowledged” (Moore 2011, 373). In terms of physical mobility, mobilizing play may occur as everything between the geographical movement of the human player and her playthings⁵, whole-body play, and gross-motor movements throughout various movement categories, such as balance, locomotion, flight, manipulation, and projection (Maude 2010). Physically, the human moves in a multitude of ways:

Fine motor skills relate to small muscle movements, which involve precise movements of the hands, face, and feet. These skills can be facilitated through actions such as toggling or pressing buttons. Gross motor skills relate to actions of large muscle groups and whole-body movements or movements of large body segments. More specifically, gross motor skills commonly include locomotor skills (e.g., running, jumping, hopping) and object-control skills (e.g., catching, kicking, throwing). (Ulrich 2000)

The radius of action of the players investigated in the studies in this thesis ranges from small to large (meaning the range of movements made in play), as the digital technologies presented in the research at hand constrain and enlarge the scope of play. Consequently, playing with the play machines is not only about “pushing the buttons,” but more about the object-control skills used in combination with creative thought. It includes everything from the tapping, swiping, and sliding done in screen-based media; the notion of “high touch”; and agile movement within physical terrains and virtual online spaces, such as social media platforms.

As play moves us, it often manifests as a holistic experience, resulting from multisensory and mental engagement. To continue, what can move us physically may also move us emotionally, ultimately increasing our cognitive and empathic abilities, such as socio-emotional skills. Thus, *How play moves us* also points to movement of a more intimate kind. In addition, what moves us in play may point to a shift in internal emotional states and movement of the imagination. Emotions and imagination are needed to consider others’ experiences. This is one perspective on how technologically oriented play moves us emotionally. Therefore, the consecutive idea in this thesis is that *play can move us in multiple ways*. When doing so physically, play sets our body in motion. To exemplify, Bianchi-Berthouze et al. (2007) found that body movements increase the level of player engagement in a digital game. The movement also occurs within players’ interactions with social settings and mediated systems:

Play is not only fun, not only a child’s activity but also exploring the free movement present in a system of any kind, where the system might refer to a social situation as much as a machine assembly. Play is the process of exploring such a system, whether it be a toy, a game, a form of the sonnet, or the economics of a household. (Bogost 2016, 113)

5 For a historical overview of the meaning of *playthings*, see Mergen (1982).

Play mobilizes us physically, most notably as part of sports and related recreational activities, simultaneously moving and transforming our minds — and mindsets. As Brian Sutton-Smith claims, play “changes the person who does it somehow into someone momentarily at least more confident on his or her return to the hazards, anxieties, and boredom of everyday life” (Sutton-Smith 2017, 217). In other words, by increasing curiosity and proactivity over passivity, playing adds flexibility to our minds being a phenomenon with transformative powers.

Central to the idea behind this thesis is that play also moves us with the help of objects, artifacts, and technology. Toys are a powerful media that influence play and impact society: “Toys have always been social markers that reflect socio-cultural practices” (Johnson & Christie 2009, 287). Modern toys, just like modern technologies, seem to separate younger generations from the older ones (Chudacoff 2007, 158). For example, as Lauwaert notes (2009, 40–41), toys are “generation-shapers”: They can tie generations together through communal play or create a rift between different generations when children and (grand)parents cannot find common ground in play. This is another motivation for why research on technology-oriented toys and the use of devices as play machines is needed to understand how and why digital play happens, how digital play manifests in the playing of different age groups, and how play moves us in association with digital technology in particular.

Besides being a matter of *homines ludentes* — the playing human beings — movement is integrated into technological innovations. Mobility and movement also have a historical trajectory and past that is meaningful to them alongside the evolution of technology and media.

Parikka and Suominen (2006) suggest that mobile media are media on media or *media in action*. In a physically mobile sense, with the naissance of railway systems and train rides, “mobility became a central issue (and concern) of modernization, and movement in itself (not merely as an instrumental issue) became a novel non-place, which consumed a huge time-share of everyday life” (Parikka & Suominen 2006, 5). Similarly, technologically enriched play accentuates action prompted by mobility of machines and media. While human mobility in association with the use of mobile devices, such as digital cameras, smartphones, and tablets, is logical and expected, the phenomenon of the *mobilizing tendency* (Heljakka & Ihamäki 2020) of technologically enhanced toys has been researched far less than, for example, player mobility in association with location-based games (for location-based games, or LBGs, see e.g., Benford 2005). Parallel to presenting the possibility of perceiving cameras and communication devices with functions outside of play as play machines, this thesis also attempts to address the gap that currently exists in research regarding toys, technologies, and mobility in a time where screens and autonomous movement are becoming an everyday standard of technology.

Currently, toys have encompassed movement through various player-employed affordances — playthings, such as smart toys, are no longer manipulated and moved

by either robust mechanics or the hand of the players only but are increasingly controlled and given mobility through devices like smartphone applications and tablets, in other words, play machines that come with *screens*. In parallel, the play that occurs with technologically enabled toys without a screen belong to the category of embodied toy robots integrated with sensor technologies, sound, lights, and movements: Embedded play refers to play with connected, screenless toys or objects where a screen-based app is unnecessary to unlock the toy's digital potential (Mascheroni & Holloway 2019, 7).

New toy technologies are emerging fast, at least if speculative accounts are considered. As illustrated by the products of speculative toy fiction (Heljakka 2022), such as the future “toy friends” introduced in the Netflix series *Black Mirror* (IMDb 2023), toys may receive unprecedented powers in terms of mobility when combined with cutting-edge technologies. This thesis is an attempt to move beyond the concerns expressed in entertainment and the dystopian views of technology of the *Black Mirror* kind and to examine where the *digital leap*⁶ has taken players during the past decade in terms of creativity in play during learning, leisure, and playbor (Kücklich 2004); it also examines how educational and imaginative aspects of play set us in motion, once invited to play by digitalizing and Internet-connected playthings, devices, and play environments. This being said, it is also possible to see how speculative toy fiction gives us a glimpse of more optimistic views on how play may move us in the future through the use of play machines.

This thesis aims at understanding the positive and multidimensional role of digital technology in everyday play (or, the *digital leap of play*), including its mobilizing tendency, and players of preschool age up to adult seniors both in the contexts of leisure and learning, as well as adult players whose play is beginning to demonstrate productive cultures through work-infused play, conceptualized by Julian Kücklich as *playbor*.

The manifestations of play depend on the context, and technological development offers a context to consider play experiences (Verbeek 2006). In her book on digital play cultures, Lauwaert (2009) observes how players “perform play activities that lie outside the core,” meaning that they challenge what the designers had in mind when designing the interaction between the plaything and the player. Lauwaert uses the term “periphery of the geography of play” to describe divergent practices of play that deviate from intentional design. Simultaneously, as a toy and play researcher, I

6 The *digital leap* is a popular term that refers to a rapid advance or transition into digital technologies. The term has been used extensively in the Finnish language context (in Finnish, *digiloikka*) and has been, for example, discussed as part of education (for reference, see Saari & Sääntti 2018). In the context of this thesis, I play with this term to explain the technological change that has both decreased and increased understanding of play with technologies.

am particularly interested in the new appropriative manifestations (Sicart 2014) of current play in the social and digital context, the mobilizing effect of technology on players (and gamers), and the prevailing attitudes toward digital play. The subject of digitalization and connectedness of play enabled by machines and media is timely considering the uncertainties experienced in current society, “since digital play can support children’s learning, development and well-being during times of crisis or rapid societal change by offering innovative new ways to play, learn and interact” (Gray & Thomsen 2021, 4). Perhaps more than ever, to advance and overcome current societal and planetary challenges, the world needs the creativity and exuberance of players who, to follow Lauwaert’s thinking, move across the core and the periphery of the geography of digital play, and who constantly innovate new ways to employ machines and media in their playing supported by devices.

As every research endeavor should start with considering the epistemic grounds of a phenomenon, it becomes necessary to ask: What is meant by technology, more generally? Better yet, let us not consult old media, but play a little digitally and ask contemporary technology itself: “Siri, what is technology?”⁷

Siri: Here’s some information. [Opens a window on screen]: Technology: Making, modification, usage, and knowledge of tools, machines, techniques, crafts, systems, and methods of organization. Technology is the application of knowledge for achieving practical goals in a reproducible way. The word technology can also mean the products resulting from such efforts, including both tangible tools such as utensils or machines, and intangible ones, such as software. Technology plays a critical role in science, engineering, and everyday life. Technological advancements have led to significant changes in society.

And then let’s ask ChatGPT, a popular “AI toy” at present, the same question: “What is technology?”⁸

[Text appears letter by letter on window screen]: Technology refers to the tools, methods, and systems that are developed through scientific knowledge and applied for practical solutions that solve problems and improve our lives. Technology can be seen in various forms such as computer systems, software applications, digital devices, machinery, medical equipment, and more. Technology has played a critical role in shaping human societies and has drastically transformed the way we communicate, work, and live. The advancement of technology continues to impact all aspects of our lives and is an essential aspect of modern society.

7 Siri is the digital voice assistant of Apple Inc. <https://www.apple.com/siri/>

8 ChatGPT is a free-to-use AI system. <https://chat.openai.com/>

To narrow down the concept of technology to *digital technology*, let us concentrate on the most relevant aspects of the phenomenon, namely technology as *devices* and *software*. The massive upsurge and presence of various technological devices (Granata 2014) and the use of screen media provoke increasing debates around their capacity to capture and hook players' attention, troubling many people today, regardless of their age.

According to Michel de Certeau, products gain meaning when used, and the same goes for technological devices. In the book *The Practice of Everyday Life* (1988), de Certeau speaks of "making do" in appropriating existing technologies through "manipulation" and "bricolage," or creating, inventing, and generating something new. de Certeau's "making do" (de Certeau et al. 1990) enables ideas of production, work, and leisure to intertwine, which is another idea touched upon in the thesis at hand, namely from the viewpoint of playbor, or productive play. This is why research on human interaction — including play — with objects, environments, emergent technologies, and players is needed to understand human ways of manipulation and creation that ultimately increase our understanding of how we interact and engage with the world around us.

Lauwaert (2009, 21) lists commodification, domestication, and urbanization as "exemplary processes illustrating how societal shifts and the changing world of toys co-evolve." Commodification refers to the act or process of treating something as a product that can be bought and sold, and urbanization signifies the trend of people moving to cities to work and live. Domestication, again, requires a few more words to explain.

How does technology become "tamed" through human play? Through a process named *domestication* (Panzar 1997). "Domestication is understood as the process which makes play an everyday practice of the domestic realm and 'bends' it to the wills and norms of the family" (Enevold 2014, 1). The domestic space is a locus in which technological devices are "tamed" (Haddon 2011), and the domestication of technology happens as media technologies turn to tools, and these tools as toys start to function as the instruments of play. An example of a domestication process unfolds in the history of the telephone: Much has changed in the meanings associated with communication technology, such as the telephone. As Pantzar (1997) points out, the first telephones were not meant to be used for enjoyment. At the same time, "playthings" of the past, toy technologies such as the car, have transformed into practical technologies with uses that stretch far beyond play. Similarly, by looking at the evolution of mobile technologies such as portable devices (cameras, mobile phones, and tablets), it is possible to see how they have and continue to serve us as play machines.

Human play often strongly reflects adult behaviors. Object play, in particular, serves to acquaint children with the technologies that adults use in the relatively safe home environment (Ember & Cunnar 2015; Lancy 2015; cf. in Riede et al. 2018).

Nevertheless, the ongoing “technologization” of object play understood in this thesis through the concepts of toys, devices, and mobility has provoked many concerns among adults, parents and educators in particular. Some of these controversies and complexities will be unpacked next.

Sometimes, the communication about play could flow more fluently between adults and children, especially concerning what is perceived as spaces, objects, or media used for play. Adults often find themselves “lost” on children’s playgrounds because they do not speak the language of play (Sutton-Smith 2017, 135). The same goes for playthings: Ellen Seiter notes how children make meaning out of unanticipated toys and are perhaps undecipherable to adults (Seiter 1995, 10). This view resonates with the difficulties of understanding technologically oriented play. Consequently, it is possible to perceive a *generational rift in understanding technologically oriented play due to perceptions of what play means, its ties to media, and how access to devices and media is enabled and governed by those in charge, who are often adults*. These reasons will be discussed in more detail in the following.

A major reason for misunderstandings around play may be the different views adults and children have on their perceptions of play. For example, Howard and McInnes (2012, 738) have observed how “research has tended to focus on what play looks like from an adult perspective, for example, in terms of what materials are being used or whether children look like they are having fun, rather than focusing on what characteristics children themselves associate with play activity” (cf. in Takhvar 1988; Howard et al. 2003). Indeed, although some parents may perceive digital technologies as more of an asset than a threat (Lauwaert 2009), children’s and adults’ views on what constitutes play may differ (Dockett & Perry 2007). Furthermore, Kudrowitz and Follett (2014) note how the needs and preferences of adults as purchasers of toys, and children as their end-users (i.e., players), tend to be very different. These complexities of play add to the perceived difficulties of understanding creative — imaginative and self-expressive — device use in association with machines as play, as conceptualized and investigated in this thesis.

Weil and Rosen (1997, 359) have observed that while fast-evolving technology presents many opportunities, the majority of us are not enamored with technology but rather feel frustrated and uncertain about it. To continue, Ruckenstein (2013, 485) has found that for some, “the use of technologies and associated media by children is considered a waste of time and money.” Early on, Resnick (2006) noted the polarization of discussions about children and technology as a sign of the aforementioned generational rift. Often, critique against technology use comes from the parents and grandparents of young children: “critics of new technologies are too quick to lump all technologies together and dismiss them collectively,” Resnick (2006, 11) observes.

One further explanation for the limited views that adults have on technological play is given by Jayemanne and Nansen (2016), who bring up the concept of *prolepsis*, first discussed by McPake and Plowman (2010) and drawing from Cole's discussion in *Cultural Psychology* (1996). The notion of *prolepsis* means that “a critical influence on parents' interactions with their children derives from the projection of their memories of their own idealized past into the children's futures, which is an explanatory force for parents' participation in technological play” (McPake & Plowman 2010, 1). Another explanation may be the limited understanding regarding the relationship between technological devices, media, and mediated content and the relations people have to these realms in the context of family lives, education, leisure, work — and play. What causes additional confusion is the intermingling of technological devices and media.

Aufderheide defines the five qualities of media as follows: “1) Media are constructed and construct reality; 2) Media have commercial implications; 3) Media have ideological and political implications; 4) Form and content are related in each medium, each of which has a unique aesthetic, codes, and conventions; and 5) Receivers negotiate meaning in media” (Aufderheide 1992; cf. in Koltay 2011, 213).

Information communication technologies (ICTs) have entered the context of everyday life as both “objects and media” (Haddon & Silverstone 2000, 251). Digital media have a close relationship to digital play as *play media*. In turn, digital play media are constructed and construct reality. Different generations operate across an evolving media landscape. Takeuchi (2012) notes how the news media, including newspapers and magazines, TV news, and books, have all contributed to characterizing the digital generation (e.g., Tapscott 1998, 2009; Prensky 2001) from which parents of the “digital natives,” the so-called digital nomads, seem to feel detached. Then again, we need to keep in mind that “digital natives are made, not born” (Takeuchi 2012, 39).

Livingstone (2007) claims that households can be positioned along media-rich and media-poor homes. As technology use demands access, our possibilities are framed by agency and, sometimes, ownership. The agency is limited by control, governance, and permission, ownership by means that guarantee access. In children's lives, parents and educators often afford and limit children's use of media technologies, even in terms of play. Barron and associates (2009) position parents as “resource providers” and gatekeepers who grant children access to tools that inspire technology-based activities. Simultaneously, parents are the child's *first educators* (Stephen et al. 2013). At the same time, they are “digital immigrants” adjusting to new play worlds their offspring already easily and effortlessly navigate and experience.

How play undergoes changes and transformations due to new devices and communication technologies is of interest to the general public — and academic scholars — besides parents, caretakers, and educators of young children. There are

manifold concerns articulated and made visible in the news media about how digital technologies and media impact what is often conceptualized as *traditional* and hence, *non-technological* play. One of the most vital and commonly expressed concerns regarding evolving play is that technology can diminish play (Marsh & Bishop 2014). Simultaneously, for some, play with digital technologies is not conceived as “real play” (Palmer 2016) or “real” interaction, physical interaction, and tactile play (Lauwaert 2009, 21). *Which societal transitions have strengthened these beliefs, and which lines of development have contributed to the fears, misunderstandings, and possible hopes associated with digital play? How have the things made for play come to have a close relationship with digital technology and media?*

“There has been increasing recognition of the potential for harm in the context of exposure to electronic media, environmental toxins, and safety hazards. In particular, electronic media” (Healey & Mendelsohn 2019, 2). From an adult perspective, the effects of technology are understood either as beneficial or detrimental. A study found that parents associate health concerns, content concerns, and addiction concerns with digital play (Erdogan et al. 2019), a form of engagement with digital resources previously understood as electronic media.

In a commentary written about a blog post I wrote on digital play, someone expressed the idea of interaction with devices having nothing to do with play by saying: *I don't conceive of children being with devices as play of any kind. Playing is a more physical and concrete action. Even social interaction is very different face-to-face than through devices.*⁹ Based on this narrow conception of device use, an essential part of digital play, engagement with technologies combined with mediated content is not perceived to carry either “physical” or “concrete” qualities. Sung (2018, 234) has found that exposure to digital technology during early childhood may indeed influence the quantity and quality of children's play. However, this development does not necessarily correlate with the diminishing physical or concrete manifestations of play — it may have to do with how technology use impacts the imaginative dimensions of play as well: According to previous research, the number of hours children spend role-playing has significantly decreased (Russ & Dillon 2011). For example, in the ongoing debate of why this phenomenon is occurring, developmental psychologists linked a decrease in role-play to the increasing use of technology among children (Ito 2012; Veiga et al. 2016).

9 “Devices” are a popular term for “machines” that enable digital communication. The comment here is given for an article on digital play on the website for the Mannerheim League for Child Welfare. Retrieved at: (<https://www.mll.fi/lapsemme-lehti/mita-on-digitaalinen-leikki/>) and translated from the original language, Finnish: “En miellä lasten laitteilla olemista leikkimiseksi millään lailla. Leikkiminen on enemmän fyysistä toimintaa ja konkreettista tekemistä. Sosiaalinen vuorovaikutuskin on hyvin erilaista kasvotusten kuin laitteiden välityksellä.”

Previous play research has expressed similar concerns; for example, highlighted anxieties tied to “the Frankenstein Paradox,” “spying” toys, and the uncanny valley associated with robotics as phenomena affecting contemporary play by decreasing the imagination and presenting other challenges. According to Sutton-Smith, the Frankenstein Paradox has concerned Romanticists of childhood for over 200 years. He writes: “Children’s imaginations, it has been said, are always being threatened by the emergence of new machines — toys, television, video games, and so on” (Sutton-Smith 1992, 4).

Then again, “the forms of a new culture are always seen as demonic by the culture that precedes it,” Pesce (2000, 272) cites from cultural historian William Irwin Thomson. This discussion is reminiscent of Ron Goulart’s (1969) idea of children’s commercial culture — toys, fashion articles, comics, and a culture of selling — as “an attack on childhood.” However, the agency of toys and their capacity “to attack” depends heavily on the player: “usually the child players control the toys rather than the other way around. This is what we have meant by the toys as agency.” Ultimately, toys are in our control rather than the other way around (Sutton-Smith 1986).

In the family context, parents are gatekeepers who control access and provide guidance for technology use (Lundtofte 2020). Parallel to understanding what digital play means to the players, it is essential to highlight the parental and caretaker role in enabling and valuing technology use in association with play. In the study conducted by Brito et al. (2019, 129), parents mentioned these barriers to adopting new play technologies: “(a) their perception of the presence of digital media in the lives of their children [is] already excessive, addictive and harmful to other aspects such as social skills and physical activity and (b) not seeing worth in investment in high-price toys without being sure that children would play with them for a long time, and benefit from developmental and educational stimulation from them.” But, as noted by Thomas and Hocking (2003), fears are not always in proportion to actual risk levels (cf. in Cowan 2020, 13).

Parental beliefs about play are fostered by the individual, culture, and society (Fisher et al. 2008, 315). In an article from 2010, Ruckenstein quotes Eeva Berglund’s (2007, 77) notion of Finland¹⁰ being a curiously technophile country. Despite this observation, many find it difficult to understand how technologies influence and support play, even in Finland. However, as Ruckenstein (2013, 476) writes, “technological developments, products, and services are an inescapable element of children’s everyday life.” Indeed, technologies saturate our world (Ibister 2016a, 2016b) and require new operational skills and literacies to develop alongside their use. Eckhoff (2017) finds a critical exploration of the role of digital media in contemporary childhood as necessary.

10 The author’s country of residence.

Digital play pivots around using devices in/for/with and “as” play. Yet, in everyday debates, for some adults, devices are the epitome of an unhealthy life (and play). In his account of video games, Sutton-Smith positions the toy as a machine, isolating and possessing the child (Sutton-Smith 1986, 75). A columnist for the Finnish daily newspaper *Helsingin Sanomat* wrote in October 2022 that “the worst obstacle to play is overly addictive digital devices. Children must be resolutely freed from their power” (Mutanen 2022, B13).

Mascheroni and colleagues (2016) have found that parents’ worries depend on their education, background, and parenting culture. Reasons such as parents’ lack of self-confidence and knowledge of online media are given in earlier research (Ibid.). For example, families with lower incomes experience a generational *digital divide*. Marsh and associates (2020, 10) acknowledge that parents face common dilemmas in the governance of technology use, such as how much digital technology they should let children use or what apps and games should be allowed as part of their children’s play. But each family addresses these complexities in different ways, and attitudes toward technology use in children’s lives result from social relations. Takeuchi (2012, 55) writes:

[...] any child’s particular relationship with these technologies is shaped by the people around them — parents, siblings, teachers, friends, neighbors, and so on. And these interactions are, in turn, influenced by individual maturity, family values, institutional policies, cultural norms.

Ellen Seiter has described computers as a transitional object, “moving children from playing with toys and games, to pursuing media-based fan activities with them” (Seiter 2005, 96). Further, Seiter argues that children use computers for entertainment (2007, 16; 90). Today, children play with tablets, smartphones, and laptops (Kudrowitz & Follett 2014). Furthermore, in parallel to devices, play happens through software that delivers the play content. Digital devices play a crucial part in how play moves us in the contemporary world. Yet, they are also one of the main entities that increase the complexities around technologically enhanced play. Mascheroni and colleagues (2016) suggest three reasons for parents’ management of digital devices: the complexity of the devices, the lack of skills needed to update and adapt their use habits, and the co-use and supervision of use becoming less available or ineffective due to the personalization and portability of digital devices (Haddon & Vincent 2014; Mascheroni & Ólafsson 2014). Today, these concerns are growing, as toys themselves are transforming to some extent into sophisticated play machines alongside other devices used in play. In this way, adult experiences and perceptions of digital play vary across concerns of excessive device use and beliefs regarding the limited creative affordances and re-playability of technologically enhanced toys. In fact, play machines carry with them the fear of addiction and enslavement. As shown,

some find it hard to link play to device use altogether. Another prevailing idea about technology-oriented play manifests as a belief regarding the detrimental consequences of playing with technology; there is an imbalance, a regulation of time spent with play content channeled and prompted through devices, and a possible encapsulation — or according to Lauwaert’s (2009) observation, an *over-domestication* — of the player into the indoor environment, especially in regards to playing digital games. These issues will be discussed throughout the next passages of this chapter.

The exploration of the artifacts of digital play must begin with an elaboration on games. Ibister (2016a, 2016b) positions games as a “rich terrain” and realm for experience design, which plays an increasing role in our everyday socio-technological experience.

Gaming is simultaneously considered the dominant category of digital play¹¹ — and at the same time, ambiguously, one of “non-play.” On a general level, I outline gaming (analog, digital, and hybrid) as one of the most significant forms of play in the early 2000s, structured as a sub-genre of play practiced by people of different ages. Based on a classical definition, in games, players partake in activities directed toward “accomplishing specific goals within an established set of rules” (Suits 1967). Free play (*with* or *without toys*) is often considered open-ended, but a game usually has a goal, rules, feedback system, and various winning conditions, and participation in games, like playing in general, is a voluntary activity. Gray (2015) claims how games with rules, such as board games, video games, or competitive sports, provide scripted ways for friends to interact and connect. The locus of the domestic space is of importance for how games are introduced to children’s lives: Mertala (2018) explains that the first gaming experiences — that is, being a player and a follower — are gained at home.

Digital games have been seen as paradigmatic of new media (Kücklich 2004, 2), and their impact on other realms of play is significant. Video games are becoming central to youth technology culture (see, e.g., Ito et al. 2013). Fizek (2017) describes video games — understood here as *digital games* — as instances of everyday techno-culture:

A digital game is an act of communication and a playful exchange involving some degree of control negotiation between the human and non-human, between the player and the machine. (Fizek 2017, 6)

11 Games have also been assigned the position of “the dominant cultural form of the XXI Century” (Zimmerman & Chaplin 2013).

Digital gameplay happens with and through devices and platforms: “Today, digital play includes playing video games on televisions with video game consoles, computer games, games on phones and tablets, hand-held video games, and augmented reality and virtual reality games found on different platforms” (Flynn et al. 2019, 55).

Playing games may contribute to various forms of skill-building and cognitive abilities. In the 21st century, games have attained a permanent position as media that entertains and can enhance and support player development in many ways. According to game scholar Frans Mäyrä, games challenge the players: playing games involves creating, testing, and modifying strategies and skills needed in the game (Mäyrä 2008, 3). Game researcher Sonja Kangas (2009, 58) has stated that (digital) games do not offer the same freedom as open-ended play. However, according to Jane McGonigal (2011, 20–21), playing digital games involves imaginative problem-solving that is both enjoyable and developmental. Players enjoy exploring the limits of game design (Ibister 2016b, 67), and limits are part of the game’s appeal: “Games aren’t appealing because they are fun, but because they are *limited*. Because they erect boundaries. Because we must accept their structures in order to play them” (Bogost 2016, x).

The motivations to play with and through digital technologies are varied and multifaceted. Play satisfies social needs and aims in addition to individual ones (Gray 2015, 236). Referring to Cheshier (2004), Moore (2011) speaks of the “stickiness” of game screens.¹² To play a game is to experience it, see, touch, hear, smell, and taste the game, move the body during play, feel emotions about the unfolding outcome, communicate with other players, and alter standard thinking patterns (Tekinbaş & Zimmerman 2003, 314).

Richard Bartle’s (1996) player typology categorizes players into killers, achievers, socializers, and explorers and points to the need to understand different aspects of player behavior. Whereas killers are known to enjoy competition, achievers are, according to this theory, gratified through accomplishment. Explorers are adventurers and investigators motivated by solving mysteries, and socializers play games to enjoy interacting with communities.

Despite the existence of player types with various motivators and qualities, playing is a social activity: Ibister notes how most people who play digital games play them with others (Ibister 2016b, 43; ESA 2015). Games create interactions through dialogues: Ibister (2016b, 63–64) sees the role of game designers as *social engineers* who employ game elements to create social situations that are interesting and compelling, even from a social perspective. That is to say, our play partners enable communication through play:

12 Rushkoff (2006) even speaks of “screenagers” when referring to children in the digitalizing age.

In games, participants test and tease one another. They assert themselves and adjust to the challenges directed at them. For such reasons, play should be seen as a dialogue rather than a straightforward expression. (Henricks 2017, 11)

Digital gaming has become a common leisure practice (Crawford & Rutter 2007). However, for many, playing digital games is not considered playing at all. Indeed, as Lauwaert (2009, 41–42) pointed out some time ago, “new media technologies in general, and the Internet, personal computers and hand-held gaming devices in particular, have recharged tensions between domestication and urbanization.” The negative impact of digital gaming on the lives and leisure time of children is accentuated in a deluge of conversations around “game addiction, violence, aggression, gaming disorder, desensitization to violence, obesity, and other pathologies that might correlate with playing video games” (Hilvoorde 2016; cf. Spitzer 2012). Despite the provocative title used in a commentary on digital play written by columnist Madekivi (2021) — “Gaming is opium for the soul” — the opinion piece quoted in the following tried to approach the subject from a more understanding viewpoint:

So what makes getting stuck with digital devices so dangerous for young people? It has been researched that excessive screen time combined with lack of sleep has an underlying effect on the weakening of cognitive skills such as language and memory. At the same time, it takes time away from daily exercise and exposes you to muscle tension and wrong positions. Otherwise, the balance of life is shaken. Friends and hobbies remain outside, personality experiences change, and gaming becomes an escape from reality. Unexcused absences from school gradually increase.

[...] With children, their example, guidance, education, and jointly agreed rules of the game are the means that responsible parents can use. [...] Age limits have been made to be observed. Digital time should be regulated, but flexibility should be given to certain situations.

The column makes several critical points about the concerns about digital play: risks to physical, mental, and social well-being. Again, the writer stresses the responsible role of the adult, who should set the example for the appropriate use of devices and guide, educate, and formulate rules for children’s engagement with them.

The fears related to digital gameplay share common ground with the ideas concerning device use in other forms of digital recreation: One of the fears of playing with technologies is the passiveness (immobility, in particular) they seem to cause. However, Fantozzi et al. (2018) argue against the passivity or one-sidedness of using digital media: Children may actively use technology in multiple ways just like adults do — to interact with others and extend play (Fantozzi 2012). That being said, even digital play can be purposeless. Further, it may be transgressive, even risky.

Play can connect people, but according to popular belief, contemporary play is mainly about play that emerges from solitary interactivity between a player and a device, most notably a device with a *screen*.

The most articulated fear related to the technologically oriented play of the contemporary kind are the screens that channel content for play in the playing of games and the case of some toys. Devices with screens are seen as problematic for many reasons. Flynn et al. (2019) note how screen media use is often linked to the sedentary lifestyle of children (American Academy of Pediatrics 2016). Additional concerns about screen time accentuate fears associated with monitoring and surveillance, not only through screens but by “intelligent” devices, which we surround ourselves with, resulting in the human looking at herself in play and being looked at and captured by screens while playing. Screen time associated with entertainment consumption is a concern for many adults, parents and educators in particular, most often in reference to playing digital games during free time.

Developing technologies may also influence where and in which contexts play takes place. The partial disappearance of street games at the cost of indoor play may result from other reasons, such as ‘stranger danger’ (see, e.g., Davey 2012). The most burning questions regarding play seem to relate to increases in screen time and consumption and contemporary children’s decreased ability to play, which are often considered to profoundly impact modern childhood.

The tumultuous move from face-to-face interactions into communication through screens for utilitarian purposes, such as education and work, makes it possible to question the motivation to spend time with screens during leisure time for the sake of non-utilitarian play. Over the past decade, screen time for young children has increased while play, including active play and play with toys, has decreased (*Common Sense Media*, cf. in Healey et al. 2019, 4).

The history of the notion of screen time precedes current mobile technologies. Hilvoorde (2016, 1) notes how “the first generation of electronic games, such as *Pong*, was more or less categorized as ‘screen time’” in its time. Curiously, whereas concerns about children center around too much screen time and too little play, adult consumption of screen-based devices is not under a similar critical lens. Interestingly, as Plowman and Stephen (2014) write, “the concept of ‘screen time’ is rarely applied to television, which enabled the playing of *Pong*: most of the concerns expressed about young children’s time with screens is focused on touchscreen devices.” Excessive use of digital technologies with screens is believed to cause digital fatigue, even ‘technostress’ (for technostress in the adult context of working life, see, e.g., Dragano & Lunau 2020). For these reasons, researchers Flynn et al. (2019, 54) have believed it “critical to consider whether the nature of digital play benefits or harms children’s development.”

However, conversations and critical discussions on screen time are often shallow. Plowman and Stephen (2014, 14) point out that deciding what counts as screen time

is complex. To better understand screen time related to play, we must start with simple questions, such as: “What does “screen” mean? What does “time” mean?” (Ibid.). The virtual world and the use of its applications, such as social media platforms, have led to a situation in which, for example, family members have different rhythms, timetables, and lifestyles, potentially leading to conflicts. *But to be more precise, why is that engagement with screens fraught with concerns and negative preconceptions?*

Many adults prefer children to be engrossed in “free play” instead of watching and interacting with screens (Levin, 2015; cf. in Erdogan et al. 2019). Animated and dynamic play associated with digital media consumption in parallel to developing playthings has caused concerns, for example, about the rapid increase in screen time among today’s children (Plowman & McPake 2013). This disposition to “screen play” accessed through “screen time” comes across in popular entertainment of present times, which addresses screen time in association with toy play: “I thought we were gonna limit screen time to thirty minutes a day,” says the mother of nine-year-old Cady during a car ride, when observing her daughter operating a toy through a tablet in the popular film *M3gan* (Johnstone 2022).

Consumption of screen time in the domestic context is an everyday challenge in many family lives, as technology-oriented play often manifests with and together with smartphones, tablets, computers, and consoles; some people claim that these devices immobilize players through encapsulation indoors.

One concern related to overtly used time with digital technologies is the supposed adverse effects of screen-based devices in limiting children’s bodily (physical) mobility. For example, many fear that screen time steals opportunities for outdoor play. Cumbo et al. (2014) refer to digital recreation, stating that children in their pre-teen years (8–12 years of age) living in urban, Western contexts increasingly spend their free time indoors engaging in digital recreation rather than outdoor, child-directed play. This recreation, positioned in this thesis as play, has been noted as a solitary activity that, harshly put, will predict their future occupation: “With the toy, we habituate children to solitary, impersonal activity; and this is a forecast of their years to come as solitary professionals and experts” (Sutton-Smith 1986, 25). Sutton-Smith agrees that video and digital games can be conceptualized as media that constitute play worlds and critiques their role in caging play in indoor environments by writing:

[...] they redirect the attention of children who previously would have turned toys and group play for excitement to the often more solitary activities engendered by our decidedly subjective and consumer-oriented society. I think it important to realize we are witnessing an enormous encapsulation and movement indoors away from all our traditional play. Many of us still grew up not too far from woods and wildlife and farms, and our play involved animals, harvests, mountains, and lonely seashores or urban streets (or even suburban sidewalks), and endless outdoor ball games. (Sutton-Smith 2017, 182)

While children's independent mobility seems to be shrinking in the offline world, human mobility across digital spaces is becoming more fluent and effortless. Still, the fears of decreased time and space dedicated to traditional play (as non-technological play), still considered a more genuine form of play — are troubling for many.

For some, the indoor life that interaction with screens often implies causes concerns: children should instead spend time in the fresh air outdoors, on playgrounds, or according to many in Finland, in nature.

This doctoral thesis strives to overcome the challenges of single-handedly seeing technologies as having harmful effects on play by asking next, *What is the position of the playing human being within this changing technology landscape?*

Smith et al. (2016) have found that children of preschool age play for longer durations and at higher intensities outdoors. But increasingly, mobile technologies have enabled play to re-enter the physical outdoors. Examples of structured play experiences in recent years have shown forcefully how location-based games such as *Pokémon Go* (Niantic 2016) have lured masses of players of different ages to move about their surroundings and, simultaneously, to become mobilized by the game mechanics promoting both bodily, spatial and geographical movement. Another example is *Geocaching*, a type of GPS-supported outdoor treasure hunt based on “caches” hidden in urban landscapes and nature. In other words, technologies also move us in outdoor space.

Affordances of virtual play spaces have also given rise to social and mediated play (Kafai & Fields 2013). Children with higher-income parents use more touchscreens (Nikken & Schols 2015). However, it is not only the children who are at it. In the digital age, a vast amount of work-life and pleasure content is mediated, consumed, and manipulated through screens. As demonstrated, screen time is often presented as if it's undesirable, but “screens perform different functions, and we use them in different ways to do different things” (Plowman & Stephen 2014, 14). Using screens in play has benefits, as they, according to Soute et al. (2010, 442), “allow rich feedback and efficient information exchange.” Further, playful interaction through the screens of connected devices means that digital technology enables us to stay in touch with other representatives of *homo ludens*. That is to say that screen use can be positive for the facilitation of play.

Research on play conducted in 2010–2020 allows the researcher to focus on a restricted period of time, during which the use of screens in play has proliferated. This moment in time also marks a shift in using smartphones for play in terms of their camera technology instead of digital cameras — the play machines of interest for the first case study in the thesis. The evolution of screens is notable and relevant to remember when considering play, as between 2010–2020, for example, the screens of smartphones have undergone significant changes in the *size* of the screens. One aim of this thesis is to shift perspective from being enslaved by the presence of screens

to being empowered by them through the use of connected mobile devices and media platforms like cameras and smartphones, which easily link to social media, as well as the more emergent field of connected toys and toy robotics, such as social companion robots. Pocket-sized technology and hand-held devices mean portability, an essential feature of devices that set mobile play in action. In robotics, the demand for portability is replaced by the robot's ability to move. This also applies to the toy robots investigated in this thesis. During 2010–2020, new Internet-connected toys have been launched, both screen-based and screenless. Notably, at the end of the decade under inspection, screens (and window screens!) became a central means of communication due to the restrictions of the COVID-19 pandemic. As observed in the final publication of the thesis — a case study on speculative toy fiction — the concept of the screen may be radically different in times to come as it may take completely different forms than is the case today.

While “we don't need computing to play,” as Sicart asserts (2014, 99), technology expands the portfolios of our playful repertoires, which may enhance our play experience in many ways. New technologies change our time use and direct our attention in new ways. Nevertheless, relationships to technology use may be subjective. *Technicity* (Dovey & Kennedy 2006; cf. in Enevold 2014, 2) emphasizes the connection between human subjectivity and technology. While digital play experiences may manifest as highly self-expressive and individual, this thesis accentuates the social aspect of engagement with what is treated here as the play machines that traverse the limits of devices that cater to gaming experiences only. Sicart (2014) wisely notes that while games are a manifestation and form of play, they are not the only one. Thus, to further broaden the perspective on digital play, I begin to build the argument that it is necessary to look at digital play beyond gaming by asking: *What if there is more to 21st-century play than playing digital games?*

All gaming is play, but at the same time, digital play represents a much broader realm than the design, playing, and theorizing of digital games. In other words, digital play is *not only* digital gaming. To move beyond the limits of games, this thesis seeks to explore the developments of digitalization, mediatization, and robotification — hence, digital, networked, and Internet-connected play outside of “gaming” or the playing of digital games.

We seek not only consumable experiences online but also cognitive and creative challenges of digital cultures and communities. Despite acknowledging that a great deal of contemporary play manifests as various forms of pre-structured and industry-designed and delivered gameplay, in the article-based thesis at hand, play is more often seen to lean on the creative (paidic) rather than the competitive (ludic) realms of human culture, including structured playthings other than games.

“Some play behaviors are more ritualistic or rule-bound (ludus); other expressions are more spontaneous or improvisational (paidia)” (Henricks 2015a, 5). In Roger

Caillois's (1961) terms, *paidia* means the “spontaneous manifestations of the play instinct.” Parallel to ludicism, there is the paidic end of play that celebrates childlike and sometimes seemingly irrational play — play where imagination and creativity are at high stakes. This is how I see technologically enhanced toy play playing out.

To understand what creative digital play can be outside of competitive games, the thesis is interested in toys and play machines and their tendency to mobilize the players physically, cognitively, and emotionally, unlimited by age.

As shown in the case studies presented in the publications of the thesis at hand, an essential part of digital play outside of games happens in association with various toys — *actual* toys and *digital devices* that extend the understanding of what toys are evolving to in the contemporary world. As previously mentioned, Sutton-Smith (1986) notes how the toy can be seen as a machine. While machines appear to many as assistants and tools to serve the needs of automation and production, toys, for the most part, have the role of functioning as the artifacts for (non-productive) play in a leisurely and (productive play) in the educational sense.

Computers enable both functional uses and those related to creative exploration, also recognized as playful behavior with toys. The dichotomous “nature” of the computer as both a tool and a toy have been acknowledged in earlier research:

The digital machine itself, being a work tool and a toy at the same time, unites those two seemingly mutually exclusive qualities. On the one hand, a computer is a digital calculator based on mathematical game theory (von Neumann 1928, von Neumann & Morgenstern 1944), performing work-related tasks; on the other, an entertainment centre used in free time. (Dippel & Fizek 2016, 9)

Koltay (2011, 211) reminds us, “technology is just a tool, which does not determine how we must act.” A study by Chaudron and colleagues (2015) found that young children mostly use digital media to play games and watch streaming, on-demand, or engage with mass-produced entertainment content. The study reported that only a few parents had loaded educational apps, and few children had the skills for content creation. In the context of this thesis, it is therefore more fruitful to ask what exemplars of *homo ludens*, the playing human beings, *want* to do with technology given that the use is not constrained or instrumentalized, but rather voluntary and free play-like, just like the use of toys. Thrift (2003) considers toys to be open to multiple usages. In a similar vein, technologies enable many forms of engagement. In current times, the worlds of technological development, toys, and their use as a form of play intersect in a stronger sense than ever before. Ho et al. (2018, 2) differentiate between 2D and 3D technologies — interactive devices and toys — observing that “2D interactive devices such as iPads®, smartphones, and tablets are increasingly becoming an important part of playtime for very young children.”

According to previous research, the tablet is the dominant screen in children's play lives (Marsh et al. 2018). The advent of the tablet happened in conjunction with

the launch of the iPad in 2010 (Marsh et al. 2016, 243). Children nowadays, and even a growing number of adults, see tablets *as* toys (Lundtofte 2020; Ihamäki & Heljakka 2018).¹³ In this way, the boundaries regarding play between games, toys, and play machines continue to dissolve: Games and toys already share similar qualities. Although the exact definition of a game presents problems, it is still thought that games are meant to be played (Stenros 2015, 41). According to Avedon (1971), games have seven unified factors: 1) reason for existence, 2) action patterns, 3) rules governing action, 4) number of players required, 5) participant roles, 6) participant interaction patterns, and 7) outcome or premium (1971, 419–426). In Suits's definition (1978, 41), playing a game voluntarily seeks to overcome unnecessary obstacles. Games are distinguished by the presence of external rules (Sutton-Smith 2010). Moreover, games have goals. According to Pulsipher's definition, players must be able to influence the outcome of a game by making choices about non-obvious options. Otherwise, it is not a game, although it may be a story, toy, or riddle (Pulsipher 2012, 39).

Creativity and imagination, which are closely linked with toy play, are also present in gameplay: Even play with rules can be imaginative when these rules are open to adaptation (Cowan 2020, 9). Similarly, the absence of rules is not clear-cut in toy play; in all forms of social play, rules begin to form at some point. At a time when adults are increasingly showing their toy relationships in public, on social media, and in physical places such as toy events, and as the boundaries between adult and children's toy cultures are blurring, the worlds of games and toys have converged in many ways (Heljakka 2013). Today, many games have toy-like features, such as aesthetics or players' avatars (Heljakka 2012b). The other way around, through its digital features, a toy can be said to contain some rules and goals for interaction, such as the IoToys scrutinized in this thesis. This means that the studies undertaken for the thesis highlight *paidic* play patterns that rely on human creativity in setting players' own goals for their playing and being creative within the boundaries they create themselves. It is worth noting that what begins with *paidia* may come to encompass more *ludic* features as the playing develops into a more structured and social activity, with goals and expected outcomes, as is the case with playbor.

Why study the technologization and digitalization of play in reference to play machines?

Societal trends have always affected perceptions of play, and technological development is no exception. As illustrated in this thesis, it is possible to see how

13 Contrary to belief, digital devices are not all getting smaller (Plowman & Stephen 2014), but in fact take larger physical formats than smartphones with small screens. Tablets illustrate one form of this development. Then again, new foldable screens that enable increased portability have started to emerge in smartphones.

some relate current developments of play to the commercialization and digitalization of culture. Whereas many see technology as relevant for education and children's cognitive development, once devices are implemented in more structured play in preschool and primary school, another fear is the concern over diminishing imaginative capabilities for those engaging in technology-based play.

One of the strongest motivators to undertake the research journey described in this thesis was to find evidence proving the beneficial aspects of technologically driven play that inspires and influences mobility and movement of the body and mind; to remedy the general fears and misconceptions associated with digital and Internet-connected play, I was determined to explore the topic through my empirical research. First, I have thought that adults — educators, parents, and other caretakers — need to be convinced that digital technology will not crowd out creative play outside of gaming that happens either in physical play, outdoors, or in the imagination of players. A second motivation for this research has been to underline, through scientific investigation, how digital technology not only influences children's play in positive ways but players in age groups beyond traditional understandings of the “play age”: from the toddler years into preschool, and further ahead into adulthood and senior age. Next, the connections between digital play and its capacities to contribute to creativity and imaginative processes over the life-span will be discussed in more detail.

Today, children in developed Western countries live in a play-rich environment. I tend to agree with Gutnick and colleagues (2011), who observe that as digital media has permeated every aspect of adults' lives, it's unsurprising that children's lives have been impacted as well. On the one hand, adults may easily interpret children's actions with toys (and other everyday objects) as play. On the other hand, children may find that adults can limit their play activities (Glenn et al. 2013) by interrupting play (Rogers & Evans 2008). In research conducted by Stephen et al. (2013), it was found that technology itself did not drive children's experiences; instead, their desires and family culture shaped them. In most drastic terms, it has been argued that strong adult control may inhibit play (McInnes et al. 2011). As illustrated by the Frankenstein paradox discussed earlier, “children's imaginations, it is said, are always being threatened by the emergence of new machines — toys, television, video games, and so on,” Sutton-Smith observed (1992, 4). “Some worry that play involving technology is limited in some way, as they fear that it constrains children's imagination” (Marsh 2017; Levin & Rosenquest 2001). Bird (2020) describes this concern to accentuate how children's *play skills* are believed to diminish with the prevalence of technologies, one of them being pretend play. “The operative word for defining pretend play is *imagining*” (Hassinger-Das et al. 2017). As previous research

shows, traditional and converged forms of play are not oppositional but *interrelated* (Edwards 2013). Converged play can also lead to imaginative play (Ibid.).

Nowadays, digital technologies are a taken-for-granted aspect of children's everyday lives; "they are constantly surrounded by people who play digital games and take advantage of communication technologies; these might be their friends, older siblings or parents" (Ruckenstein 2010, 508). Kafai (2021) states that technology is part of children's fabric in their everyday lives. Contrary to many adults, they do not feel threatened by computational media or other programmable devices. Instead, they experience their explorations and interactions as enjoyable. "Children's interest in technology, which begins with play worlds at kindergarten age, is later maintained by other digital devices and services" (Ruckenstein 2013, 480).

The scenarios presented by new technologies broaden the range of play experiences (Yelland 2011). Raessens (2006) has noted how technologies stimulate play behavior. Exploring childhood play has long-standing roots in studies of childhood and early education. It has been observed that:

CHILDREN LOVE TO PLAY. They naturally engage the new and find ways to interact with it. They joust. They explore. They spontaneously invent. They engage in the moment, and it engages them. (Woolsey & Woolsey 2008, 128)

Let's experiment: Would it be impossible to think that in a future instance, the quote by Woolsey and Woolsey (2008) above could instead account for both children and adults and their creative relationships to technology use and read like this:

CHILDREN AND ADULTS LOVE TO PLAY WITH TECHNOLOGY. They naturally engage with new technology and find ways to interact with it. They joust. They explore. They spontaneously invent with new technology. They engage in the moment with new technology, and it engages them.

Why is it hard for many adults to interpret children's engagement with digital technology as play?

In a paper by Fantozzi et al. (2018, 88), a parent remarks, "Well, I just don't want her sitting around pushing buttons," referring to children's use of technology-oriented toys. This concern of the possibly pejorative effects of engagement with technologies has recently found its way to popular fiction as well: In the trailer of a movie (*Risto Rappääjä ja villi kone*, a Finnish film from 2023) continuing the famous saga of Finnish Risto Rappääjä, the aunt of Risto — a boy around 11 years of age is introduced to the world of video games — asks, "Do you want to be in a relationship with a machine for the rest of your life?" (Salomaa, Selin & Helle 2023).

If playing digital games is not the only way of playing, then what more is digital play about?

In the context of this thesis, the focus gravitates toward exploring how play makes us move in association with the use of technological devices and software for reasons outside the realm of games. I have decided to call these devices *play machines*.¹⁴ These artifacts and entities of present times can be differentiated from non-technological toys with no connection to digitality or devices. As commodities — and toys — are made more technological, this socialization experience of playing with them may become more crucial: digital toys are an early dip in the bath of commodified technology, constituting what Pesce (2000) describes as a “new class of toys.” This is one example of how technology has become domesticated. Essentially, this thesis deals with what is understood as technology and how play relates to this powerful realm of humanity — our environment, communication, interactions, and digital play behavior.

Interestingly, Ibister (2016a) points out the capacity of games to take focus away from the novelty of the technology and instead direct attention to personal and social tasks and goals. This is also a valuable insight into explorations of more open-ended and creative types of play, such as the technologically oriented toy play scrutinized as the employment of play machines — digital cameras, smartphones, connected toys, and toy robots. At the same time, it is important to remember that technology influences creative play beyond play with “real” devices. Dyson (2006) notes how children may pretend to take pictures with cardboard cellphones. Again, adult-created toys produced by the *industries of play* (Heljakka 2013) familiarize children with the patterns of social and family life and reflect the world views — ideology, tastes, fashion — and technological advances of adult conceptions (Smirnova 2011). An important cultural function of toys is to bind the child into the family (Sutton-Smith 1984). Besides improvised and self-crafted “technology toys,” computers, laptops, and cameras have found their way as accessories to various character toys, such as animals and toy figures.¹⁵

To discuss the “functional devices” as play machines more thoroughly, let us move next to consider the following question: *What are the devices that support digital play of the open-ended and creative kind?*

This thesis builds on the idea that play happens through portable, digital, and even connected devices that represent everyday technologies that have either undergone a domestication process in present times, such as digital cameras and smartphones,

14 They are either digital cameras, smartphones, and social media platforms as “second-level toys” or Internet-connected and “intelligent” digital toys, such as various toy robots.

15 Look carefully at the cover image of this thesis, and you will see vignettes of miniature plastic devices borrowed from the (traditional, i.e., physically material) toy chest. (These small-scale imitations of play machines come from the toy collection of the author’s daughter.)

and social media platforms; those that will become fully integrated into the home environment and educational contexts, such as the emerging Internet-connected playthings as an evolvement of interactive toys; and finally, social robots, which are speculated to become a more normalized part of labor and leisure of society in the future as assistants, tutors, learning companions, and quite possibly — play partners.

Technological development advances rapidly, and during 2010–2020, technological innovations merged and made some devices redundant. Through ownership of mobile devices such as smartphones, players have access to high-quality digital cameras, and separate devices are no longer needed to partake in what is conceptualized here as *photoplay* — or visual documentation of toys and play through photography (see e.g., Heljakka 2011; 2018a). Similarly, interactive toys with cutting-edge capabilities, such as the possibility to connect to online worlds, make them what is recognized as IoToys, referring to Internet-connected toys. The Internet, again, extends the play space, interconnects players, and connects the privacy of the home with the public arenas of play (Lauwaert 2009).

In research, toys integrated with technologies are, for example, called smart, high-tech, interactive, and robotic (ter Stal 2017). Fernaeus and colleagues (2010, 39) explain the difference between robots and other digital devices, understood in this thesis as play machines: “unlike a piece of software that is installed on a computer or a mobile phone, a robot is an active, tangible artifact that interacts directly with the world around it.” In the context of this thesis, however, these playthings are also considered play machines, all of which demarcate things with interactive affordances.

According to Plowman (2004), the term “interactive” has been applied to a range of playthings from plush toys to dolls and construction toys that are computationally enhanced. Interactive toys “include technology-enhanced battery-operated toys and toys with computer chips installed that make the toys talk or act in certain ways” (Johnson & Christie 2009, 287). Bergen (2012) categorizes technology-enhanced toys into those with limited and broader affordances. Toys of this kind, conceptually understood as *smart* and *interactive*, range from simple plush animals that say or sing a few phrases when a button is pushed (i.e., exemplifying a technologically enhanced toy with limited affordances) to sophisticated robotic animals and childlike characters that simulate many of the actions of real animals or children (i.e., technological toys with wider affordances).

“Feedback and control are two new important features of interactive play technologies” (Kafai 2021). Pesce describes the two necessary elements of interactive toys as follows:

All interactive toys must have at least two different types of components: sensors which allow the toy to know what is happening in the environment around it, and effectors, which allow it to respond to the environment. There are sensors to mimic every sense that we possess: light sensors, microphones, switches that turn on or off when tilted (a sense we have in our inner ears), pressure switches (which sense touch, much like our skin), and so on. (Pesce 2000, 25)

Smart toys “leverage some form of computational power,” and they “appear to have a capacity for adapting their interactivity to the abilities of the player” (Allen 2004, 179). They may contain embedded electronic features (such as a microphone, camera, sensors, accelerometer, gyroscope, compass) that enable them to interact with their users and adapt to their actions. Those toys are not necessarily connected to the Internet. The newest development threads in this field are smart, interactive toys of present times — Internet-connected toys (IoToys), which have intricate connections to wider digital material ecosystems (Berriman & Mascheroni 2019), and social robotics, such as social companion robots labeled as toys (or, alternatively, toy robots). As ‘connected toys,’ they are ‘designed to connect to the Internet and therefore remote servers that collect data and power the toy’s intelligence’ (Future of Privacy Forum & Family Online Institute (FOSI), cf. in Chaudron et al. 2017). Such toys “have the facility to share those recorded data, the ‘play data.’ Play data can be recorded by the toy or device while the user is playing” (CogniToys Privacy Policy, cf. in Chaudron et al. 2017). These are not merely consumer-level entertainment robots (Jones & Deeming 2008) but entities that often cater to possibilities for edutainment and playful learning.¹⁶ They can be conceptualized as toys that can be controlled remotely or programmed to perform diverse actions. Furthermore, these Internet-connected toys may include sensors, making distinguishing them from robots irrelevant. They are, in fact, considered *toy robots*, and this notion makes it possible to link to robotic pets, also understood as social companion robots. Indeed, the play machines are many, but a blunt division can nevertheless be made into digital devices and screen-based technologies of interest for this thesis, such as smartphones and digital cameras, which are mainly used for functional purposes (communication and photography) not understood as play, and to actual devices meant for playing purposes, i.e., toys and *toyified* robots.

Mobile and robotic media afford liveness, affective stickiness, and portability (Berriman & Mascheroni 2019). The toys described above encourage open-ended exploration and play but demand the players’ attention at the same time. Previously, non-technological toys were said to send signals to their players: “toys persuade

16 Playful learning is used throughout the thesis to denote teaching and learning activities including play-based approaches that allow for enjoyment through exploration, such as object play (including the use of technologies) and creative play. For more on playful learning, see, e.g., Whitton (2022).

them and others, including the children themselves, that they love” (Sutton-Smith 1993, 241). Through technological development, toys have moved from a subtle invitation to play to a more vigorous persuasion technique, if not strategy, to direct and make demands for the players to care for and nurture them.

Sicart (2014) sees fascination arise with mechanical and procedural toys, as they are played with in order to see how they react. Smirnova (2011, 35) describes interactive toys as differing from (traditional) dolls and soft toys “in that they have an independent life of their own.” Seth Giddings (2019, 68–69) describes how IoToys mobilize imaginative processes in three ways: Firstly, they are designed for the imagination to foster imaginative play. Secondly, like in history, they have served as microcosmic models of social, cultural, and technological orders and attitudes. “And thirdly, recent developments in the use of advanced networked, interactive, virtual and mechanical technologies in toy design add to longer-established commercialization, franchising, and ‘mediatization’ of toys.”

In summary, this thesis seeks to answer how current digital technology influences human play behavior positively and creatively in interaction with digital devices and media outside (or on the fringe) of digital gaming as play machines that celebrate activity, agility, amicability, and most of all, movement of body and mind, aiming at progression, not regression.

Technology understood in a digital and connected sense weaves a thread throughout the argumentation of the thesis — *homo ludens* of the 21st century is invited to play through the use of devices and digitality and incorporates cameras, connected toys, smartphones, screens of social media and social robotics in play, which generate motion and emotion, and therefore, multidimensional mobility of the human body and mind.

“The body, fantasy and/or available toys and play partners are choice points of convergence of the focus of play,” writes Frappier (1976, 194). Entertainment and play experiences are often mediated through interactive (media) technology conceptualized here as digital technology. I intend to highlight creative player engagement with digital media and related devices by accentuating contemporary play’s physically mobile, mentally agile, and emotional tendencies, emphasizing the positive and productive aspects of human evolution through digital play, and suggesting its relation to physical, cognitive, and mental movement.

As this chapter of this thesis illustrates, digital technologies cause concerns about addictive screen-usage, encapsulation indoors, and excessive playing of games. However, as argued, there are other kinds of digital play that highlight the open-ended and creative aspects of play.

On the one hand, this thesis attempts to demonstrate how digital technology has made play more perceivable in the physical, digital, and social realms. On the other hand, it shows how the previous perspective on play as an ephemeral phenomenon is partly a thing of the past: technologies such as (digital) cameras, smartphones, software like apps, and perhaps the most influential dimension of the developing communicational means; the emergence and strengthening influence of social media has brought play into the public sphere. By offering a more comprehensive approach to digital play beyond digital gaming, the findings of this work will inform practitioners, scholars, and designers of play as an activity that transcends the limits of players' ages and highlights the creative and productive uses of digital technology in its various aspects.

The structure of the remaining part of the thesis is the following: In the *Background* section, play as an evolving area of cultural study is discussed, and the theoretical notions of digital culture considered highly important for the thesis — *digital play* and *digital toys* — are explained. Section 2 highlights the theory on play used in the thesis and positions the meanings and values connected to play in society as part of contemporary leisure, learning, and productive endeavors. This section argues for the emergence of and movement toward a post-digital era, in which the understanding of digital play needs to be expanded. Section 3 explains the combination of qualitative methods used, their rationale, and the treatment of research materials and research questions, including ethical viewpoints. Section 4 briefly presents the consecutive case studies and my role in their design, execution, and reporting, and considers their limitations. Section 5 goes on to present the publications highlighting research conducted with various play machines (Articles I–VI) and provides evidence gathered through the six case studies and discusses, synthesizes, and elaborates these findings of the studies each with their unique focus on digital play, followed by Sections 6 and 7, which present the discussion on the evolution of play with machines as a form of digital and connected play, lay out the conclusions for the research, and offer guidance for future research.



Figure A. An AI-enhanced version of Pieter Bruegel the Elder's painting *Children's Games*.

1.1 Background: The transforming nature of play

The background for the research conducted with an interest in technology, toys, and mobility begins far earlier than the beginning of the 2000s. In fact, the merging of play and technology is speculated to have begun with the employment of human creativity that led to the birth of the first artifacts associated with and used for purposes other than survival.

To look at the evolution of play, let us begin by asking what really has changed in children's play during the past 500 years. To answer this question, let us try the following: Playful interventions often begin with a "throwback task" asking the participants to travel back in time into their childhood and to reminisce about situations where play happened. Instead of leaning toward a personal memory of play, I want to reach back further in time, not arriving at a moment in the history of technology but of art: Flemish Renaissance artist Pieter Bruegel the Elder's painting *Children's Games* (ca. 1560), in which the artist describes the amusements of his time that also included objects classified as playthings.

According to Google Arts, more than 230 children are occupied with 83 different games in the painting, and the artwork gives "an encyclopedic" view. Despite representing an adult perspective on play, the work serves as an intriguing subject for

those interested in play cultures (with a particular accentuation on object play) because the functions described in it in visual terms can be interpreted as manifestations of the various ways that children play. This is how an adult artist of his time depicted children's play to happen.

Art historian Amy Orrock's doctoral thesis from 2010 informs that play in the painting has been interpreted earlier in at least two ways. She writes:

[...] some scholars have seen the children in the picture as sinister and deformed, and have argued that their games are emblematic of adult folly. To other interpreters, the children appear to be innocents, their actions filled with childish delight in the physicality with play which transcends the centuries. (Orrock 2010, 18)

When referring to the painting, Soute and colleagues (2010, 436) state: "In the 'old' days, before the introduction of technology, entertainment for children was fairly straightforward. A child played with toys or with other children." The forms and patterns of play occur in the painting both as intangible alongside "free play" activities and more tangible — and therefore more accessible — forms that present more possibilities to analyze the play. "These games are rich in social interaction," Soute et al. (2010, 436) note, and "the rules are often few and simple, appropriated and adapted by players."

Play is considered a substantial part of early childhood education, but in Bruegel's painting, the playing children seem occupied in playing outside of educational aims. In the 21st century, the supposed "Century of Play," digital technology use has increasingly expanded the phenomenon of play and playfulness into the interaction of people of all ages within learning, work, and leisure.

Whitebread et al. (2012) distinguish five types of play: physical play, play with objects, symbolic play, pretend play, and games with rules, the first two being the most important for this thesis. Essentially, and similarly, as Orrock (2010) observes, the Bruegel's historical painting depicts both dynamic human interaction through bodily and physical playing — running, climbing, dancing, and, in parallel, playing that centers around various objects. Physical play often involves activities that require eye-hand coordination, such as playing football, climbing trees, or playing on gymnastic equipment (Bjorklund et al. 1998). In a bodily sense, the children in the painting are occupied with locomotor play, movement in any or every direction for its own sake, for example, in chase, tag, hide and seek, and tree climbing (Hughes 2002).

Playing with an object is manipulating it and testing its abilities to create meaning and value for play. In Henricks' terms, using an object for play is to experience the satisfaction of trying to control it (Henricks 2006, 186).

In Bruegel's work, the play materials on offer are represented by games in which players take advantage of some physical resources. These are explicitly articulated as

various playthings, understood here as *toys*. It is the case that toys are usually our first experience learning about the material world.

In the Western world, modern toys came into existence in the period between 1550 and 1770 as a result of the concatenation of three processes: mass production, new notions of childhood, and “toys increasing involvement in a world of mechanism as ‘little machines’” (Thrift 2003).

Basing his analysis on Bruegel’s painting, Finnish play scholar Lönnqvist states that common playthings in the 16th and 17th centuries were hobby horses, spinning wheels, balls, stilts, barrel wheels, dolls, and doll cribs (Lönnqvist 1991).

Diverse and sensory-rich materials are crucial to support children’s active play (Berriman & Mascheroni 2019). Which skills are reinforced by which toys? Helen Boehm (2003, ix) provides the following suggestion of abilities that the choice of a plaything can affect skill-building on many levels:

- Cognitive (thinking and problem-solving skills)
- Visual discrimination (observing and seeing)
- Visual/Motor Skills (eye-hand coordination)
- Auditory Discrimination (listening)
- Tactile (touching and physical connection)
- Creativity (imagination and artistic skills)
- Large Motor (coordination, running, and climbing)
- Small Motor (fine coordination and finger dexterity)
- Instructional (facts and pre-academic learning)
- Socialization (cooperative play with empathy)
- Independence (individuality and self-confidence)

Boon and colleagues (2020, 9) list play types, which may also be perceived in Bruegel’s painting: “Balancing, being entertained, caring, collecting, communicating, experimenting, exploring, fiddling, following, keeping captive, kicking, made-up games, manipulating with objects, rolling, sensing, sharing, throwing, traditional games, transitory play actions.” What is of interest here is the movability of their playing devices and the tendency of these devices to generate movement and mobility in the players on a bodily and mental level.

According to The Strong Institute of Play (2023), the ball, the world’s most classic and famous example of a non-digital, mobile toy, is one of the earliest playthings. In Bruegel’s time, toys were the products of handicrafts, often made of leftover materials. The skills of toy making were passed on from generation to generation, unlike the tradition of making playthings out of organic materials, such as pinecone cows. The industries of play (Heljakka 2013) — a technology-driven sector — operating

nowadays with cardboard, textiles, plastics, rubber, and computer chips to produce brand new toys, is preceded by centuries of toy makers crafting playthings of, for example, natural materials, such as bone, wood, leather, and yarn to amuse children with their skillful handicraft techniques. The first connection between toys and technology was, in this way, realized through the use of tools in handicrafts.

Moreover, when *Children's Games* was painted, the understanding of media was somewhat limited; Gutenberg had innovated the movable-type printing press around 1440, but instead of printed words, play culture lived on in folklore; verbal storytelling and artifacts sculpted by the human hand — toys and modes of storytelling represented media in their own right, and they did not mix as they do now. The industrial production of toys began much later with the organization of workshops, which in Central Europe started to serve wealthy families interested in adorning their living spaces with curious miniatures, such as tin soldiers, doll houses, and other objects that mimicked humans or animals. The professionalization of toy making and growing consumption paved the way for toys and story worlds to connect within the domestic space. Toys started to tell their own story about the lifestyles of those who purchased them; they would no longer be objects meant only for play but also objects that spoke for their owners and could be used as part of identity construction.

While tracing the changes that have taken place in play culture over the past 500 or even 100 years is a fascinating endeavor, a doctoral dissertation investigating the topic of play must inquire a far narrower time, mainly if it is conducted with digital technology in mind. This thesis aims to shed light on how technology in a digital meaning has affected human play. Concentrating on the past decade, namely the years 2010–2020, highlights how rapidly evolving technologies have influenced the tools, content, and cultures of digital play. While the concept of play has not changed radically over time, what constitutes a toy at the time “is substantially different than what it was during the previous century” (Healey & Mendelsohn 2019, 2).

Thrift (2003) goes through the history of toy commodification, recalling their association with the mass media. In the UK, the BBC broadcasted a series on a set of small wooden toys, and in the US, a Shirley Temple doll was launched in the 1930s. It was only after the 1950s, however, when toys were combined with mass television advertising, that the most vital link between toys and mass media was tied.

Julian Kücklich (2004, n.p.) writes that “play is not just a mode of interaction the user is subjected to, but also an attitude that she brings to the medium in the form of notions and expectations about the technology or text.” My interest is significantly guided by the same question that Kücklich asks: “How do users interact with new media, and how do the practices of interaction shape media technology?” However, to be precise, I am asking how players are engaging with play machines as a form of digital technology (and media).

To continue the thought experiment presented in this chapter, one could ask what Bruegel's painting would look like if it were portraying today's children,

demonstrating the playing children at the dawn of the 21st century, the “Century of Play.” Today’s playing manifests between online and offline spaces through devices, which, more than ever before, are considered a category of “toys” — as playthings — in parallel to their other functional uses.

Assumably, a 2023 version of Bruegel’s painting would involve the “ever-evolving portrait of the 21st-century child” (Takeuchi 2012, 37), portraying playtime spent with digital devices (mobile phones, tablets, and connected devices, such as smart toys, IoT toys, and non-connected social robots) and social media. I would believe there to be crowds of children, gathered around multiple screens, portable and connected devices afforded by the nearly ubiquitous accessibility of the Internet, but I would know there to be people of all ages interacting with each other, not just engaged in communicating, or information searching, or entertaining themselves, but actively involved in interactive and connected toy or game play made possible through evolving media and digital technology, and the industries of play. In this animated, *digital painting*, I envision constellations of people, assemblages of artifacts and media technologies, and many forms of play happening — energetically, frenetically, and faces emoting feelings of joy and maybe of concentration. Furthermore, the playing would occur indoors and outdoors in physical locations, even across virtual spaces. From the perspective of the future, devices and play machines would still be of interest to the players, although their physical forms might vary from what we recognize today.¹⁷

In the journal *Pediatrics*, researchers Healey and Mendelsohn (2019) recommend the following: “Recognize that one of the most important purposes of play with toys throughout childhood, and especially in infancy, is not educational at all but rather to facilitate warm, supportive interactions and relationships.” For this reason, toys, in current times, could also be recognized as vehicles of empathy development, *objects of resilience* (Heljakka 2023) that offer companionship and comfort to their players, or even friendships of sorts.

Before introducing the case studies undertaken for the thesis to look more closely at the transforming nature of play, let us review the literature on the essential components of digital technology in reference to play — namely, the terminology introducing *digital culture*, *digital play*, *digital (and hybrid) play environments*, *digital players*, and *digital toys*.

17 In 2023, Artificial Intelligence (AI) made it possible to start to play with digital text and images through generative language models much faster than ever before. The manifestations of this thought experiment together with AI use resulted in the images replaying Bruegel’s artwork with Adobe Firefly/Photoshop, featured in this thesis. (See Figures A-G).

1.1.1 Digital culture

Culture is an umbrella term for the actions partaken in play — we play as part of cultures, and our playing contributes to culture. Johan Huizinga (1938) argued in *Homo Ludens* that culture derives from play. This thesis is conducted in *digital culture* as a sub-branch of digital humanities, which allows steering attention from the machine's capacities to human agency as a user of play machines, i.e., the digital and Internet-connected toys explained further in this part of the thesis.

Digital technologies combined with the properties and aspirations of human entities create digital cultures. Digital culture is predominantly visual culture originating in the physical world and social media cultures online, enabled by digital technology.

“Digital” itself is intangible, but the outcomes of digital culture often manifest in terms of visual aspects. Engagement with digital culture means reciprocal interaction with it. Digital culture has a close relationship with digital media: “The term ‘digital media’ refers to digital devices (such as computers and mobile phones) and to products or outputs including apps, games, photos, websites, interactive stories, songs, messaging, blogs and video that are viewed, read, played or created on these devices” (Plowman et al. 2012). For the sake of clarity, in this thesis, digital media are spoken of in the name of play machines, even digital toys.

“Young children in the 21st century and post-industrialized societies participate in highly technologized and digitally mediated cultural landscapes” (Bird & Edwards 2015; cf. in Marsh et al. 2005; Vandewater et al. 2007). Media environments entertain and socialize (Çetintaş & Turan 2018). “Games, films and other media are an integral part of children’s lives which they get inspired and challenged by and which has an undeveloped potential” (Lahtinen & Svanqvist 2005, 1).

How digital media impact children’s experiences depends on the age of the children, whether there are other children around, the devices and content available to them, and the values and attitudes of the people who look after them (Plowman & Stephen 2014). Here is the place to highlight how digital cultures are also a highly relevant area of study in adult play lives.

Digital technology mediates content through devices, and here, play machines may be used for digital play, productive or unproductive. Central to these machines is the interaction they provide: Takeuchi (2012) observes how digital media offer more control for users over how they experience delivered content than do books, radio, and television. The interactivity associated with these media makes up a playful space that is highly interactive. Andrew Darley, author of *Visual Digital Culture*, defines interactivity as “a distinctive mode of relating to audiovisual representations or fictions” (2000, 156). Kücklich (2004) notes that the concept of “interactive media” implies the notion of “passive consumption” in other media, such as with television: The introduction of television in every household changed children’s play behavior

after World War II, with a slow reduction of physical play (Sutton-Smith & Rosenberg 1971; cf. in de Vries 2021, 249). Scott (2018) presents another view by stating that interactions with television and other digital devices can be playful and that children may be more or less active during this playful activity. To broaden the perspective, as early as 2004, Kline (2004, 145) already wrote that interactive media (i.e., electronic media and video gaming as antecedents to play machines of 2010–2020) was “a highly convergent medium combining learning, play, and entertainment in a synergistic experience.” In these ways, as *homines ludentes*-playing human beings-we continue to relate and position ourselves as actants within digital culture.

1.1.2 Digital play

“Play is culturally cultivated” (Brown 2009, 199), and “all media are playable when we look at them in the right light” (Bogost 2016, 117). Being playful can “transform virtually any environment to make it more stimulating, enjoyable, and entertaining” (Barnett 2007, 949; cf. Cowan 2020). Play becomes mobile as it moves across media cultures (Moore 2011), and in the context of the thesis at hand, play moves between players, devices, and (social) media cultures and the “media ecology” that Granata (2014) calls the *digital world*.

Play culture is media culture, and the two realms have a dialogical relationship reinforcing and changing one another (Jenkins 2004). Pink et al. (2018, 27) assert that “play is increasingly part of how people engage with a contemporary digital world.”

This thesis explores the nature of play as part of current techno-culture. From the perspective of this thesis, it is essential to see digital cultures evoke play(fulness) in human minds and bodies as they illustrate how play moves and makes us move — physically, cognitively, and emotionally. Thus, digital culture is playful culture and digital play manifests through the use of both playful media (Reid-Walsh 2018) and *playable technologies*.

Play is now conducted, and player identities are constructed through media formats (Henricks 2015b, 116). Playing extends from the intimacies of solitary behavior to the arenas of social, even public play. “New media cultures are connected cultures” (Marshall 2004, 43). Kücklich (2004) refers to this connectedness as the human being constantly enclosed in the mediasphere.

Jo Bird (2020) talks about children’s digital participation. Gerard Jones (2003) reminds us that children, too, should be considered the users of media cultures. He writes:

When we consider children in relation to mass media and pop culture, we tend to define them as consumers, watchers, recipients, victims. But they are also users of that media culture: they are choosers, interpreters, shapers, fellow players, participants, and storytellers. (Jones 2003, 18–19)

To continue and put it more specifically, children are considered as the firsthand *players* of media cultures. However, as shown in the thesis at hand, we also must consider that play behavior is not limited by age — adults are players of media cultures as well, including digital culture.

Digitality often brings to mind computers. Referencing the theory presented by Paul Levinson (1977), Kücklich (2004, 9) claims that “computers have never progressed past the toy stage.”¹⁸ Ultimately, this means that computers (or artifacts, including computational elements) enable play. The development of digital media began with computers. Computers “execute dynamic interactions between the machine and human actors” (Murray 1997, 71–72) and demarcate the beginnings of digital play. The first commercial computers became available in the 1950s. *But what is digital play?*

“Digital play” refers to using technologies in a play-based way (Marsh et al. 2016). According to Plowman and Stephen, there’s no simple way of defining digital play (2014, 20), and they offer a general description of the term in regard to children:

Broadly speaking, it refers to children’s freely chosen activities with digital devices and smart toys. In addition to play with digital toys, these activities could range from dancing along to a song on YouTube, or using an app for drawing, to pretending to talk to a distant friend or family member on a mobile phone that doesn’t work any longer. Depending on the app, device or toy [...] problem solving, self-expression and developing the imagination can all be associated with digital play.

Digital play can never be altogether immaterial. What is needed are devices — hardware — and access to software. Myers (2005) mentions the concept of “digital media play.” Given that media has infiltrated the digital fabric of devices as devices and platforms for play, I continue to use the term “digital play.” “The qualities of the digital medium facilitate human creativity to build new forms and sorts of play – material, symbolic, and imaginary” (Dippel & Fizek 2016, 2). “Researchers and practitioners have traditionally recognized many different forms of play, such as physical play, object play, and symbolic play, with different kinds of benefits” (Whitebread et al. 2012). “Digital play can incorporate and extend any of these other types of play, and therefore has the potential to provide a wide range of benefits in terms of children’s health, wellbeing, learning and development” (Gray & Thomsen 2021, 9). As noted, this idea should be extended to include other age groups as well.

A *play environment* is where toys and games are enjoyed (Levy & Weingartner 2003, 5). Furthermore, and more precisely, a *digital play environment* may offer itself as a setting where particular toys and games are enjoyed and as the primary setting for

18 Seymour Papert has even described the computer as “the children’s machine,” as cited in Rieber (2001).

play. The development of technologies related particularly to digitalization — digital play environments, social media playgrounds, apps, etc., have allowed the sphere of play to expand from the material into digital spaces and have joined them in the name of converged play. In the early 2000s, Brenda Danet noted “cyberspace” as a site for play, as it affords all kinds of activities related to different forms of play (Danet 2001, 7–8). The evolution of cyberspace has been rapid, including the now emerging space of the metaverse, which falls out of the scope of the research conducted for this thesis.

However, it is evident that the emergence of both virtual worlds and social media has affected the evolution of play culture on a more general level. For example, Myers observed how the popularity of social software and social games has been one of the major success stories in the gaming industry during the first decade of the 2000s (Myers 2010, 129). Moreover, it is justifiable to consider online platforms as playgrounds and digital play environments of present times, which children also access:

Recently play environments and materials have changed, with digital materials becoming increasingly available for young children. Parents’ preferences about the importance and appropriateness of digital play may influence the quality and the quantity of digital play opportunities children receive at home. (Erdogan et al. 2019, 131)

“It is inspiring to see the ways in which various ‘communication tools’ or ‘social utilities’ are being repurposed by their users to become playing fields,” Frans Mäyrä wrote in 2011 (19). Popular examples of interactive play environments include social media platforms (such as Instagram) and digital applications that cater to open-ended play (such as *Toca Boca*, a children’s digital play environment accessed online) or gameplay (such as geocaching or *Pokémon GO*). Notably, location-based games have blurred the lines between engagement with physical and digital environments, simultaneously creating possibilities to engage with both realms (Mäyrä 2017b).

1.1.3 Digital (and hybrid) play environments

I acknowledge that research on digital play, or in broader terms, on the relationship between technology and play, is by no means a novel area of academic inquiry. For example, Yelland (1999, 217) has studied the “impact of the new information technologies *on* play and *as* play.”¹⁹

19 Kücklich sees the relationship of the player to the technology used as meaningful. He writes, “play is not just a mode of interaction the user is subjected to, but also an

Digital play is often placed in opposition to traditional play (Mustola et al. 2016). However, as Nicola Yelland discovered in the late 1990s, tradition meets with innovation, enriching understanding of engagement with new information technologies:

Traditional activities can now be complemented with different experiences that have been made possible with the new information technologies. Those who do not embrace such events as opportunities may be in danger of losing touch with the popular culture of young children and their families. (Yelland 1999, 220)

Conversely, this thesis aims to place digital play in parallel (and in connection) to traditional play, considering the phenomenon as an emergent field of play that evolved thanks to the introduction of digital technologies.

Ruckenstein (2010) states that toys encourage particular forms of play and social interaction and notes the hybrid character of children's play practices. Plowman and Stephen note how today's children are adept at mixing traditional (non-digital) and digital play (Plowman & Stephen 2014, 22). "Digital culture cannot be thought separately from memory-based making," De Kosnik (2021) notes. And in this context, toy players as play makers operate through creative acts involving physical objects and communication technologies (tools) distributed through online platforms (networks), e.g., the IoToys investigated as part of the evolving field of digital technology in this thesis. In this context, *digital play is hybrid play*.

The convergence of play has been conceptualized as *hybrid play* (Heljakka 2012; 2016, Tyni et al. 2016, Paavilainen et al. 2018). Again, *hybrid play products* expand previous understandings of corporality, immateriality, and the playful object experience. It is no longer uncommon to see toys and games lending elements from one another to provide multidimensional play experiences (Heljakka 2012b). Hybridity concerning connected toys provides potential added play value within physical and material experiences (Heljakka & Ihamäki 2019). Already in 2004, Sutton-Smith pointed to the "massive hybridization" of integration between electronic media and toys, games, and books. Since the publication of the book *Toys, Games, and Media* edited by Jeffrey Goldstein, David Buckingham, and Gilles Brougère (2004), the understanding of what hybridity means for the cultures of toys and play have developed further.

Tyni and colleagues (2016, n.p.) described hybridization in the following way: "New technologies enable development where immaterial products become materialized in novel ways, while material products and environment will be augmented with digital services. In this evolution immaterial, digital services will form multifaceted value

attitude that she brings to the medium in the form of notions and expectations about the technology or text" (Kücklich 2004, 6).

networks with material products.” A characterization of hybridity was later given by Maurer and Fuchsberger (2019):

What ultimately characterizes hybridity in play is more than complementing the digital with the physical. Interrelating a variety of entities and actors, such as the players, physical objects, and social aspects, as well as introducing the non-verbal, the fuzzy, analog, and ambiguous, constitutes rich hybridity in play. (Maurer et al. 2019, 19)

Earlier theory on hybridity suggests the categorization into different types of hybridity (Heljakka 2012b): *conceptual hybridity*, the hybridity of affordances for play related to *paidia/ludus*; *technological hybridity*, hybridity between digital and material technologies; *artefactual hybridity*, hybridity of production materials; *thematic hybridity*, hybridity between different media (i.e., transmediality); and *functional hybridity*, hybridity of play forms actualized in interaction (toy or gameplay) with a player. For this thesis, the dimensions of *paidia/ludus* and *technological hybridity* are most relevant.

In some ways, hybrids are also tangible. Technologically enhanced play as a form of hybrid interaction does not emerge from “intangible” content for play, such as wordplay and the use of language as a form of social communication, but instead from tangible resources for play, which are used simultaneously combining physical entities (play material, such as toys) with digitally operated devices and platforms, which are partly physical in their form but digital in their content.

Exemplars of influential scholarly work on hybrid play cultures include, for example, *The place of play: Toys and digital cultures*, “Maaïke Lauwaert’s ambitious attempt at describing how internet culture and technology have affected geographies of play in the twenty-first century” (Murnaghan 2011, 520).

1.1.4 Digital players

Who plays digitally?

Digital play — aside from the playing of digital games — is often investigated exclusively from the viewpoint of children. This thesis aims to add to the knowledge base on digitalizing and Internet-connected play through a broader understanding of play as a life-long and life-wide phenomenon and by shedding light on how various technologies are used to supplement, extend, and enhance play in combination with traditional playthings, or to connect players of different ages in a multitude of ways.

When the book *Toys, Games, and Media* (2004) was published, Sutton-Smith noted how the emergence of these media phenomena related to digital play was of relative unimportance to children. Currently, however, “digital play is woven into the cultural, aesthetic, emotional and political fabric of children’s lives” (Marsh et al. 2020, 10). The term “digital play” has been used and defined by researchers

such as Bird and Edwards (2015) and Stephen and Plowman (2014). But as said, there's no simple way of describing play, and the same goes for digital play. Broadly speaking, it refers to activities that young children choose using digital devices and toys (Plowman et al. 2010). Plowman and colleagues (2010) describe digital play as interacting with information and communication technologies that can be actively supported in preschool education. Guided digital play is one of the subtypes of play where preschool teachers can guide digital play for learning purposes, such as teaching language and math skills.

The possibilities of digital technologies are seen here as a basis for human play across the lifespan, complementing more traditional forms of play until they dissolve and converge entirely. Edwards (2013) conceptualizes *converged play* as related to children's famous cultural artifacts and texts, including digital media. This also applies to adults, as the studies undertaken in *photoplay*, *world-playing*, *doll dramas*, and *toy tourism* for the thesis illustrate. As shown in previous research, these cultures are hybrid or phygital: Current times recognize a new bridging between the digital and analog. The playful era of the 21st century demonstrates a *dematerialization* of culture in terms of playthings and simultaneous re-materialization of play (Heljakka 2012b). This means that digitalizing play entails formations of *hybrid play*, in which children, adults, and even transgenerational groups of players participate.

1.1.5 Digital toys

Processes of play unfold in toys, playgrounds, technologies, and social groups (Sicart 2014, 2). From infancy onwards, we are not only touching objects but are also being touched by objects. "It is the order of the relationships to objects and between objects that creates people through socialization" (Miller 2008, 287).

Objects have always been used in play. Hassinger-Das et al. (2017) note that any object used for play can be considered a toy, including everyday objects utilized in play. According to Sutton-Smith's (1993) expansive conceptualization of toys, they can be seen as gifts, objects, tools, compensations, property, fashions, and deconstructions.

According to semiotician and game researcher Mattia Thibault (2017), it is unlikely that we would find a civilization that did not have play equipment. Daily, improvised toys such as sticks and cones in nature become play equipment in young players' hands and imaginations. In today's age, connected objects serve this exact purpose but with different techniques relying on sharing online content and those created and consumed through devices.

My previous research interpreted toys as media representing children's first material culture resource (Heljakka 2013). (Non-digital) toys are defined as artifacts "designed or intended (whether or not exclusively) for use in play by children under 14 years old" (*Toys (Safety) Regulations* 2011). Today however, toys are also increasingly part of adult play cultures, where toys are collected, customized, and

creatively narrated through photography and crafts, and whole worlds of meaning are built for toy characters materially and narratively (Heljakka 2013).

Industrially produced toys, as a means of expression that transcends generations, offer opportunities for enjoyment, learning, and increasingly, empathy development. Today, many industrially manufactured toys seem to be gaining ground as playthings that serve as teaching aids for educational entertainment (*edutainment*) and toy-based learning. These toys can be thought of as representing toys with a serious purpose (for *serious toys*, see Ihamäki & Heljakka 2021). However, this development is not new: Toys, such as tin soldiers, small stoves, and miniature steam engines, were given to children in the 19th century to accustom them to using emerging technologies (Oldenzien & Hård 2013).

“Play is deliberately working with the materials we encounter,” writes Bogost (2016, 91). At the core of today’s play industries are the *play products*: toys, games, apps, and even play environments. In fact, the *ludic era* (Sutton-Smith 1997) of the current century parallels an “age of convergence where all things and all people can play with and interpret objects in different ways through different media” (Geraghty 2014, 117).

Whereas research in digital games as animated and fast-moving spectacles is closer to media studies, research on toys has leaned more on design and interaction research, playful learning, and early childhood education interested in the capabilities and affordances of static playthings. According to Bogost, toys as things themselves are *hybrids* of nature and culture, humankind and the world, society and individualism (Bogost 2016, 221). Moreover, what informs and influences their use are viral phenomena on social media — (audio)visual, animated storytelling demonstrating playthings and play forms. To compare, the concepts of what a toy is and what play as a phenomenon represents evolve constantly. This is to say that while the basic understandings remain, the meanings and associated values vary:

Indeed, the concept of “toy” has changed considerably over the last decade with the advent of new technologies that have brought additional dimensions to objects that had previously been relegated to a passive role in their interactions with children. (Yelland 1999, 217)

Merging of the physical and digital worlds, including innovations made in toys, is made possible with new information technologies (Yelland 1999, 219). “The Internet is altering, stimulating, and broadening the market for children’s toys, and fueled by and sustained by the Web” (Seiter 2007, 83). Mark Pesce writes: “Our toys, writ larger, echo profound revolutions in simulation, the science of materials, and digital communication” (Pesce 2000, 8).

“What’s the fuss about going digital?” asks Edith Ackermann (2005) in her conference paper titled *Playthings That Do Things; A Young Kid’s “Incredibles.”* The

research discussed in this thesis attempts to unpack the “fuss” by addressing issues relating to digitalization and connectedness of play and how play is affected by digital technologies, social media platforms, and digital toys that offer new landscapes for play to at least partly answer Ackermann’s question.

Sicart (2014) goes so far as to argue that toys are a technology for play. Similarly, toys can be regarded as media. Combining their thingness with technology and media takes toys in the direction of machines that can be played with. In this thesis, I give digital toys a central position in the experience of digital play, alongside other playthings that all fit in the category of play machines.

The discussions around technological toys and technologies *as* toys have an early beginning. To exemplify, in his foreword for a guide on selecting age-appropriate toys, Sutton-Smith (1986) writes about the attitudes toward the early manifestations of technologically oriented toys:

*[...] along with the children we find ourselves spending more time with our toys, whether these be called computers or video games. I know there will be those who wish this kind of toy-laden world would go away. My own attitude, on the contrary, is that it is here to stay and is becoming a fundamental part of the solitary education, skill differentiation and confidence of the modern child. (Sutton-Smith 1986, xi in Boehm, *The Right Toys*)*

It is necessary to remember that the concept of play is a social construction (Stenros 2015, 115), just like the concept of the toy. Humans are the only animal species known to modify playful objects for their offspring (Fagen 1981, ix). Doris Bergen has noted how playthings evolve as the culture evolves, and the toys and play activities reflect the technological change at all age periods. For example, toy trucks and train play and play with toy telephones became popular as technology created such devices (Bergen 2015, 63).

A book published in 1975 by the iconic New York-based toy store, F.A.O. Schwartz, discusses how difficult it sometimes is to draw the line between the (functional) capacities of a plaything, as compared to a “gadget” for children, in other words — a toy:

It is always a challenge to decide how fine gadgets for children should be. The perfect walkie-talkie or the horn that would be acceptable in a symphony are a lot better than play requires. Toy stores have found it difficult to know where to draw the line. At times the gadgets available for children are good enough to fill the requirements of an adult looking for a simple version of a machine. (F.A.O. Schwartz 1975, 127)

In traditional thought, toys are children’s own currency, objects, and paraphernalia, valued for their attractiveness and (re)playability. Hassinger-Das et al. (2017) divide

toys into informal (everyday objects) and formal toys (things produced for the specific purpose of play). Toys provide structure to play (Back et al. 2017). Any item that can be used for play may be considered a toy. Fleming (1996) also argues that any object can *temporarily* become a toy. To extend this thinking on improvised toys (Thibault 2017) as the extensions of play, as discussed in the thesis at hand, it is not only contemporary playthings that aim to afford play, but for many, it is the mobile digital technology and social media platforms that suggest, invite, encourage, and even stimulate play. Interestingly, screens of televisions, smartphones, and tablets also being understood as “toys for children” is of recent development.

“The interaction between the child and the toy is a sensory experience that involves auditory, visual, haptic, and kinetic communication” (Mascheroni & Holloway 2019, 5), which influence the experience of playability (and *replayability*). Playability as a term aims “to indicate the extent to which a certain game has the capability to provide enjoyment for a player over an extended period of time. Therefore, playability is closely related to replayability” (Kücklich 2004, 5).

Playability is not just a feature of games and toys, but it arises from human interaction with those playthings. As Bogost argues, “all media are playable when we look at them in the right light” (Bogost 2016, 117), and “all media start out as toys” (Levinson 1977).

Inevitably, contemporary media are a notable force that inspires and influences toy making, as well as the players and their uses of digital technology in association with current toy media. Therefore, it is no surprise that today’s toys include miniature versions of technological devices — mobile phones, cameras, and laptops, to name a few.

Doris Bergen observes how technological changes in toys and other play materials have been extensive during the last ten to twenty years. In the past, the context of play involved concrete manipulation of physical and traditional play materials and face-to-face interactions in the home, school, neighborhood, playground, or other venues. But “the advent of technology-augmented toys and virtual play experiences on computers or other electronic devices is producing new venues for play, which creates a new environment for the psychological study of it” (Bergen 2015, 63).

According to a traditional definition of a plaything, it is mainly an object a child uses in various play activities. It can be intended for indoor or outdoor use, for playing alone or together. Children use toys as instruments of play and interaction (Healey & Mendelson 2019, 1). However, industry-produced and mass-marketed toys are usually invented, designed, and manufactured by adults. Play equipment often includes material that the child modifies to make the play equipment for himself (Salminen 1988, 11).

The researcher and research context are inseparable from the area of inquiry. My position as a researcher looking at the toy industry, toy players, and toy cultures has broadened my understanding of the functional similarities between toy play

and digital gaming. During 2010–2020, the concept of play material has expanded beyond the physical and, like play with technologies, may be conceptualized as digital play so can toys with digital features be understood as digital toys.

Blocks, bricks, and sandboxes are brought up by Kafai (2021) in her discussion on electronic play. These playthings have their equivalents in the digital realm — interestingly, they intermesh traditional play ideas with digital technology. For example, in digital toys, physical manipulations trigger digital responses (Berriman & Mascheroni 2019).²⁰

Sometimes, it is impossible to distinguish between the two play media discussed in this thesis — open-ended toys and more “closed” games. An example is the so-called non-games marketed alongside traditional digital games as games without structured goals, objectives, or challenges. In non-games, players thus have the opportunity for greater self-expression and free play, with the player defining their own goals independently. Game designer Will Wright has used the definition of “software toy” to refer to such digital games. Software toys (Wright 2007) can change the world when players explore and discover multimodal affordances for play that propose clues and invite specific actions to take place in play. Software toys come with non-quantifiable goals. According to Stenros (2015, 113), *SimCity*, for example, becomes a game when players add their own goals. Similarly, a game can become a toy or a playground when a player abandons the official rules and goals of the game.

According to Antle (2007), materiality is critical for children to adopt tangible toys. Contemporary devices are sensory-rich media (Woolsey & Woolsey 2008). The toys serve dual roles, both as physical objects for traditional play and as technological tools for virtual engagement. As a result, the boundaries between offline/online and physical/virtual play blend together when children incorporate their interconnected toys into their daily activities (Mascheroni & Holloway 2019, 9). Sung (2018, 250) notes that “a digital toy may directly trigger children’s interests and provide an interactive environment for children to experience novel technology.” Moreover, smart and connected toys offer a medium through which digital play can be approached and comprehended. Screens often imply that handheld devices are needed to play. Nowadays, a physical toy can be controlled with an existing smart device.

20 *Minecraft*, for example, seems to serve as a good example of both the playfulness of digital games and social playing with toys that encourage cooperative action. A game with toy-like features, such as *Minecraft*, can be seen as a more open-minded play tool than a traditional digital game: As stated on the game’s website, *Minecraft* is a game based on laying and breaking blocks: “*Minecraft* is a game about breaking and placing blocks. At first, people built structures to protect against nocturnal monsters, but as the game grew players worked together to create wonderful, imaginative things.” <https://minecraft.net/>.

“Digital toys can serve as catalysts for new forms of play and can have a positive influence on the content of more traditional forms of play” (Johnson & Christie 2009, 284). Jayemanne and Nansen (2016) consider mobile devices and touchscreen interfaces as gestural interfaces that reshape children’s media culture. As this thesis illustrates, there are many reasons to expand our understanding of these devices as *second-level toys* in themselves, which are used to prompt and enhance play in many ways. Simultaneously, digital game elements, such as game characters, are undergoing *toyification* (Thibault & Heljakka 2019) as they transform from digital entities into physical toys.²¹

Technologically enhanced toys provide technological agency. “Technological artifacts and humans are both actants. Therefore, technological artifacts are agents with purposiveness. In humans, this appears as intentionality” (Orlikowski 2005). Rather than examining playing with or the imaginative and dynamic manipulation of virtual objects (or characters online), this thesis focuses on bridging the physical materiality of traditional play objects and environments with mobile and connected technologies addressing hybrid play. Technology toys as interactive entities represent what research describes as intelligent (tangible) objects with sensors, actuators, and computing power, that provide feedback to players’ physical activity (Bekker & Sturm 2009).

Digital play, increasingly, also means Internet-connected play. “Computing is becoming more and more connective,” Thrift wrote in 2003 (p. 392). Character toys, connected toys, robotic creatures with camera technology, mobile devices, and social media communication platforms have evolved in the cross-sections of these areas and may be conceptually understood as *digital toys*, explained in more detail in the following.

One novel group of networked toys is represented by the Toy Internet (IoToys). These toys are a subset of the global Internet of Things (IoT) phenomenon. The Internet of Things is a concept that refers to the connection of any device to computer networks. The Internet of Things can be seen as a giant network of artifacts. Essentially, they include sensors and communication capabilities built into everyday objects.

Whereas the Internet of Things (IoT) means physical objects that are embedded with electronics, sensors, software, and connectivity that support the exchange of data, the Internet of Toys (IoToys) are sensory interfaces, such as robotic toys that allow children to access media content (Mascheroni & Holloway 2019, 1; 4), that connect actors and objects, such as toys. Furthermore, they create an “environment

21 This development becomes evident also in the decoration of devices with functions other than those designed for the purposes of play: “Several companies have developed products that wrap around a smartphone or tablet, turning it into a creature with a screen” (Kudrowitz & Follett 2014, 243). Personalization of devices makes them “toys” in a decorative sense, which adds on to their conceptualization as “toyified” gadgets.

of affordances” (Berriman & Mascheroni 2019), which makes an entirely new playground sometimes hard for players of any age to understand. Previous research illustrates diverse ways of viewing this novel environment of interactive and interconnected toys. On the one hand, quoting Plowman et al. (2010), Sung (2018, 237) notes how most parents were ambivalent toward young children’s play with technological toys. On the other hand, according to Ruckenstein (2010), the Nordic debate on digital toys often understands these toys as “an unnatural intrusion into the lives of young children.” Caution is healthy, as connectivity may mean complex issues arise from the toy owner’s relationship with the toy company and the one in control of the software.²²

What differentiates playing digital games from playing with technologically enriched toys, such as smart, connected, and robotic toys?

Fizek (2017) notes that “in a digital game, most processes are automated and hidden from the player’s view.” The same goes for the digital toys. The contact between the player and the digital game is mediated chiefly through a flat screen. Again, smart and interactive toys are three-dimensional play machines that are sometimes controlled by mobile devices and played supported by smartphones and tablets. In 2003, Luckin and colleagues defined digital toys as having tangible interfaces not bound to a desktop computer; this is one of the most central differences between digital games and digital toys.

Due to the increased prevalence of digital toys, “we are in the midst of another revolution in toy design and use” (Hassinger-Das et al. 2017). To give an example of new interactive playthings, there are the internet-connected toys, which Palaiologou et al. (2021) describe as a “fluid entanglement between digital and non-digital.” Berriman and Mascheroni (2019) conceptualize smart toys like this as hybrid objects. A simple yet illuminating definition given by Mascheroni and Holloway (2019, 4) states that IoToys are sensory interfaces that allow children to access media content.

Palaiologou et al. (2021) note the ability of IoToys to communicate with children and vice versa — this is one of the main differences between IoToys and traditional toys. Today’s interactive toys are smart, automated, networked, and hybrid (Giddings 2019). As defined by Peter et al. (2019, 29), these toys:

22 “Most smart toys are ‘hybrid’ products – where the physical object (the toy) is owned by the customer, yet the presence of embedded and connected software means that the customer is subject to long term contractual obligations,” and issues related to data security (collection of biographical data), device security (the toy hijacks surveillance, tracking, or problem behavior), children’s privacy (data collection), overuse, lack of authentic play, lack of parent-child interaction, play that is too controlled/contrived, or health implications from electromagnetic radiation (Chaudron et al. 2017, 8). “Dating from 2015, this looks at toys such as Activision Skylanders and Disney Infinity to consider how the data generated by playing with toys such as these can reveal details of children’s everyday lives and to what extent children, and their parents, are aware of what the technology can do.” See Marsh (2017).

- are devices that need energy
- rely on one or more types of sensors (e.g., visual, audio, haptic)
- are software-controlled smart and connected toys
- are both smart and connected toys that interact with children
- may be able to move in the physical world

In 2014, Kudrowitz and Follett (2014, 245) wrote about how digital play needed more face-to-face social elements and tangible interaction. This no longer holds true as digital play affordances are incorporated in *physical* and *Internet-connected* playthings like IoToys. In present times, in this way, tactile toys and artifacts connect players to the virtual world (Arnott 2019, 135). “All objects in our lives will become smarter and will be animated by digital technologies, but the kids who play with them will lead the way,” says Thrift (2003, 389).

Plowman et al. (2010) use “digital devices” to denote tablets, smartphones, laptops, and other computers used for leisure, work, or study, but these also include activity trackers, digital cameras, voice assistants, and internet-connected or “smart” toys.

Nicholas Negroponte, founder of the MIT Media Lab, “looked into the future and decided that it would be digital and interactive” (Pesce 2000, 89). Both interactive devices and interactive toys represent commodities and consumer-level technologies and are, in this way, industrially produced artifacts that often come with a screen of sorts. “Recent developments in the use of advanced networked, interactive, virtual and mechanical technologies in toy design add to longer-established commercialization, franchising and ‘mediatization’ of toys” (Bak 2016; c.f. in Giddings 2019, 69).

According to Nigel Thrift, *Tamagotchi*, developed by the Japanese company Bandai in the mid-1990s, was the first commercially interactive toy in the world (Thrift 2003, 397). The original Tamagotchi, “the precursor of the artificial pet movement in 1996” (Rault 2015), is a handheld egg with a digital screen.

Through play, we learn the interaction and communication skills required to solve problems and better understand our own individual-level activities and the activities of environments and communities. Playthings may contribute to these processes, as children train communication by playing with toys (Alves et al. 2010). Toys familiarize children with technology (Ruckenstein 2013, 481), and impact interaction in play:

[...] when the world of computers intersected with the world of toys, the concept of interactivity, of two-way communication between toy and child, opened up a new universe of possibilities. Now toys could listen to children, observing patiently as they worked at various spelling exercises or games, and read to them personally, like a watchful parent, constantly assessing performance, gently extending the boundaries of

the child's knowledge. This reactive intelligence produces something greater than the sum of its parts: the child often feels more engaged and so works — or plays — harder. (Pesce 2000, 19–20; cf. in Thrift 2003, 395–396)

Critical voices have been aroused by the enchantment with interactive playthings like smart toys, which “with their strong initial appeal and attractiveness due to fancy gadgetry, may spoil children” (Johnson & Christie 2009, 287). Such toys have been envisioned to steal playtime from traditional toys of the players, who, after their interactions with the toy, “may then find other ordinary toys less appealing” (Ibid.). Hassinger-Das and colleagues (2017) state that “extra effort will be required to ensure that electronic toys provide the same type of enriching experience as their traditional counterparts.”

Hinske, Langheinrich, and Lampe (2008) recommend that toys that have been designed with technology components (also *augmented* toys) must follow certain design guidelines that draw on the existing criteria for good toy design. They should:

- a) be “fun”
- b) offer a mental challenge
- c) be age appropriate, reliable, and easy to understand and use
- d) encourage imagination
- e) give immediate feedback
- f) further extend the play while supporting physical and social interaction

If a toy is augmented with technology, these authors suggest that all traditional toy qualities should be present and that the technology enhancements should provide *added* value. Another set of criteria relevant to studies interested in the effects of augmented toys is formulated by Carr (2000) and includes *transparency*, *challenge*, and *accessibility*. Transparency refers to the ability to understand the concepts inherent in the toy; challenge means that the toy has affordances that increase possibilities for action; and accessibility points to the amount and type of social participation the toy affords, i.e., the number of players participating in playing with the toy. The term “affordances” is explained in the following sub-section.

1.1.6 Affordances

“Dr. Toy” Stevanne Auerbach has rightly claimed that “the wow is not a toy — it’s what you can do with it” (in Heljakka 2013, 361). Toys (or, more precisely, their designers) seek to control play through *affordances* (Norman 2007, 66–69). The theory of product affordability is derived from the theory developed by the American psychologist James J. Gibson (1904–1979) claiming that environmental factors contain clues as to how they can be exploited. “With products that require less knowledge for their operation, learning usually occurs by following cues within

the interface (Margolin 2002). These cues are recognized in the design field and, for example, in human-computer interaction theory as affordances. An *affordance* is a quality of an object, or an environment, allowing an individual to perform an action. The theory of affordances describes how we perceive an object's potential uses, for instance, how seeing a chair affords sitting. In this way, "affordances name the range of apparent possibilities that an object or device is capable of performing" (Bogost 2016, 162), or affordances set the circumstances that condition the use of an artifact (Berriman & Mascheroni 2019). According to *affordance theory*, affordances represent the relationship between an object or environment and an observer. Affordance theory has been used in design research and ergonomics by design theorist Donald Norman, among others. The idea of affordability related to objects and the environment, presented by Gibson and later developed by Norman, provides a theoretical starting point for reflections on the digital play discussed in this thesis. The reasons why, for example, the video and photography of toys have become popular can be understood by interpreting the affordances of toys themselves and by looking at play machines and play environments used as tools and contexts for play.

A toy is known to offer a variety of physical, fictional, functional, and affective offerings for play, that is, materials related to manufacturing materials, storytelling, functionality, and emotion; for example, physical toys may have tactile, functional, narrative, and emotional features (see Heljakka 2018b in Paavilainen & Heljakka 2018). A toy with more affordances might have more play value because it could allow for more types of play (Kudrowitz & Follett 2014, 248).

Quoting Norman (1999), Berriman and Mascheroni (2019) write about how the affordances of digital toys are made up of natural and deliberate clues. While natural clues refer to inherent properties of objects (size, shape, or material), deliberate clues are information incorporated into designs to direct people to discover possible actions. Play does not stem from the playthings alone: There are "*situational affordances* that may play an important role as well" (Boon et al. 2020, 13).

Affordances are a relevant entry point to investigate the converging realms of toys and technology in terms of physical and digital dimensions. The research undertaken for the case studies at hand aims to address both the toys' perceivable and hidden affordances.

In three-dimensional toys, such as dolls, action figures, and other types of character toys, we know based on their physicality and functionality what can be done with them in terms of object play (i.e., play that involves manipulation by the hand). Physical constraints may be related to their mechanical properties, such as articulation and, thus, "poseability." The concepts of *perceptible* and *hidden* affordances refer to instances where "objects do what it looks like they should be able to do" or when their "uses [...] are not apparent" (Shaw 2017, 593–594; cf. in Lundtofte 2020). For digital toys, their perceived possibilities for action are not always so apparent, and hence, must be uncovered during play. Indeed, James Cronin refers to the work

of Paul Virilio and Slavoj Žižek, who observe that we are already experiencing a “disappearance” of technology as multi-platform tools become smaller, faster, and disappear from physical sight, only to become more integrated into our daily lives (Žižek 2003, 18; cf. in Cronin 2011).

As illustrated by the case studies introduced in this thesis (Articles I–VI), the capabilities of digital toys as play machines unfold in the processes of play. For example, Berriman and Mascheroni (2019) suggest that these affordances are categorized as liveliness, affective stickiness, and mobility in Internet-enabled toys. Of these terms, *mobility* is the most central for the studies in the thesis at hand, which approach play machines not only from the viewpoint of play with Internet-connected toys but from a wider array of perspectives to arrive at an understanding of how play moves us in 2010–2020 and beyond.

2 Positioning Play in Theory and Society

No technology is important — it's the use of it that's important. Mark Pesce, author of *The Playful World, How Technology is Transforming Our Imagination*

The thesis deals with technological — digitalizing and Internet-connected — play from the perspectives of children and adults, leisure and learning, and the employment of technologies within these contexts. The following section, *Positioning Play in Theory and Society*, combines theoretical ideas presented in earlier research about the meaning and state of play in contemporary society as part of players of different ages acting in other contexts. This section offers definitions of play, presents theoretical views on the meanings and value of play, and discusses the dimensions of play in contemporary society, which are relevant to the thesis.

The thesis presents interdisciplinary research: The theoretical threads used as source points for the research undertaken in the subsequent case studies weave the thesis first and foremost together with toy and play research (in enlarging the concept of the “toy,” expanding understandings of the widening age groups of players, and describing novel and hybrid play patterns with play machines), research on HCI (*human-computer interaction*, in describing how the affordances of play machines are appropriated in play), interaction design (in offering food for thought for new play design), and early education (in illustrating creative ways of incorporating technologies into the preschool environment). However, the most influential theoretical ideas stem from the area of play studies, an interdisciplinary field of research, to which the author wishes to contribute the most by creating new understandings of how play moves us in association with digital technology through play machines.

The author is indebted to play theory, presented mainly by Western theorists, namely American play scholars or those outside North America. Brian Sutton-Smith is acknowledged for his wide-ranging interest in the meanings and possibilities of play (Henricks 2015c, 386) and is one of the most influential theorists of play *and* playthings referred to in this thesis. Alongside Sutton-Smith, whose work on toys and play has significantly inspired the studies undertaken in this work, the research has been most informed by other modern play scholars, such as Thomas Henricks. Although canonical figures in play and game research are referenced, such as Johan Huizinga and Roger Caillois, it is the theorists who have investigated the connections of play to the areas of media and technologies and published their work in the English language that have influenced this work the most. Parallel to the research of play as its area of academic investigation, I have found research in education and

human-computer interaction most helpful in increasing understanding of how early education experts and interaction designers approach play in their fields of operation.

The thesis highlights perspectives on what connects us with play machines. It opens up perspectives on adult toy play as world-play as part of digital, networked, and Internet-connected object play; the role of toy robots in developing socio-emotional ability; and the importance of technology-enriched play for the well-being of all ages. For example, highly topical play patterns such as the teddy bear challenge were presented as a form of pandemic toy play. Additionally, the thesis aims to grasp a glimpse of what the future of play holds by offering a perspective on a novel area of research, namely speculative toy fiction, focusing on technologically enabled play with possible “toyfriends” of the future. The focus of the studies representing various approaches to technologies as play machines are captured in Figure 1.

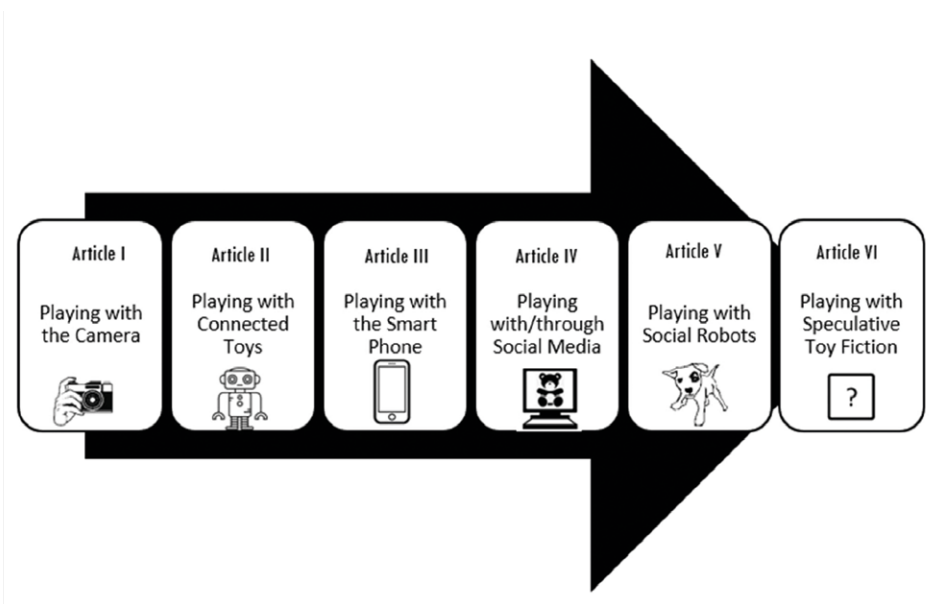


Figure 1. The focus of Articles I–VI: Various approaches to technologies as play machines.

2.1 The Meaning of Play

Play has been examined in a variety of disciplines and theoretical perspectives, and therefore, scholars of different academic areas have participated in discussions of the essence of play and how it could be studied. Scott Eberle, former editor-in-chief of the *American Journal of Play*, recommends that play scholars take a broad view to approaches that might advance understandings of the multivarious phenomenon that play is. He writes:

Because play is an interdisciplinary field, serious play scholars should acquaint themselves with philosophical and literary approaches, with the insights of social studies like sociology, anthropology, and history, and emerging disciplines like performance studies, health and recreation, and interactive sciences. Nor should they neglect the physical sciences. (Eberle 2009, 9)

But what is play, in essence?

To begin with, play theory is varied and ambiguous (Sutton-Smith 1997). What characterizes play is its infinite variability (Sutton-Smith 2009). “At its core, play is ambivalent and vague in all its aspects – its references, intentions, sense, contradictions, and meaning” (Sutton-Smith 1997, 2; cited first in Dippel & Fizek 2016, 3). On the one hand, academics constantly refer to the difficulties of defining play, even in the context of early education (e.g., Theobald et al. 2015). On the other hand, if the players (especially children) were asked how they see the play, we might gain insights into the phenomenon that would overcome some of these difficulties.

In theoretical terms, however, scholarly understandings of play must be considered as they offer clever, concise, and contested ideas about the meanings of play. Nevertheless, “it is notoriously difficult to pinpoint exactly what is play” (Back et al. 2017, 3). Indeed, Cowan (2020) notes how adults find the definition of the term play and understanding its meanings difficult. Others have pointed out the elusiveness of play as a concept (van Leeuwen & Westwood 2008). Citing Schwartzman, Sutton-Smith (1980) characterizes play as “a fickle creature of often elusive communication.” Play is about communication — as formulated by Garvey (1977): “Playing is saying.” Moreover, play sets various processes in motion. To exemplify, Bergen (2012) sees transformation as the essence of play.

What I find in the light of the definitions given, however, is that play is relatively easy to define, but it is instead the vastness of the definition that is troublesome. The plurality of meanings that play encompasses may be complicated for many to grasp unless involved in working with play as either researchers or play experts with in-depth expertise in play in design, education, or within the industries of play. Furthermore, what adds complexity to this endeavor is that experts sometimes conceptualize play differently than parents (see, e.g., Fisher et al. 2008), let alone the playing children (or adults!).²³

There needs to be more explanations of what belongs to the phenomenon of play. Sutton-Smith (1980) reminds us that cultural definitions of play must be considered. Play is defined differently across disciplines (Sutton-Smith 1997), but there are common denominators: Manifold attempts to define play have been made, some

23 For example, in their study, Fisher et al. (2008) found that mothers define play more broadly than child development professionals.

of which will be presented in the following. To exemplify, play has been described as a “multidimensional construct that varies in meaning across time, culture, and contexts” (Cohen 2006, 18). Paul Frappier defines play in the following way:

Playing is a common phenomenon, a ubiquitous one. We are familiar with it and take it for granted as part of the repertoire of human behaviors. At first glance, there seems to be nothing obscure, ambiguous, or problematic about such a simple, well-known activity. Without dwelling on it, we usually take it for granted that playing is one of the many possibilities of engaging in an activity for limited amounts of time and with an animated spirit of joyous relaxation. (Frappier 1976, 11)

Play is self-expression, and the best definitions of play are clearly expressed and easy to understand, such as the one given by Gray (2015): Play, or being playful in the definition of Gray, is (1) self-chosen and self-directed; (2) intrinsically motivated; (3) guided by rules; (4) imaginative; and (5) conducted in an active, alert, but relatively non-stressed frame of mind (Gray 2015, 125; cf. in Johnson et al. 2015). A similar definition has been given by researchers working for the LEGO Foundation: “We say learning through play happens when the activity (1) is experienced as joyful, (2) helps children find meaning in what they are doing or learning, (3) involves active, engaged, minds-on thinking, (4) as well as iterative thinking (experimentation, hypothesis testing, etc.), and (5) social interaction.” (Zosh et al. 2017; The LEGO Foundation, 22).

Despite its multifarious nature (Murnaghan 2011), there are more concise ways of defining play. For example, recent work by Fehr, Boog, and Leraas (2020) explain that the four defining features of play are that play:

- must involve positive affect and be fun
- is non-literal (themes and scenarios that occur in play are separate from what occurs in the real world)
- is intrinsically motivating and flexible

“[T]he desire to play is fundamentally the desire to be,” says philosopher Jean-Paul Sartre (1995, 170). *How exactly does this desire manifest in human behavior?*

Based on earlier understandings, play can also be perceived as a state of doing and being *actively engaged*. In this way, play is “active pleasure,” as defined by media scholar John Fiske (1988). That may result in personal gratification through autotelic (or intrinsically motivated) play, as explained by Sutton-Smith:

Autotelic play is often given as the name for the kind of play where the individual has freedom and control over what he or she does. But in addition, the play is said to sometimes yield peak experiences of particularly high personal quality. (Sutton-Smith 1986, 112)

Play is generally seen mainly as an activity of children, which, depending on their attitude, is seen as either an enchanting, functional experience or a useless passage of time compared to cultural creativity, which is considered lucrative. Ruoppila (2014, 9) defines play as an internally motivated activity of a child, which Helenius and Lummelahti (2014) specify as an activity in an imaginary situation. Imagination plays an essential role in the definition of play (Piironen 2004, 13–14).

The International Play Association (IPA) provides an interpretation of “play” regarding children and the context of Article 31 (Plowman & Stephen 2014, 19):

Children’s play is any behaviour, activity or process initiated, controlled and structured by children themselves. Play is non-compulsory, driven by intrinsic motivation and undertaken for its own sake, rather than as a means to an end. It may take infinite forms, but the key characteristics of play are fun, uncertainty, challenge, flexibility, and non-productivity. While play is often considered non-essential [...] it is a fundamental and vital dimension of the pleasure of childhood and is an essential component of children’s development.

According to Nachmanovitch (1990, 43), play can be understood as an attitude, a playful way of doing things. Alongside free and open-ended play, play is an activity determined by the rules, the playground, and the participants. According to Caillois (1961), play is a voluntary pattern of action determined temporally and locally. In Caillois’ thinking, play is thus defined as a voluntary, special, insecure, and unproductive activity that is regulated and imaginative. Play has rules based on imagined rather than real life (Caillois 1961, 9–10). The belief that playing has no definite outcome and is unproductive, as perceived by, e.g., Caillois (1961), needs some critical inspection. To offer a counteractive view that concerns digital play, the children involved in the multinational study conducted by Marsh and colleagues (2020) and investigated the play worlds of contemporary childhood understood that technologies can be used in productive and unproductive ways.

The nature of play develops, as the imagination allows, by playing alone or together. Play is influenced by both the individual’s internal and external factors that support or limit playfulness. Play is a voluntary activity that combines the player’s free will with creativity. Play means taking over the world, dismantling and rebuilding it (Henricks 2006, 185). Play allows people to understand life’s material and symbolic contents and face the limits of their own forces (Henricks 2006, 219–220).

When permitting ourselves to play and freeing ourselves from everyday constraints, by choosing to give ourselves limits and obstacles as rules, by taking it upon ourselves to confront difficulties or to let be, to master or surrender, according to Frappier, we affirm life, assert ourselves as voluntary agents of our activity, as able and willing to share enjoyment, wonder, and excitement with others (Frappier 1976, 196).

Thomas Henricks provides a valuable perspective on play by arguing that although play is commonly an attempt at wish fulfillment and thus a (mental) psychological affair, it also makes people deal with existing material (physical) elements — props or “pivots” that facilitate thinking — and with existing idea systems (like language, game rules, and other cultural directives) as well as with the interventions or other people (Henricks 2015b, 115). What this idea leaves out is the relation that play has to machines and devices — to the systems provided by digital technology.

Moreover, “play is a concrete activity in the world” (Henricks 2015, 115) and, although nowadays often mediated by emerging technologies, visible in human gestures shown toward and with the technologies. Simply put, concrete activities materialize in how play moves us physically.

Play scholar Burghardt (2005, 9) views play as a peak experience that involves positive emotions and affects, ecstasy, flow, relaxation, and optimism. According to Csikszentmihalyi (1975, 37–38), play is the flow experience *par excellence*. Sometimes play manifests as movements of emotion. Often, physical and emotional movements occur simultaneously in play.

According to a definition by Klugman and Fasoli (1995), play is interaction. It is “a major interactive process through which children learn about themselves, their environment, the other people in that environment, and the interrelationships among all of these” (Klugman & Fasoli 1995, 196; cf. in Yelland 2011).

“Play can refer to a plethora of individual actions or cultural activities. It can include games, festivals, artistic play, gambling, and sports. It can be organized, structured, or rule-bound (as in games). Or it can be spontaneous, unstructured, and playful as in imaginary or free play” (Power 2011, 289). Indeed, play is a heterogeneous behavior category (Dansky 1983, 72) for which a single acceptable definition of play is hard, if possible, to make (Chudacoff 2007, 1).

“Play has been notoriously difficult to define” (Zosh et al. 2018, 1). Burghardt (2005, xi) notes how even eminent scholars have faced challenges in defining play and considered it more a mystery than a phenomenon that can be understood through scientific analysis. Bernard Mergen underlines this unsolved quality of play by stating that “play observed, recorded, analyzed, and classified is itself a kind of fantasy, one that satisfies the adult desire to explain and to pretend to know what play is” (Mergen 1995, 271).

Notably, even researchers partake in the instrumentalization of play by formulating their definitions according to their needs. Consequently, they add further complexities to understanding play as a phenomenon. Although putting it bluntly, it may be wise to accept the existence of play and to *move on*.

Sutton-Smith suggests that a definition of play should be broad rather than narrow (1997, 128), for example, as is the case in defining free play: Free (unstructured) play is considered valuable for its ability to enhance cognitive, social, emotional,

and physical development; foster creativity, imagination, and problem-solving skills; educate and learn; and support health and well-being (Cowan 2020).

As a diverse activity, play is practiced by a large group of players (e.g., infants, children, adolescents, adults, male and female players, gamblers, elite sports players, playwrights, performers, and comedians) (Sutton-Smith 1997). In today's world this list could be extended.

For some, the functional nature of play is hard to confirm. Sutton-Smith has noted how the voluntariness of play means that it must also be nonfunctional. According to the scholar, this perception is questionable (Sutton-Smith 2017, 108). "Play is extremely productive for the life of the playing groups involved" (Sutton-Smith 1986, 153–154). To take the idea further, it is fruitful to acknowledge the simultaneous occurrence of the functional (productive) and nonfunctional (non-productive) aspects to emerge in most forms of play and, at the same time, admit that play is carried out both for intrinsic and extrinsic motivations.

For the sake of clarity, a distinction between playfulness and play is needed. One clear-cut differentiation in defining the phenomenon is to think of play through the approaches of human "being" and human behavior. To distinguish between the ontology of play versus the philosophy (and theorizing) of play, Similar to Nachmanovitz (1990), Frappier describes play as an attitude toward people, events, things, and situations (Frappier 1976, 13). Similarly, Melasniemi and colleagues (2022) point to John Dewey's ideas in referring to playfulness as an attitude. While an internal playful attitude guides the mental states, play implies actual behavior and activities that are externally visible to others. Playfulness can be seen as an antecedent and precondition to play. Consequently, play is doing something with a playful attitude and is thus an important bridge from being to doing (Frappier 1976, 146, 196, accentuation in the original).

Seen from the perspective of this thesis, play represents a relationship to technology, a mindset, and a curious stance to experiment and experience (e.g., Resnick 2006). As many definitions of play do not account for the digital aspects of play. I lean on earlier definitions but develop them further to overcome this challenge in suggesting a definition of play. Here, I state that:

Play is a voluntary, open-ended (unstructured), or goal-driven (structured) activity that enhances emotional, physical, mental, cognitive, or social well-being by producing enjoyment and gratification for players of any age, in which the human being employs imagination, creativity, or skill to explore various objects, artifacts, environments, systems, or assemblages of them in order to communicate and interact with oneself or others productively or unproductively. To put it in simple terms, play can consist of goal-oriented action, like in association with games, or more open-ended exploration, as free play with toys. Contemporary play may take many forms: it can be solitary or social, embedded in the physical, digital, or imaginative, exercised both offline and

online as part of leisure, work, and playful learning, extended with play(ful) things, tools, technologies, and media, and engaged in by players of different ages, even between individuals of different generations.

2.2 Play and its state in society

This section considers the importance of (the study on) play. The unpacking of the controversial topic of devices used in association with digital play starts with the phenomenon of greatest interest for this thesis, namely *play* most profoundly inspecting current societal attitudes toward play. Gwenda Davey (2012, 115) claims that “in the twenty-first century, in so-called developed nations, adult interest in children’s play ranges from benign to malign; in between is indifference.” One only needs to observe the growing number of media articles that deal with digital vs. traditional (non-digital) play and primarily focus on the negative aspects of digital play, most prominently digital gaming. Fisher et al. (2008, 306) observe that “a particular belief about play fundamentally limits the activities that are identified as play.” Often, as illustrated in the introductory section of this thesis, contemporary play is most strongly associated with games and gameplay.

The importance of play has been easily undervalued (Moyles 2012). In work-centered societies, in particular, according to Brian Sutton-Smith (1970), there is a “triviality barrier” surrounding the serious study of play. At the same time, however, claims have been made about the century we live in as the century in which play has gained an elevated status.

Scholars such as Sutton-Smith have envisioned that the 21st century will be the Century of Play — in essence, what he calls the ludic era (Sutton-Smith 1997). James Johnson, one of the editors of *The Handbook of the Study of Play*, has observed an unprecedented increase in professional and public interest in play in the last decade (Johnson 2015, xi). Currently, the interest in play has risen within society and academia.

Play is an interdisciplinary area of study that can be investigated from many angles. So far, the phenomenon of traditional (i.e., ‘non-technological’) play has been scrutinized from the perspectives of folklore, ethnology, cultural anthropology and cultural history, psychology, philosophy, art history, and artistic research, to name a few areas. The scope of “play studies assumes that one can learn more about play by examining carefully from many different angles rather than just one vantage point” (Johnson 2015, xiii). The theoretical underpinnings behind the idea that play has attracted particular attention in various research fields during the past decade are grounded in understanding games as a powerful media.

Gaming is one of the most accentuated dimensions of the playful turn, ludic turn, or ludenic age presented by Brian Sutton-Smith (1997), James E. Combs (2000), and

Eric Zimmerman (2015), to mention a few. Joost Raessens (2010) states that culture and its actors have become increasingly playful, mainly due to changes in the media environment. According to Raessens, computer games and other digital technologies, such as mobile devices and the Internet, seem to stimulate playful goals and promote the formation of playful identities (Raessens 2006, 1). These theoretical ideas on the role of technology in contemporary play are highly relevant to the thesis at hand.

What consequences does the playful era have for studying and recognizing the value of play?

Cultural and societal trends shape player preferences and play patterns. Play evolves within society and culture. It has universal dimensions but also culture-specific aspects (Smith 2010, 95). Undoubtedly, the Western context of the research also affects the research undertaken. Playfulness — captured as part of a Western worldview — manifests in our time as multimedia cultures of production, distribution, consumption, and users, in which play equipment, the media, and user-players who use both creatively play their own roles. One of the arguments in favor of the paradigm of the playful era is based on the idea of cultural change: In the past, a work-oriented society has become a society that emphasizes the importance of play and leisure (de Jong 2015). Many have come to see why play is worthy of investigation, exploring it from angles such as child development, media use, and education. Culturally, play has always had significance for people of all ages, but during different times, societal attention and appreciation of play have varied. For example, in the 1970s, Paul Frappier noted that literature on play concerns almost exclusively the play of children (Frappier 1976, 1). Sutton-Smith sees an explanation for this in the growing impact of media-child stimulation, which materializes through news media, technology use, and the influence of toys and games:

The last fifty years have witnessed unprecedented levels in Western culture of media-child stimulation through newspapers, radio, television, video games, computers, the Internet, mass-produced toys and games, cell phones, and the like. These media supplements have made it increasingly common for parents to socialize their children into this intense and varied simulation, which parents themselves now experience. (Sutton-Smith 2017, 50)

For Sutton-Smith, the most apparent modern manifestations of play as a consumable experience include children's toys, computer and video games, attendance at artistic and sporting events of the young and the old, and the plethora of other, more specific entertainment available (Sutton-Smith 2017, 233–234).

This article-based thesis aims to offer complementary perspectives on the evolution, culture, and digitalizing landscape of play, disregarding (or rather, overcoming!) the triviality barrier mentioned by Sutton-Smith. In this thesis, attention turns specifically to toys and play machines and their linkages to digital technology.

While according to some, traditional (childhood) play is under siege, there is a need to widen the scope of research to capture aspects of play that may be considered non-traditional, including play that combines the areas of toys, technologies, and mobility. This means an urgency to develop the understanding of digital play as both a life-long phenomenon as well as a *life-wide* one — a matter of children, youth, adults, and seniors (even as an interspecies phenomenon including playing animals) and an object of investigation that traverses the limits of (early) education, leisure, and working life. These expanding ideas on play will be elaborated on in more detail in the following parts of the thesis.

2.3 Play of children and adults

Can all ages play? In her historical review of the role of play, Nina J. Lieberman raised the question of adult-oriented and child-oriented play and suggested that, during the Middle Ages, the Renaissance, and even the Age of Enlightenment, child's play was not only minimal within the individual's lifespan but was accorded little importance in human development as such. If play was emphasized, written, and sung about, it was the adult's play. To be specific, Lieberman pointed out that, in particular, she referred to adult play among the leisure class (Lieberman 1977, 143–144).

Frappier (1976) notes how Friedrich Froebel (1782–1852) suggested that play is for children, not for relaxation, but the most significant aspect of childhood. Lieberman claims that the trend toward child-centeredness in perceptions of play began in the 18th century, developed in the 19th, and had become acknowledged by the 1930s as the characteristic mode of behavior in childhood.

Lieberman writes: “Within the historical perspective, we can, therefore, say that the movement has been from adult games to child's play, and correspondingly, the underlying philosophy has moved from a competitive, rule-dominated foundation to the spontaneity, freedom, and sense of fun associated with child behavior” (Lieberman 1977, 13).

For children, play is considered a “natural occupation” (Ummanel 2017) and the child plays to adapt, grow, and socialize in and with the world (Sutton-Smith 1997). Sutton-Smith (1980) notes how Karl Groos' notion of play as a socializing phenomenon became the central thesis about play in the 20th century.²⁴

Children's rights to influence, speak, and explain matters relevant to their everyday lives are recognized globally in The Convention on the Rights of the Child (UNCRC) (United Nations 1989). Hence, children's right to play is also recognized. Cowan (2020) describes the phenomenon of children's play with words such as vibrancy and variety. Studies on children's play contribute to the overall understanding of play

24 Karl Groos is a philosopher and psychologist who lived 1861–1946, and who offered instrumentalized views of play.

by showing consensus on how children find the activity enjoyable, casual, and as something that happens with a lack of adult involvement (Einarsdóttir 2004).

When it comes to playing, it is still wondered in general debates (or perhaps rather, in the minds of the adults themselves) why adults would use their time for such a “frivolous” activity. Here, the notions of time, consumption, (expense!), and usefulness vs. futility intersect. Time is by far the most precious of human resources, and time should be well spent for children in play and adults in non-play activities.

However, the age of players has expanded. Or rather, societal and cultural trends have made it possible to view players of the 21st century as a broader demographic group than before. The idea of “maturing while becoming” encompasses all age groups. This means that growth happens at every age, and play has significance for the processes contributing to our growing minds, mindsets, and creative capabilities.

Sutton-Smith argues that there is more to play than its manifestations in childhood:

What is particularly ludicrous is the view that nursery school play is the only true kind of play. This is something like saying that the true nature of language is to be found in baby talk. (Sutton-Smith 1986, 155)

Nevertheless, when it comes to digital technology use, Woolsey and Woolsey (2008) identify youth as the expert in digital domains because of their playfulness. It is possible to consider children and youth as leaders in the development of using technologies for playing purposes and the adults who wish to maintain their youthfulness as their followers. Kücklich perceives the desire for youthfulness to play its part in adults’ relationship to play:

The characteristics of play seem to contradict basic values in western societies such as sincerity, diligence and dedication. But there are indicators that suggest a change in this perception of play. In cultures that emphasize youth as a desirable state, which is to be prolonged and upheld by all means for as long as technically possible, playful behaviour might be one of the ways by which their members can present themselves as youthful. (Kücklich 2004, 2)

In addition to the romanticization and nostalgia for traditional, non-technological childhood play and the criticism against, for example, media technology, journalistic media, its audiences, and play, researchers at the beginning of the 21st century have become seemingly more interested in adults’ fascination with various play tools and services, play behavior related to these aspects of play, and adult play. Kücklich (2004, 14) also states that “play is not infantile; toys are not just children’s playthings,” meaning that the instruments for play belong to other age groups in parallel to the one of children.

In 2023, the body of research on adult play has grown significantly, transcending the boundaries of research on adult play within the realm of digital gaming, into areas such as adult toy play (Heljakka 2013) and playful learning in higher education (see, e.g., Whitton 2022).

In addition to technological development, Sutton-Smith (2017) considers the existence of adult play and talks about ludic liberalization in his work, mainly as an individualistic project and a consumption-related activity. Seen in this way, adult play is not exclusively located in the communality of sport; for example, play has become increasingly personal, while social media reveals its visible and shared nature and the qualities of toys at play. In the digitalizing and Internet-connected age, players encompass broad groups of individuals both demographically and professionally — preschoolers, school children, educators, working and retired adults, and seniors all have their own interests and relationships to play. One example may be found in ideas on toys. According to traditional thought, toys exist to serve the child (Gorman O’Neill 2017), but with the emergence of *kidults* — or adults who accumulate, create, and find meaning in toy-related activities (Heljakka 2021), toys also exist to serve the adult imagination and creativity.²⁵

2.4 Play in leisure, learning, and productive endeavors

The Strong National Museum of Play perceives play as a process by stating in its exhibition texts that “play moves. It’s a cycle of events and mental states.” It is possible to conceptualize this movement between the previously discussed notion of *childhood-adulthood* and the theoretical axis of the themes of *health-depression*, *leisure-recreation*, *entertainment-learning*, *unproductive play*, and *productive play, or playbor*. All of these areas have relevance for the thesis at hand, as play is investigated as not only a leisurely activity but as behavior that has consequences for learning and contributes to productive endeavors. While offering avenues for self-expression and socialization, play contributes to our well-being.

Let us first look at the first axis, *health-depression*: The opposite of play is not boredom but depression: Stuart Brown lists the consequences of long-term play deprivation for adults as a “lack of vital life engagement, diminished optimism, stuck-in-a-rut feeling about life with little curiosity or exploratory imagination to alter their situation, predilection to escapist temporary fixes [...] alcohol, excessive exercise (or other compulsions), a personal sense of being life’s victim rather than life’s conqueror” (Brown 2014, n.p.).

25 While *kidults* represent the ASYL (*adults staying younger longer*), *adul-kids* can be perceived as representatives of KGOY (*kids growing older younger*). For the consequences of this “age compression,” see Heljakka (2013; 2021).

To emphasize the meaning of play in today's society, previous literature acknowledges the many benefits play has for human health. Bogost (2016, 101) notes how the benefits of play are expressed predominantly in terms of their resultant underwriting of mental (and often physical) healthfulness. Again, play in itself is perceived to benefit the players by contributing to mental states, such as "total abandonment, no worry, joy, clear thinking, energy, curiosity, wonderment, pride, connection, movement, imagination, relaxation, therapeutic" (Brannen 2002, 67–77). Overall, however, associating play with health benefits introduces some problems: Alexander et al. (2014) summarize how (i) play is viewed as a productive activity and legitimizes it as a health practice; (ii) tropes of "fun" and "pleasure" are drawn on to promote physical activity; and (iii) children are encouraged to self-govern their leisure time to promote health. With this understanding, the researchers think that:

[...] by regulating children's play to be healthy and active, and thus normalizing the ways in which children are encouraged to play, other relevant qualities of play may be neglected. Indeed, while playing simply for fun (that is, frivolous pleasure) is considered a common experience of childhood, it appears to be less important than the more productive and explicitly active play for health. (Alexander et al. 2014, 1201).

However, as one contributor to a healthy life, play is not limited to childhood, fitness, or sports (Marshal 2002, 73). Paul Frappier, who investigated adult play in his dissertation written in the 1970s, asked: "Is there a value to play other than diversion and recreation?" He writes about play's association with pleasure and "uselessness," which have contributed to evoking suspicion toward it (Frappier 1976, 2). This brings us to the second axis of *leisure-recreation*. Indeed, he continues, "play in its essence has a definitive quality of non-purposiveness, of being an end unto itself, of being pleasant, of being pursued for the fun of it. This links it rather closely to pleasure. Our attitude towards pleasure conditions our attitude towards play" (Frappier 1976, 52).

To clarify the role between genuine play and recreation, it is possible to see how play differs from "recreation, which is understood as activities with a function, such as artistic, sporting or community engagement" (Cowan 2020, 10). Leisure is undertaken for the sake of pleasure and recreation to express oneself through creative activities or to partake in communal life.

On the one hand, according to the numerous definitions of play presented in the thesis at hand, play can be intrinsically motivated. On the other hand, play may have extrinsic goals. Consequently, playing happens both in the name of leisure and recreation.

However, the places and patterns of leisure and play undergo changes. One of these changes related to play is the intermingling of leisure activities like entertainment and education. In the intersection of these areas lies *edutainment*, a combination of entertaining ways (often associated with leisure activities such as toy play) to deliver educational content and, therefore, learning possibilities. Resnick (2006, 3)

has observed how “there has been a surge of computer-based products that claim to integrate play and learning, under the banner of ‘edutainment.’” This development manifests on the axis of *entertainment-learning*.

Hirsh-Pasek and Golinkoff (2011) have stated that the dichotomy between play and learning is false. However, critical views have been expressed about the value of childhood play outside of education: Children’s subcultures and freer play forms are denied when play is interpreted through an analytical lens in association with learning (Cole et al. 2017). Indeed, progressive and productive forms of play tend to be valued over non-productive ones.

Time used in play provides fun, relaxation, entertainment, and educational socialization (Auerbach 2004, 13). For children, play caters to the need to adapt to the world and to create new learning experiences (Elkind 2007, 3). Playthings, play environments, and philosophies in pedagogy all contribute to this process.

Cole and colleagues (2017) note that different forms of play create different kinds of cultural environments for learning. Early childhood education is one of the most notable areas of academic inquiry into play (Scarfe 1962). For example, in the U.S., educators and caretakers are encouraged to play with children and to use play as a means of teaching (Smith 2010, 92).

Though learning happens right from birth, you may wonder how we build more complex, higher-order skills such as creativity, critical thinking, collaboration, and problem-solving. One approach – often overlooked – is play! (Zosh et al. 2017, The LEGO Foundation, What We Mean By: Learning Through Play)

While the consumption of entertainment is rarely viewed as productive, learning is considered highly productive for the individual regardless of age. “All types of play offer opportunities for active learning” (*TOY, Together Old and Young Course* 2021).

Play is a natural way for a child to develop physically, mentally, emotionally, and socially (e.g., Piaget 1962; Guha 2011; Piaget & Cook 1952; Yogman et al. 2018). Playing is closely tied with creativity, problem-solving, and innovation through artistic play. To Lieberman, “combinatorial play” is an essential ingredient in imagination for rearranging known facts and a condition for producing unique solutions to existing problems (Lieberman 1977, 149–150). Carl Jung (1875–1961), the renowned Swiss psychoanalyst, has said that the creation of something new is not accomplished by the intellect but by the play instinct. Again, Einstein defines play as the highest form of research. Indeed, as discussed in the following, play has a close relationship to creativity, novel ways of thinking, and learning — play moves our bodies and minds in such ways that we come to learn about the world, each other, and perhaps most of all, ourselves.

Theobald et al. (2015, 345) describe “a denigration of the role of play in favor of more teacher-structured and formal activities.” Simultaneously, play is regaining momentum as a recognized and legitimate learning activity (e.g., Singer et al. 2006).

More positive stances toward play acknowledge the potential and benefits of the phenomenon both on the level of institutions and individuals. For example, Theobald et al. (2015) conceptualize play as a learning resource. Bennett et al. (1977) have described play as an educationally powerful process. Fisher et al. (2008, 305) view the role of play as a “structured, educational thrust for early academic preparation.” These views commonly consider play as a means to an end and, thus, an instrumentalized resource. To exemplify, Roach argues that “play in education is situated as a means to an end, a method of ensuring the progress of students through the academy and into the marketplace” (Roach 2013). In this way, play receives even more perceivable instrumentalized values guided by educators and, as a consequence, is considered a pathway to constructive rather than disorderly behavior.

The tools, techniques, and technologies used in playful learning manifest in interactions between structured learning scenarios and materials intended to activate students and generate learning experiences. In the current world, there is much interest in playful learning and, even more concretely, in game-based or even *toy-based learning* (Ihamäki & Heljakka 2018). To illustrate, different playthings and play environments afford and promote educational benefits in different ways:

*[...] the particular kinds of toys the child persists with over ten to fifteen years contribute to training in human skill. It is not surprising that athletic parents are eager to provide balls, bats, gymnastic and other equipment. What is not generally realized is that there are as well other less well recognized ability curriculums in the world of toys. For example, there is a training in the spatial relationships an architect or designer might need through blocks, tool sets, trains, and model kits. There is a training in the logic and mathematics that a scientist might use through number of games, electronic games, chess, and science kits. There is a training of the verbal skills of the writer through books, word games and riddles. And there is training in the interpersonal skills needed by the salesperson and politician through puppets, telephones, and theater games. In such myriad ways toys are used by children to develop the skills that they find most rewarding for themselves. (Sutton-Smith 1986, xii in Boehm, *The Right Toys*)*

However, play and learning are complex concepts (Theobald et al. 2015), and so is the concept of playthings, especially when connected to the phenomenon of play.

“Play-based learning is a feature of Anglo-European early childhood pedagogy where young children have long been argued to learn through active, hands-on engagement with objects and through social interactions with others” (van Oers, 2013; cf. in Bird & Edwards 2015, 1149).

Today, current education often means learning with the newest tools, hence *digital learning*. Arnott (2016) sees technologies as tools that can support play and learning experiences in childhood. However, Bird and Edwards (2015) argue: “A significant problem for early childhood education has been how to understand the pedagogical use of technologies in a sector that values play-based learning”

Critical voices have been raised about the marketization of education (Selwyn 2011), marking rhetoric of progress through technology (Plowman et al. 2011) as learning technologies and environments evolve and new educational media technology branches out.

Sometimes, learning intertwines with edutainment through interactive learning experiences with digital technology: Smart toys and toy robots, such as the IoToys investigated in this thesis, have been labeled as “teachable machines” (Druga et al. 2019). Despite the clever neologism that edutainment presents, Hall et al. (2022) observe how toys that claim educational benefits are rarely backed up with empirical studies that prove their educational benefits, even if these would be the primary selling point for the toy.

In the context of this thesis, it is necessary to ask the following questions: “*Is it important that young children learn to use digital media as part of their play?*” “*What opportunities does digital play provide for learning?*”

The presumption is that all forms of play educate in one way or another. Growing up with digital media means playing and learning with it (Takeuchi 2012). Yelland (2011), who has studied children’s learning, suggests that making new technologies available enables and extends playful explorations within playful learning.

Still, to be considered learning tools, the usability of playful technologies must be assessed in terms of their suitability to be used as part of playful learning, which means learning through active participation (Resnick 2006).

Because of these reasons, “most people would agree that children’s experiences with technology – whether for play, learning, or communication – will have significant implications for their future lives,” write Plowman, McPake and Stephen (2012).

Fisher et al. (2018) identified electronic media to be marketed as having educational benefits (Kaiser Family Foundation 2005). Some toys, like the Internet-connected (IoToys) presented in this thesis, have a clear educational purpose. Johnson and Christie (2009) have observed the potential opportunities that technological advances in toy manufacturing bring to early childhood education. “Digital play can incorporate many different kinds of play, and so it seems to have great potential to provide children with the benefits of playful learning” (Gray & Thomsen 2021, 4).

Tools and systems for play that are designed to be functional for learning require understandings of how children learn. Through their *Digital Play Framework*, Bird and Edwards (2015, 1149) discuss “how children learn to use technologies as cultural tools, first by exploring the functionality of technologies through epistemic activity (according to Oxford Languages, ‘relating to knowledge or to the degree of its validation’), and second by generating new content through ludic activity.”

Yelland (2011) notes that those who advocate for traditional play-based curricula tend to discourage using new technologies.

The role of adults in allowing use and access to devices is fundamental: Parents may either support or hinder learning by guiding and restricting children’s interaction

with tablets, smartphones, or apps (Marsh et al. 2015; Plowman et al. 2008; 2010). *Which digital media are best suited to the needs of young children when considering playful learning?*

Plowman et al. (2012) have identified digital cameras or mobile phones as having extended the range of possibilities for learning and playing. “Tools are not only things to be discovered in their own right; they are means to personal self-assertion or autonomy or Mastery,” writes Sutton-Smith (1986, 144). Playing with technologies contributes to skill-building, competencies, and literacies.²⁶

Koltay (2011, 212) refers to a definition of media literacy given by Auferheide (1992), who identifies it “as a movement, which is designed to help to understand, to produce and negotiate meanings in a culture of images, words, and sounds.” Media literacy means the ability to access the media, understand and evaluate different aspects of the media and media content critically, and create communications in various contexts (European Commission 2007). “Children need a broad range of holistic skills – skills such as creativity, communication, collaboration, problem-solving, and self-regulation – as well as knowledge of academic subject areas and technological literacy” (Gray & Thomsen 2021, 4). Wohlwend and Pepler (2013) recommend that play should be valued as literacy in itself. Media literacy is a notable concept in reference to contemporary play.

Lynch (2017) has predicted that by 2020, 77 percent of jobs will require digital competency. One part of digital competency is literacy, and when conversed in the context of digital play, it refers to both the user’s media literacy as well as multiple literacies associated with play, such as *ludic literacy* (Mäyrä 2017a) and *toy literacy* (Sutton-Smith 1986; Heljakka & Ihamäki 2018; Almeida 2023).

As stated by Mäyrä (2017a), ludic literacy includes understanding (a) technology, (b) culture, and (c) social dimensions of games and play — the ability to step within a game, interplay with others, and be creative within those frames. 21st century toy literacy follows the same ideas, but applies them to toys and interaction with them.

In his foreword for the book *Toys, Games, and Media*, Sutton-Smith (2004) expressed his excitement for what the volume would highlight in terms of the development of media literacy. The book addressed early digital media and the impact of technology on media-related play by showcasing chapters on children’s use of the Internet, computers, and early smart toys. Nearly twenty years later, this thesis takes a digital media literary approach to contemporary play by further acknowledging that the investigation of technologically oriented play — with specific interest in play machines, such as mobile devices and social robotics in addition to the Internet, digital cameras, and IoToys and the developed IoToys — demands a multimodal

26 In the context of Western childhood and learning in the domestic space, this has been critically discussed under the concept of “curricularization of family life” (see, e.g., Buckingham & Scanlon 2003; cf. in Plowman 2004).

understanding of media literacy and technological literacy, incorporating skills in media, visuality, hardware/software, and finally, a developed toy literacy.

But what is toy literacy?

Play is multisensory, but “much play is based in touch” (Pesce 2000, 22). Allen (2004, 181) observes that when we touch an object, the hand is usually the “organ of stimulation.” Both manipulability and manual dexterity are essential when considering tools and technologies for playful learning — both portable technologies and most toys are “handheld devices.” Objects instigate and invite people to specific actions (Keane 2005, 194), and screens affect digitally oriented object play. Naisbitt and Philips (2001) combine “high tech with high touch.” The use of technological devices has implications for playing: “Contemporary children have been described as the touch-screen generation” (Rosin 2013; c.f. in Brito et al. 2019). According to Aziz (2013), young children can perform seven basic gestures by age four: tap, drag, and slide, free rotate, drag and drop, pinch, spread, and flick.

Digital skills attained in technologically oriented play can be skills in reference to digital literacy: operating devices and navigating apps, finding information, keeping safe, and creating digital content. These skills serve children in their education and future employment (Marsh et al. 2020). Play is a practice of the mind and body that requires agility in both senses. This physical and mental movement can also be approached through the notion of *digital dexterity*, a facet of contemporary toy literacy.

Even machines such as digital devices are material entities approached through multitouch screens or natural interfaces. Jayemanne and Nansen (2016) discuss digital dexterity as a particular skill among digital competencies. Digital dexterity should be understood as a linking of physical skills of the hands and body to operate interaction with gestural devices and to mobilize the device’s component elements. Physical gestures as part of digital play relate to both productive and non-productive activity. This means that previous assumptions of play and work are diluted. According to literary character Tom Sawyer, work was seen as an obligation, whereas play has been understood as a “non-obligation”:

Work consists of whatever a body is obliged to do. Play consists of whatever a body is not obliged to do. (Mark Twain, *The Adventures of Tom Sawyer*; cf. in Alexander et al. 2014)

The final axis of interest here is the one of *unproductive play-productive playbor*. Play inspires creativity in both children and adults. What separates play from creation, again, is the tendency of play to create possibilities, while creativity produces ideas and artifacts (Power 2011, 316). Sutton-Smith (2017, 77) offers a compromising view by proposing that most play could be seen as originative or open-ended rather than systematically creative.

Play and creativity often go hand in hand, as they are bound by a common denominator — *imagination*. There is no reason to separate play from imagination (Ummanel 2017), especially not when playthings come to the fore of inspection. “In new media cultures, play has moved center-stage in its significance in the creative forms of production and recreation” (Marshall 2004, 43–44).

Playthings, such as toys as objects and artifacts, grant permission to play and have the possibility to set the imagination in motion. Combined with device use, the products of creativity become easily documented and effortlessly shared. In this combinatory play, it mobilizes the imagination via creative device use that makes playing productive.

This thesis demonstrates aspects of leisure and learning as play but does not address play as a professional or occupational practice. However, human creativity and user-created content change the nature of media production (Kücklich 2004). Following this thought, one can claim that the 21st-century player is a content creator and, thus, a producer of play who makes sharable play content out of anything, such as unboxing videos (Blythe & Cairns 2009) or toy play with storytelling in focus. In this way, device-enabled play contributes to the notion of seeing both children and adults as *playborers* (Articles I and III in this thesis).²⁷

Kücklich (2004, 16) asserts that “games now produce goods with a value in the real world.” Therefore, gamification can be perceived as one form of playbor (Rey 2015). In the thesis at hand, playbor is understood as the endeavors of the “professionals of play” who produce entertaining and interactive content for others to consume through their creative activities with toys (Heljakka 2021). Kücklich’s notion of playbor deals primarily with the unpaid labor conducted by players who, e.g., create content through activities in relating to “modding,” and whose creative productions benefit game companies. It is important to note that in this thesis, I use playbor to describe player activities that are productive in a similar sense to work, and that give playing structure and continuity. While I also acknowledge that there are players who can be considered consumers for the outcomes of playbor, I do not address their role as content creators from whom, e.g., toy companies would profit. Undoubtedly, there are ways to benefit from play financially in regard to monetization of play, but this matter is not the focus of this thesis. Instead, I regard playbor as a form of content production derived in play.

Content of play means what is created during play, what is shared socially, and what potentially inspires more play. The online networks and platforms used to share play such as Facebook and Instagram also allow the consumption of play

27 My prediction is that in the not-so-distant future, (adult) people will be playing more in their daily lives as part of what has been understood to constitute their labor activities. This provides more opportunities to study the areas of playful learning and playbor in the adult context, for example, as part of higher education and work life.

through spectatorship. In this context, play becomes (semi)professional, productive, perceivable, and in due course purchasable, as players of different ages produce creations that have value once spectated and consumed by other players.²⁸ This productive realm of contemporary play is dependent on device use and social media in documenting, distributing, and sharing the outcomes of play, which are predicted to become more recognized in the era of post-digital play, elaborated on in the following sub-section.²⁹

The artifacts and devices both affect the players and enable and extend their abilities to communicate (Mascheroni & Holloway 2019, 6). The technologies as play machines presented and scrutinized in this thesis allow open-ended play experiences beyond digital gaming. These can be experiences of either children, adults, or intergenerational audiences, which have outcomes for leisure, learning, and productive play and open-ended, *paidia*, and structured *ludus* (see Figure 2.) that may further be analyzed leaning on the notions of *health-depression*, *leisure-recreation*, *entertainment-learning*, *unproductive play*, and *productive playbor* discussed above.

28 This is understood in terms of a platform economy: “Platform economy is the tendency for commerce to increasingly move toward and favor digital platform business models” (Fitzgibbons 2023).

29 Virtual goods have already emerged in early adaptations of the metaverse in the “form” and notion of NFTs (*non-fungible tokens*) in new (screen-play) media ecologies. As this thesis deals with toys and devices with a physical dimension, entirely virtual creations are left out of focus. Nonetheless, these goods are likely to receive more attention as “toy-like” products of digital playbor in the upcoming years.

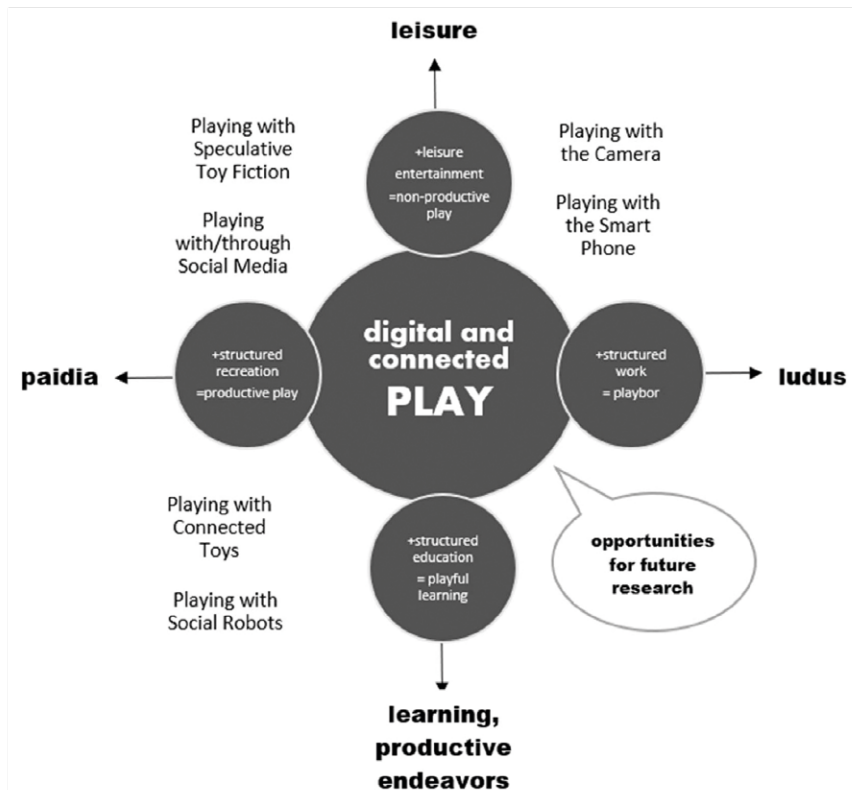


Figure 2. Facets of digital and Internet-connected play: Play as part of leisure, learning, and productive endeavors as investigated in the thesis (and detected opportunities for future research).

2.5 Toward Post-Digital Play

“The farther cultures move into post-industrialism the more important play seems to become” Julian Kücklich (2004) writes. Post-industrialism refers to “belonging or relating to an economy that is no longer based on heavy industry, such as the making of large machines” (Cambridge Online Dictionary 2023). Oldenziel and Hård (2013) have noted how toys closely mirrored the adult industrial world of the 20th century. In the 21st century, toys such as the play machines of interest for this thesis, can be said to mirror the post-industrial world.

When exploring changes in play during 2010–2020 with a particular accentuation on the digital and Internet-connected practices in relation to play, attention should turn toward another theoretical concept, namely post-digitality. *What significance does post-digitality have for the realm of play machines as hybrid playthings?* To begin to answer this question, I turn to the digital dimension of physical playthings.

In the definition given by Berry and Schleser (2014), post-digitality describes the situation in the evolution of the digital, when digitality and non-digitality blur through mobile, pervasive, locative, and augmented media. “The post-digital is represented by and indicative of a moment when the computational has become hegemonic”:

[...] the historical distinction between the digital and the non-digital becomes increasingly blurred, to the extent that to talk about the digital presupposes an experiential disjuncture that makes less and less sense. Indeed, just as the ideas of “online” or “being online” have become anachronistic as a result of our always-on smartphones and tablets and widespread wireless networking technologies, so too the term “digital” perhaps assumes a world of the past. (Berry & Schleser 2014)

What post-digitality (Cramer & Jandrić 2021, n.p.) means is this:

[...] a perspective that finds the distinction between ‘digital’ and ‘non-digital’ to be less clear than it seems when it is rigorously inspected, and also less useful and relevant than it often seems. The postdigital perspective thus breaks with the ‘new media’ paradigm [...] the criterion of ‘analog’ versus ‘digital’ is not the most important.”

As de Vries (2021, 250) accurately notes, manipulation play can only be performed by species that have hands. Indeed, object play has a role in human evolution: “the reliance of Homo sapiens on material culture as a key adaptive feature is more pronounced than it is in any other extant or extinct hominin” (Riede et al. 2018). “The world isn’t there to be used, but to be played with, manipulated by hand and mind” (Soni & Goodman 2017, 46). Intersections of material and digital cultures and object play constitute *hybrid interactions*, which this thesis addresses.

In an Internet-connected age, the notion of *post-digital play* (Nansen et al. 2019, 92) becomes relevant: “In a post-digital environment, play multiplies across digital infrastructures and environments.” Consequently, “digital childhoods are messy, multifaceted, multi-modal and ultimately complex” (Mascheroni & Holloway 2019, 15). So are any manifestations of hybrid play experiences detailed and discussed further on in this thesis despite the age or context of the players.

In a time when many *physical* toy brands already have a permanent position in digital realms through their makers’ and marketers’ websites, social communities, apps, and gaming platforms, it is not surprising that players of the same toys have a *digital* presence enabled by the same means. Seen from this perspective, we have reached a time in which play simultaneously evolves across the analog and digital platforms through device-use (as in simultaneous playing with traditional toys and digital devices — cameras and mobile phones — Articles I and III), between physical toys and their digital counterparts (as in playing with traditional toys and their manifestations on social media — Articles III–IV), and in a more developed sense

also as play machines, where the physicality and digitality seamlessly intertwine (as is the case with IoToys, toy robots, and creatures of speculative toy fictions — Articles II, V, and VI).

While technology is often positioned as a possible threat to the romantic notions of childhood play, it is a fact that humans of all ages have some kind of relationship with technology. Similarly, all digital natives, digital nomads, and adults, “the perpetual digital immigrants” (Prensky 2001), have some relation to play, as will be explained in the studies undertaken for this thesis. Therefore, it can be stated that *post-digital play is ageless* and a matter of all those who have access and skills to use digital technologies in their play.

Toys as the tools and instruments of play in combination with digital devices create tangible entry points to networked and Internet-connected play. An overarching theme in general conceptions of digitalizing play is the fear of an excess of technological play. Pink et al. (2018) note that in a digitalizing time, activities thought of as work, leisure, and play become entangled in new ways. In a post-digital play world, the concepts of *leisure-recreation*, *entertainment-learning*, *unproductive play*, and *productive playbor* become equally blurred. To increase *health* and avoid *depression* due to excess use and addictions through use, players in the post-digital age should be aware and informed, and therefore literate, about what a balanced diet of interaction with digital technologies means. Assistance in this can be found in the “Independent Worker’s Technology Bill of Rights” proposed by Weil and Rosen (1997). That is still relevant. To reference some of its points, the bill declares: “2. Technology is available to help me express my creativity; 5. I can use technology to stay connected, informed, and productive — my way³⁰; 9. Technology never needs rest, but I do.”

To return to the positive consequences of how play moves us with and through toys, technology, and mobility, the thesis provides insights gained in the six case studies undertaken. The following section explains the methods for the studies conducted with the players operating the play machines under investigation.

30 This work does not address critical views associated with connected toys, such as monitoring, control, or even spying on the players. However, enabling an online connection through a physical toy proposes even more challenges than is the case with smartphones. This is to say that three-dimensional toys with hidden affordances are still not expected to function as recording devices capable of transferring data through networks in the same ways as communication devices. Marsh (2019) observes how post-humanist accounts of play are now emerging. This development refers to the *robotification* of play(things), which proposes even more challenging questions about the roles of humans and animals (living) and robots (non-living) that will interact more in playful encounters and situations.

3 Methods

All life is an experiment. Ralph Waldo Emerson

Play has been studied by employing diverse methods, such as observation in the natural environment, observation in a structured environment, interviews and questionnaires, and examinations of toy inventories, pictures and photographic records, and other evidence of children's play (Smith 2010). Additionally, play scholars have employed a variety of tools of discipline inquiry, including archival records, conceptual analysis, and philosophical investigations (Johnson 2015, xiii).

Hall et al. (2022) note: "Even with articulate older children, it can be difficult for adults to understand or assess their play experiences." Therefore, research on play, on the play of children in particular, benefits from a multidisciplinary approach and often research collaboration with scholars from different fields of academia. Indeed, play studies present an *inter-discipline* (Henricks 2008, 171), and the thesis at hand is based on an interdisciplinary theoretical framework connecting digital culture with childhood studies and play cultures of adults and intergenerational players.

The thesis at hand represents *exploratory research*, "the soul of good research." It consists of an attempt to discover something new and interesting by working through a research topic (Swedberg 2020, 17). The thesis title pays homage to Katherine Ibister's work, *How Games Move Us: Emotion by Design* from 2016 and, in this way, celebrates the advancements made in (digital) game studies. I aim to complement the ideas associated with movement in gameplay by presenting supplementary views focusing on play outside but adjacent to digital gaming, namely in toy-play enabled by digital devices and platforms.

This thesis, conducted for digital culture, attempts to answer this question first: **"How has play moved human players of the Western world in 2010–2020 in terms of physical, cognitive, and emotional mobility/movement?"** The sub-question inquires about the kinds of digital play encountered in interactions of people of different ages as part of technologically enhanced leisure, learning, and environments, where play is increasingly happening remotely, with and through machines and social media platforms by asking: **"How are the acts of play realized in each instance of play through digital technology use, and what functions does the playing have for the players in each study?"**

These questions are answered in the six research publications, a collection of book chapters, journal articles, and two conference papers, all offering eclectic but informative perspectives on 21st-century play enabled by the use of digital devices and platforms. These studies were selected as they represent a wide variety of instances of engagement with the play machines that during each time throughout the doctoral research allowed a different and timely perspective to toys, technology, and mobility. The common denominator for the studies is *play* (see Figure 3.).

Jagoda and McDonald (2018) claim that the success of a game ultimately depends on experience design that privileges the prospective player. Obviously, the same idea applies to other kinds of play experiences as well — we need to let the players tell us about their ways of playing. *How, then, do we make sense of the diversity of play and different groups of players?*

In this thesis, the overall research method is qualitative with a descriptive design to present the object(s) of study vividly and truthfully, acknowledging their richness in all ways possible. It relies on content analysis (Ackland 2013) as the primary method of approaching the data. This thesis takes the form of six case studies (for reference, see, e.g., Yin 2016) examining devices and technology platforms in three broad categories associated with toy play and play machines: mobile devices, social media platforms, and social robotics.

“Understanding a specific medium requires a conceptualization that understands and accounts for the specific characteristics of that medium” (De Grove et al. 2014, 221). The central theme connecting these studies is the mobility, movement, and emotions experienced in play. By highlighting the movement of digitally enabled play, the thesis contributes to the area of play research considered from life-long and life-wide perspectives, including leisure, learning, and productive play.

Marshall and Rossman (2011) categorize case studies as a major genre of qualitative studies. These six case studies have been chosen as this thesis’s focus for several reasons. Each is an exemplar in its particular area and has inspired other research with similar features. Each case illustrates different kinds of play employing various technologies previously identified as instruments that, in some way, enhance play. In each case study, I have aimed to consider how play moves the player’s body and mind within various spaces and contexts.

Four publications represent co-produced research that emerged from a collaboration between academics in various stages in their scholarly careers. In two studies (Articles IV and VI), the author was the sole contributor responsible for ideating, designing, conducting, writing, and publishing the research.

While each publication offers a unique perspective into the broader theme of how play moves us in mobile and emotional ways through the use of digital devices and platforms, the author has sought to puzzle out common themes and, in this way, bind the sub-studies together by reading the players, play machines, and related play patterns through a similar lens — that of acknowledging and appreciating each age group and context the playing happens in.

3.1 Playful approaches to qualitative research methodology

Research on play may be innovative in bending rules of thought, action, and behavior. Firat and Venkatesh (1995, 251) write that “the joys of doing research must be found not in the pursuit of a holy grail of singular knowledge but in capturing many exploratory moments.”

Throughout the studies, playful approaches have been used to complement traditional qualitative research methodology (e.g., Creswell & Creswell 2017; Strauss & Corbin 1998). For example, children’s digital play cultures ask for explorative angles to be taken in research (Lundtofte 2020). Parallel to traditional methods of inquiry, the author has sought to be innovative in approaching the overarching research question: How has play moved us between 2010–2020 in association with device use — toys and play machines?

“All opportunities have a genesis: the processes of preparing, arranging, trying out, and relating, which place you in a position where you can transform occasions into opportunities and opportunities into actualities” (Hjorth 2005, 387). Alongside one-on-one interviews, an often-used technique to collect participant data, the studies included in this thesis employ unorthodox research methods, such as participatory play interviews and play-tests.

Stenros states that most game researchers recognize themselves as active players (Stenros 2015, 26). The “autoplay” I have been pursuing as a toy researcher since the beginning of my research, i.e., autoethnographic play based on personal play, self-reflection, documentation, and artistic activity, has become a natural way of looking at the multifaceted phenomenon of play (Heljakka 2013). According to Chang (2008, 89–102), such material aimed at self-perception and self-reflection is important for play research. Harnessing digital technology in my own play practices, for example, digital photography and toy-based photoplay, has also opened up my understanding of the creative play activities of other toy players. My autoplay — the autoethnographic research method — my personal and public manifestations of play with my toys, often carried out with a digital camera or smartphone and with social media sharing in mind — thus complements the understanding of play as a phenomenon throughout this thesis. It has a fundamental meaning also for why the first study reported in Article I was initiated.

The research includes digital ethnography (or *netnography*) to complement offline participatory observation. Kozinets (2002, 62) has defined netnography as “a new qualitative research methodology that adapts ethnographic research techniques to the study of cultures and communities emerging through electronic networks.”

Netnographies can be short and focused on a single community. Following the blogging, tweeting, videocasting, podcasting, social networking, and virtual environments of adult toy players has informed the author about more details about adult toy play than other empirical data could.

Furthermore, innovativeness has been a prerequisite for research involving interaction with live subjects during the COVID-19 pandemic. In this thesis, two of the studies published at the end of the project were carried out subject to pandemic restrictions, meaning that the researchers needed to seek alternative approaches in reaching interviewees and following study sessions focusing on playful learning. This is where techniques carried out over distance came into question — for example,

research interviews were carried out over e-mail as well as through Messenger and Instagram messaging. Article VI relies entirely on media material collected in post-pandemic times by watching the movie *Ron's Gone Wrong* (2021) and analyzing its transcribed dialogue and news media articles.

3.1.1 Triangulation

The empirical background of this thesis builds on the idea of triangulation, meaning that the phenomenon under scrutiny is approached from different directions. This is known as data sources triangulation (Martella et al. 2013). “The triangulation essential to social scientific advance demands the employment of a variety of (viable) methods, including the case study” (Gerring 2004, 353).

Triangulation protocols are used to ensure accuracy and alternative explanations of the data (Stake 1995). This was accomplished by collecting data from different sources (i.e., adult players, preschool children, and their teachers) and using content analysis methods (e.g., thematic analysis). The concepts and themes related to self-directed play were expected to emerge from the multiple data sources.

3.2 Research participants, materials, and research questions

Technological devices are essential in capturing, storing, and analyzing research materials that are visual evidence for this research. Research materials, again, present a collection of various forms of data ranging from transcribed qualitative interview material, field notes from observations, play-test recordings, photographs, and videos, including self-produced material by the children (drawings of IoToys) and adult toy players (photoplay they have published on social media platforms and allowed the researcher to use as part of the studies).

Before starting work on the research presented here, I had established a good relationship with a local preschool and had initiated other studies co-designed with two preschool teachers. For this reason, cooperation with the preschool continued in fruitful collaboration.

The participants of the studies were between 5 and 75 years of age, and they were chosen according to the approach used in convenience sampling (also known as availability sampling). “Convenience sampling methods place primary emphasis on generalizability (i.e., ensuring that the knowledge gained is representative of the population from which the sample was drawn)” (Etikan et al. 2016, 4). The author also considered which age group would be the most suitable to address, depending on the form of play under investigation. To exemplify, most IoToys are recommended for ages five years and up. As the researchers found it essential to conduct play-testing with an appropriate target audience, the groups of 5–7-year-old preschoolers in the context of Finnish early education came into question. This study is reported in

Article II. The study that aimed to investigate the robot dog as part of playful learning in a kindergarten context was conducted later with groups of children of the same age within the same preschool.

The adult participants who joined the research through interviews and self-produced photoplay (Articles I and IV) can be described as experienced toy players from Finland, the U.K., and Singapore. Again, the adults who joined the online survey for the study presented in Article III have a firm background in geocaching practices. Due to the international scope of the survey, they came from different countries. It is important to note that some of the adults had participated in studies I had carried out earlier. Some adults were interviewees for all three studies (Articles I, III, IV) conducted.

It is also necessary to point out that most of the *playthings*, alongside the devices that support the play with them, scrutinized in the case studies of this thesis, focus on play material created by the American toy (and movie!) industry, namely Barbie and Ken fashion dolls, and Blythe dolls (Article I), the multiple IoToys (Article II and Article VI), and the Golden Pup robot dog (Article V).

The more universal teddy bears presented in reference to the publication on pandemic toy play (Article IV) traverse the boundaries of North America. Lastly, the B*Bot conceptualized in Article VI as a fictitious IoToys character also has its actual toy version on the market, still with fewer features than depicted in the speculative toy fiction Article VI scrutinizes. A detailed summary of research participants, materials, methods, and research (sub)questions used in each study are gathered in Table 1.

3.3 Research ethics

The research has followed the ethical guidance of the Finnish National Board of Integrity (TENK 2019; 2021) concerning human subjects in human sciences. Still, it has not been externally reviewed by a research ethics board. However, the guidelines have been followed carefully, especially concerning child participants who joined the researchers in the context of early education, namely Finnish preschool. The preschool teachers took part in the design of the play-test sessions and approved the final implementation. They were present during all sessions. According to guidelines, research permission was also asked from the participating children and their parents before data gathering occurred.

Publication	Context, setting, players (participants), and sampling	Method data collection and analysis	Research (sub-) questions discussed in the thesis	Perspective on digital play as presented in the thesis
<p>Article I “From Displays and Dioramas to Doll Dramas. Adult World Building and World Playing with Toys.” <i>American Journal of Play</i>, volume 11, number 3, 351–378.</p>	<p>Context: Adult world- play (pre-pandemic) Age of players in sample: Mature players aged 25+ years Media articles and in-depth interviews conducted as play interviews Convenience sampling Participant sample size (n=4 adult toy players)</p>	<p>Year data collected: 2015 Participatory play interviews and observation (ethnography, digital ethnography) photographs, (in- situ), (social) media materials (Instagram photographs, news articles, netnography)</p>	<p>How do adult toy players actively engage in world-building in their world- play?</p>	<p>Playing with the Camera as part of world-play practices</p>
<p>Article II “Persuasive Toy Friends and Preschoolers: Playtesting IoT Toys.” In Giovanna Mascheroni & Donell Holloway (Eds.) <i>The Internet of Toys: Practices, Affordances and the Political Economy of Children’s Play</i>. Palgrave Macmillan, 159–176.</p>	<p>Context: Early childhood education (pre-pandemic) Age of players in sample: Preschoolers aged 5–7 years Convenience sampling Participant sample size (n=20) Collaboration with a preschool group in Finland</p>	<p>Year data collected: in 2017 Play-test recordings (in-situ), group interviews, photographs, videos Identification of themes based on the interviews, audiovisual data, and notes of participant observation</p>	<p>What could this toy teach you, and how would you play with it? a) alone with the toy b) with other children</p>	<p>Playing with Internet-connected toys as part of playful learning in Finnish early education</p>
<p>Article III “Toy tourism. From Travel Bugs to characters with wanderlust.” In Nicky van Es, Stijn Reijnders, Leonieke Bolderman & Abby Waysdorf (Eds.) <i>Locating Imagination. Popular Culture, Tourism & Belonging</i>. Routledge, 183–199.</p>	<p>Context: Intergenerational and hybrid play (pre-pandemic) Age of players in sample: Mature players Convenience sampling Participant sample size: In-depth interviews (n=7) Survey answers (n=45)</p>	<p>Year data collected: in 2017 Interviews and online survey materials, photographs</p>	<p>What are the imaginative, creative, and social toy play practices and the physical aspects of toy mobility?</p>	<p>Playing with the Smartphone in the context of toy tourism (or toyism) as part of paidic and ludic practices</p>

Publication	Context, setting, players (participants), and sampling	Method data collection and analysis	Research (sub-) questions discussed in the thesis	Perspective on digital play as presented in the thesis
Article IV “Liberated through teddy bears: Resistance, resourcefulness and resilience in toy play during the COVID-19 pandemic.” <i>International Journal of Play</i> , December 2021, 387–404.	Context: Intergenerational and hybrid play (during the pandemic) Age of players in sample: Mature players aged 45–75 years Convenience sampling Participant sample size (n=7)	Year data collected: 2020 Online media articles (news, blog writings), social media postings (images on Twitter and Instagram), brief interviews with adult mature toy players supplemented with their photoplay	Interview questions: Did you participate in the teddy challenge in spring and summer 2020? Tell about your toy play activities during March–June 2020. Please send examples of photoplay created during the COVID-19 pandemic.	Playing with the Screens with/ through social media during times of the Covid-19 pandemic
Article V “Playing with the Opposite of Uncanny: Playful Learning with a Companion Technology Robot Dog vs. A Real Dog.” Proceedings of <i>CHI Play’2020</i> , Virtual event, 2–4.11.2020, 262–266.	Context: Early childhood education (during the pandemic) Age of players in sample: Preschoolers aged 5–7 years Collaboration with a preschool group Convenience sampling Participant sample size (n=16)	Year data collected: 2020 Learning situation recordings (audiovisual), group interviews, photographs, and videos (in situ)	What empathic responses guided by SEL-related activities can be achieved in playful learning with a robot dog versus a living dog?	Playing with Social Robots (i.e., a robotic dog and a live dog) in the preschool learning context as part of playful learning of prosocial skills
Article VI “Reading Ron Right: Speculative Toy Fiction, Friendship and Design of Future IoT Toys.” In Proceedings of the 25th International Academic <i>Mindtrek</i> Conference 16–18.11.2022, 334–338.	Context: Speculative toy fiction (post-pandemic) Age of (fictional) players in sample: 11 years	Year data collected: 2022 News media articles on the movie and transcription of movie dialogue were found online.	What are the key affordances of the fictitious B*bot robot “Ron”?	Playing with speculative toy fiction (i.e., playing with fictitious “B*bots as “future IoT Toys”)

Table 1. Research data, analysis methods, and critical questions summarized.

3.3.1 Recruiting subjects and requesting their permission

Good research that involves human participants asks for respectful treatment of them. Informed consent underpinned the research undertaken in the case studies: This means asking the participants about their willingness to participate voluntarily in the study and explaining the research aims. All informants have consented

to the information used in an academic context as part of publications, such as journal articles, book chapters, and conference papers. For case studies II and V, the researchers prepared information sheets and consent forms, which were distributed via the preschool teachers to the children's families to familiarize themselves and, if giving their consent, to be signed before the planned data gathering. The research work performed in the context of preschools was conducted with the adequate understanding and written informed consent of the head of the preschoolers and their parents.

3.4 Responsible data management

Ethical considerations were made throughout the data management process, which began with the planning, creating, and collecting of consent forms for studies II and V, in which children took part (see APPENDICES I–II): First, the researcher(s) informed the participants about the nature of and the motivation for gathering the particular data that would be collected. The preschool teachers helped the researchers distribute the forms to the parents before the study began. In the studies that involved the participation of adult interviews made in person (Article I) and during the COVID-19 pandemic in online environments (e-mail, Instagram, and Messenger, Article IV), participants were observed in offline and online play environments. Due to the sensitive nature of the data, the safe storage, transfer, use, and preservation of data were acknowledged by the participating researchers. For example, the data were securely stored on hardware drives behind passwords only known to the researcher(s). Informed consent was collected from both the participating children and their parents. The videos of the group sessions were used in the analysis. The anonymity of the participating children was ensured in the storage, analysis, and publication of research after generating and collecting the data. The metadata were made searchable and accessible through the publications. Other data were not made interoperable or reusable due to their sensitive nature.

In reporting the findings, the researcher(s) strived to treat the participants with dignity as respectfully as possible. Anonymization practices were used with consideration of the sensitivity of the participants, in this case for studies II and V, in which the participants were preschool-aged children. In the procession of data, participant names were replaced with pseudonyms except in case studies (namely in studies reported in Articles I and III) in which the participants are identifiable through their self-selected pseudonyms that connect the toy characters they play with with the human personalities behind their online presence (e.g., Facebook and Instagram accounts), and possible instances of photoplay that they have posted on social media platforms were requested separately by the researcher to be included in the publications (see Articles I–V).

Studies reported in articles I, IV, and VI employ supplementary materials, such as (news) media articles, as secondary data sets. This decision is grounded in the idea of making visible the timeliness and geographical width of the research subject under scrutiny to illustrate how the phenomenon of a study is not a concern of the location where research takes place but, instead, unfolds as an international (Western) matter.

3.5 Data analysis

The data analysis phase involves organizing and interpreting the data to answer the research questions. The researchers used qualitative content and thematic analysis methods to identify key themes that emerged in the data. Following Patton's (2002) model, our analysis in each case study involved making sense of the data by reducing the volume of raw information followed by identifying significant patterns and, finally, drawing meaning from the materials and subsequently building a logical chain of evidence. To explore our data, we conducted a thematic content analysis. Thematic analysis is a qualitative research method in which researchers identify novel items and recurring patterns in a data set and organize these observations into broader themes (Braun & Clarke 2006). It offers a flexible means of summarizing critical features of a body of data, condensing extensive data sets in a way responsive to their particularities and linked to the pre-existing research literature. Thematic content analysis involves an inductive, reflexive process focusing on emerging ideas and thematic structures (Hsieh & Shannon 2005). The thematic analysis includes three major stages: identification of broad themes, subthemes, and their naming. Similarities and differences across the data set can be highlighted as especially useful for cross-cultural comparison (Braun & Clarke 2006). In the multiple case studies of this thesis field, observation notes, photographs, audiovisual recordings were all subjected to thematic analysis by organizing the individual data into themes and making sense of these emerging themes in relation to and when answering the research questions of each case study. On a broader level, in a synthesis made based on cross-examination of each case study, the author then landed at the six perspectives of device use in play, provided by the play machines central for each case, namely 1) Digital cameras, 2) Internet-connected toys, 3) Smartphones, 4) Screens with/through social media, 5) Social robots, and 6) Speculative toy fiction.

4 Case studies

With my research, I participate in formulating an understanding of the state of play by sharing ideas on the evolution of technologically driven play during 2010–2020. While the articles of the thesis function as case studies representing multifaceted aspects of contemporary play, they are by no means exhaustive. The challenge with investigating play is familiar to anyone researching human culture: Once it is adequately documented, scrutinized, and theorized, it has already moved to new realms with new tools, environments, and functions for other researchers to grasp.

At the beginning of the 2020s, online and hybrid forms of play are as prevalent as ever. With the global health crises, players have employed their imagination and innovation in terms of play probably more than before. Thus, digital technology has enabled us to be social players, even if physically present social interaction has been limited for many.

As the articles presented as part of this thesis show, various forms of play differ in their relationships to the key themes of the thesis — movement, and emotions.

To follow Jagoda and McDonald's (2018) distinction between a proceduralist focus on the play experience (which emphasizes rules, objectives, and systems) and a play-centric focus (which emphasizes modes of player response), this thesis aims to bring to attention the latter, accentuating a *player-centric* focus.

A commonality among the diverse case studies is their shared interest in digital play as a practiced and lived experience associated with character toys, or “toys with a face” (Heljakka 2013).³¹ In the selection of articles, each publication provides a perspective on the practices of players as part of digital culture and does so by focusing on different contexts and demographics of players, from preschoolers to adults, as well as play as an intergenerational activity.

The rationale for including the inspection of players of different ages in the study is to make the perspective on play as wide as possible and to illustrate the role of digital technology in the lives of active players in different contexts. Each of the studies presents empirical data on novel play scenarios of players of different ages and highlights a unique perspective on how play moves us in a digital and connected age as both a life-long and life-wide phenomenon.

4.1 Author's role in the design, execution, and reporting of studies

In each of the six case studies, the author functioned as the lead author and corresponding author, meaning that she was the driving force in generating the

31 In this thesis, the notion of character toys extends to both anthropomorphizable and zoomorphizable characters, which are related to digital technology.

firsthand ideas and designs relating to play for the studies and who mainly contributed to writing and polishing the published papers prior to publication.

In each study, the author functioned with the primary responsibility of producing the studies into a published format as both an observer of the participants and a fellow player among the researchers with a co-author role. In three of the case studies conducted for this thesis, particularly in the data collection execution and analysis phases (Articles II, III, and V), cooperation with research colleagues and choosing the right avenues for publication has been an essential part of the process. In the articles mentioned above, research colleagues have contributed to the theoretical frameworks, ideating and organizing the data collection and structuring the findings.

The publication platforms illustrate a wide variety of scholarly avenues suitable for publishing research on the cross-sectional areas of digital technology and play. These avenues represent a diversity of fields following ideas presented by the Leiden Manifesto (Hicks et al. 2015), which states that “historians and social scientists require books and national language literature to be included in their publication counts.” In contrast, computer scientists require conference papers to be counted. As a researcher based in the area of digital humanities and one with a solid connection to the areas of toy and play research, I consider it vital to have published the research on a wide array of platforms, with each of their traditions and requirements regarding the structuring and formatting of the research. Nevertheless, what justifies choosing the avenues for publication is that in each case, they have represented a suitable and timely channel to participate in scholarly discussions on human interaction with the world — through world-building, Internet-connected toys, toy tourism, hybrid and transgenerational play with teddy bears, robotic dogs, and speculative toy fiction.

Notably, the reporting of studies has taken place in journals, edited volumes, and conferences, which all welcome the publication of studies interested in play: The articles are published in the *American Journal of Play* (2019) and the *International Journal of Play* (2021); the edited volumes are on toys and popular culture tourism, in which the chapters included in this thesis published are by renowned publishing houses Palgrave Macmillan (2019) and Routledge (2020), and the two conference papers are published as part of the proceedings of the well-known conference series *CHI Play* (2020) and *MindTrek* (2022).

4.2 Description of articles

This section provides an overview of the case studies conducted. Each study represents case analyses and the performed activities and lived experiences of play. In the following, I will describe the main content of each sub-study. I aim to answer what digital technology is used, who is using it, and how it is used to play within each of the studies included in the thesis. The following section on Findings delves deeper into

the contexts of the case studies to connect them with the particular devices used in play and the ongoing debates about movements occurring in the play phenomenon.

The first publication of this thesis is a journal article titled “From Displays and Dioramas to Doll Dramas. Adult World Building and World Playing with Toys” (Heljakka & Harviainen 2019), which focuses on adult toy play in the context of world building conceptualized here as *world-play*. The rationale for the study presented in the article is to find evidence for adult activities with toys that happen beyond collecting artifacts and represent imaginative and creative uses of offline and online space and storytelling. Such object-related activities represent the displaying, making of dioramas, and creation of doll dramas in association with technologically enhanced toy play, in this case playing with camera technology and engaging with photoplay or toy photo- and videography. Movement in playing with cameras emerges as imaginative and emotional as the toy character’s adventures are captured as part of the spatial arrangement of objects and narrative accounts of their “lives” before sharing on social media.

The second article, or a book chapter titled “Persuasive Toy Friends and Preschoolers: Playtesting IoToys,” captures how preschool-aged children engage with technological toys by employing Internet-connected toys as part of their preschool play activities. The objective of the study reported in the chapter is to find out how children of preschool age (between 5–7 years) appropriate IoToys as part of brief play scenarios, including in play-tests and a group interview situation, to understand better how actual play with these toys takes place and whether or not it conforms to the toy designers’ and toy makers’ ideas and integration of various affordances in the toys. According to this study, the role of movement in playing with Internet-connected “toy friends” is multidimensional — it concretizes as physical, cognitive, imaginative, and affectionate movement and in terms of spatial and mental mobility of preschoolers.

The third publication is a book chapter named “Toy Tourism. From Travel Bugs to Characters with Wanderlust” explores the mobilizing tendency of contemporary character toys when played with in association with smartphones. These mobile devices enable location-based tracking, simultaneous photography of toys, and social sharing of their adventures, which takes place in geographical contexts beyond the players’ domestic space. In this study, paidic and ludic forms (Caillois 1961) of toy tourism were scrutinized by interviewing adult toy players who either travel with their toys or set their toys out to travel on their own as part of programs or as Travel Bugs within geocaching practices. Movement is central to toy tourism as perceived by its physically mobilizing tendency. Parallel to physical movement within geographical space, the adult players interviewed and surveyed for this study also expressed emotions arising from involvement with traveling toys; for many, the toys are considered trusted travel companions to the extent that they would not dare to part ways with their toys to set them out traveling by themselves. On the other hand,

players of Travel Bugs take pride in their “toy friends” accomplishments of traveling extensive miles during their adventures.

The fourth publication, a journal article, carries the title “Liberated through teddy bears: Resistance, resourcefulness, and resilience in toy play during the COVID-19 Pandemic.” The study reported in this article investigates a widespread phenomenon within play that occurred at the beginning of the COVID-19 pandemic — the teddy challenge. The research for this study only involved adult players as informants. Still, the supplementary materials made by the media articles included in the study, as well as the testimonials made by the interviewees in their comments, reveal the intergenerational nature of this play form, which became a global phenomenon thanks to the sharing of play on social media platforms, namely Facebook and Instagram. Teddy bears displayed in the windows in the name of the teddy challenge moved the players physically by inviting families to take (safe) outings to spot teddies in the windows. The teddies also moved the participants by spreading the communal message of hope amidst a global crisis — “by playing together, we will survive this together.”

The fifth article is a conference paper for which the study was produced during the first year of the pandemic. The publication “Playing with the Opposite of Uncanny: Playful Learning with a Companion Technology Robot Dog vs. A Real Dog” explains a study on how a robotic dog in parallel to a live dog was used in playful learning to enhance prosocial skills among preschoolers. This study involved 5–7-year-old-children, who, by their participation in the playful learning sessions, could inform the researcher about the potential to use social companion robots in the context of early education. Socio-emotional learning (SEL) is a telling term about how we may be moved socially and emotionally in play. Hence, this form of movement is critical for the study reported.

The thesis ends with a closing sixth article on post-pandemic toy play — “Reading Ron Right: Speculative Toy Fiction, Friendship, and Design of Future IoToys” — that simultaneously represents futuristic play — and, namely, speculative toy fiction investigating what future toys could afford and what their role could be for post-digital play.

4.3 Limitations of Studies

The limitations that pertain to this article-based dissertation study may first be understood in terms of the researcher’s firsthand motivation to investigate digital play by concentrating on its positive aspects. Regardless, a cautious attitude toward novel play machines is a healthy and understandable way of approaching them, especially with young players in mind. This thesis’s Introduction and Background sections has extensively discussed the potential challenges (and benefits) of using technologies in and for play. However, the studies undertaken do not investigate safety, security,

and privacy related to Internet-connected play. Instead, play is seen as a common category of behavior and a way of using mobile technologies in that play. Moreover, if other people or players are hurt or otherwise mistreated in play, the behavior is no longer about play but about control and abusive behavior gone wrong.

It is worth noting that in the studies reported in the articles, the author has not asked the participants what they think about the beneficial or detrimental effects of their engagement with the various play machines. The focus of the empirical investigation has strictly concerned the perceivable play experiences, or experiences related to playful learning, and the researcher's interpretations of them.

The children who participated in the two studies (Articles II and V) represented male- and female-identifying participants. The survey conducted for the study reported in Article III produced answers from both male- and female-identifying participants.³² What needs to be highlighted, however, is the gendered nature of the adult participants interviewed for the other studies (Articles I and IV) who were all female-identifying — this produces a gender bias.³³ The ethnicity of the participants was not inquired.

All research conducted for this thesis involves activities associated with character toys (dolls, action figures, and soft toys). Studies conducted with other types of toys, such as construction toys (building sets) or toy vehicles (toy cars), could produce different kinds of findings.

Future researchers will capture the nature of post-Covid-19 play in more detail. Still, this thesis aims to highlight how play moved us through its mobilizing and emotional tendencies before and during the pandemic of 2020 and through an investigation of speculative toy fiction, even beyond that. It is, therefore, necessary to stress the conditions in which play has taken place in the pre-, mid-, and immediate post-stages of the pandemic, which have undoubtedly influenced play — and an upsurge in device-based and network-connected activities regarded here as play — in many ways.

Finally, a crucially relevant note on the context in which this thesis has been produced: It should be stressed and acknowledged that while digital play is a global issue (Erdogan et al. 2019), the thesis at hand is the work of a Scandinavian researcher

32 The researcher is not aware of any transgender or non-binary participants (perhaps apart from the Ken doll, who has a player-generated backstory in Article I).

33 Even the gender of the researcher may affect the tendency to perceive play in a particular way. To exemplify, Birgitta Almqvist (1992), a Swedish play researcher, claims that play researchers who are male clearly see the transition from play to games, to competition, to sports, while those who identify as female scholars see the transition from play to intimate conversation, to drama, poetry, and art. In this thesis, the researcher aimed to account for as many perspectives of play as possible. Nevertheless, there is an accentuation in open-ended play (*paidia*) over more structured, goal-oriented, and even competitive play (*ludus*).

of play, who first and foremost studies play from a Western perspective, in particular focusing most notably on play content (produced with physical digital devices and playthings, on social media platforms) produced in and controlled from the North American territory. Furthermore, although European and Asian research is regarded as relevant in constructing a theoretical framework for the thesis, it is necessary to highlight the influence of British and North American scholarship in play that has enabled the publishing of the articles in this thesis.

Alma Gottlieb (2018, 14; c.f. in Rossie 2021, 463) observes how Europeans and North Americans only represent 5% of the world's population. Hence, doing research in and of this context creates a bias, which brings to the fore WEIRD, a situation noted by Henrich, Heine, and Norenzayan (2010). The "WEIRD" world acronym stands for the "White-Educated-Industrialized-Rich [world from] Democratic [countries]." Thus, it is fair to say that generalized explanations for play cannot be given from research representing such a scarce part of the world's population. Similarly, it is justified to claim that the studies included in this thesis only capture a microscopic view of the current play cultures of the world.

The focus of the *American Journal of Play*, indeed, is focused on matters of play explored from a Western context. In contrast, the *International Journal of Play* represents a broader perspective on play. However, while the chapters published in books by Palgrave Macmillan and Routledge represent work published in the U.K./U.S., the editorial work for these two volumes is international, meaning that scholars from countries like Italy, Australia, and the Netherlands have been involved in the editorial work. Finally, the conference papers published with *CHI Play* and *MindTrek* involve editorial teams with international backgrounds. All of the outlets mentioned above have welcomed the interdisciplinary work that the publications of this thesis entail. In this way, these platforms for publication recognize the necessity for multidisciplinary inquiry that research on play demands.

5 Findings

This section of the thesis presents the main findings of each case study. It analyzes the studies as part of a synthesis of the mobile and emotional perspectives on digitalizing and Internet-connected play of contemporary times. Each case study illustrates performances during digital play through human engagement with digital technology. The key findings of the case studies and main contributions of research are summarized in Figure 4. and Table 2.

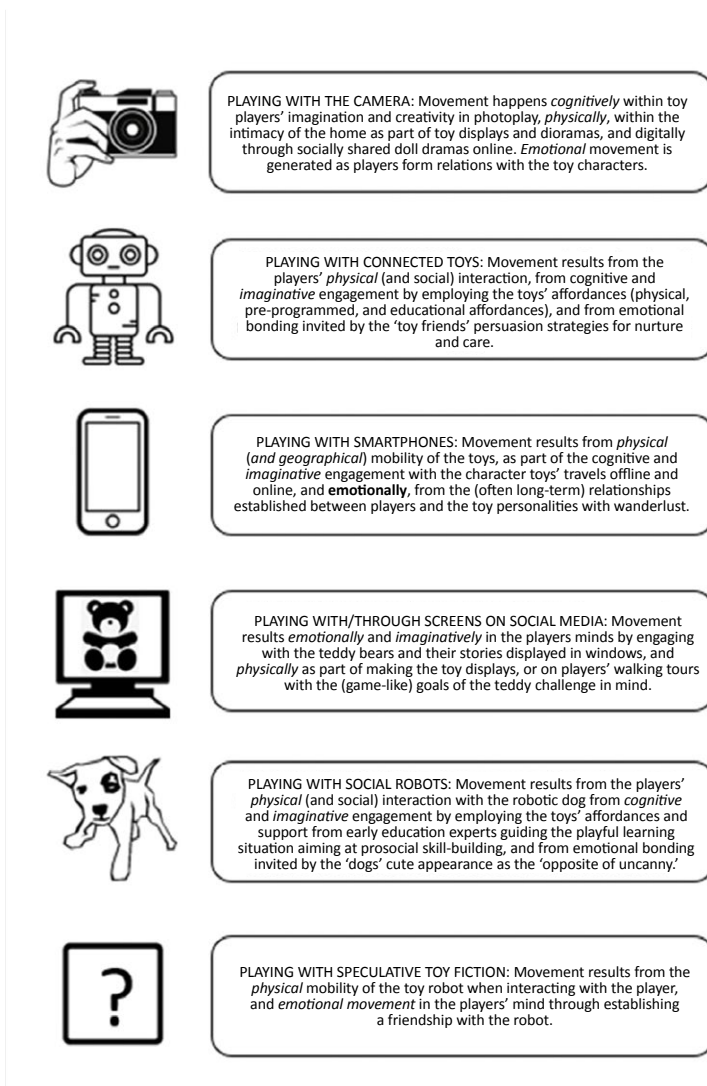


Figure 4. Findings of the case studies summarized.



Figure B.

5.1 Article I: Playing with the Camera

Article I of the thesis discussed in this section — “From Displays and Dioramas to Doll Dramas: Adult World Building and World Playing with Toys” (Heljakka & Harviainen 2019) — focuses on how the digital camera has been used by adults for photoplay to capture displays, dioramas, doll dramas in toy play in the 2010s. The study, conducted in pre-pandemic times, encapsulates movement generated in and through play with digital technology as manifestations of the imagination, materials, spatial arrangement of artifacts, and images of toy-infused environments with or without the presence of character toys, conceptualized as *world-play*. “Central to world-play is its relationship to technology and media” (Heljakka & Harviainen 2019, 359).

According to Koltay (2011), visual communication and information are becoming more important. “In a world that is increasingly populated with stories from the media, the reality is — now more than ever — governed by media technology and images,” write Reijnders et al. (2020, 2). Research on the use of (digital) camera technologies positions photography as a form of play (Heljakka 2012a; 2016; 2018a; 2023). “The use of camera technologies [...] has become an integral part of toy play

today” (see, e.g., Heljakka 2016). Due to these developments, toy play has become a more visual phenomenon, and consequently, play a more *oculocentric*, or vision-based, practice.

The first case study of the thesis conducted with play machines centers around digital camera use as technological devices that enable creativity and storytelling through photoplay when combined with character toys. Research on play with devices that enable creative expression is bridging play research with creativity research. Creative play encompasses the transformation of information and awareness of new connections, with an element of surprise. Creative play allows design, exploration, trying out new ideas, and using the imagination with different tools, props, and equipment (Hughes 2002).

Mathematician and computing educator Seymour Papert saw computers alongside multimedia cultures, to provide children with “an autonomous zone free from parental control” and, Kline (2004, 136) adds, “in which children constructed and bonded through self-made play interactions”.³⁴

The role of computers as creative tools has been noted by Resnick (2006, 1), who sees their potential beyond processors of information and more as a resource for human expression:

[...] in my view, computers will not live up to their potential until we start to think of them less like televisions and more like paintbrushes. That is, we need to start seeing computers not simply as information machines, but also as a new medium for creative design and expression.

Similarly, Pesce has noted how the computer “can engage us as an intellectual partner, playmate, or artistic palette” (Pesce 2000, 65). Sicart (2014, 99) has described play and computation as “fellow travelers” as both enable ways of being expressively in the world.³⁵ Digital cameras as play machines function in a similar way.

34 For more on Papert’s work, see (1980) *Mindstorms: Children, Computers, and Powerful Ideas*. New York: Basic Books, and (1993) *The Children’s Machine: Rethinking School in the Age of the Computer*. New York: Basic Books.

35 In 2001, when articulating the relationship between computers and media, Lev Manovich wrote: “There is no reason to privilege the computer as a machine for the exhibition and distribution of media over the computer as a tool for media production or as a media storage device. All have the same potential to change existing cultural languages.” Coining the camera as a “new media machine,” Manovich (2001, 5) noted the new media revolution as “– the shift of all culture to computer-mediated forms of production, distribution, and communication.” These aspects are all relevant when considering the movement related to technologies to what can be conceptualized as play machines.

Cascone (2000) has perceived “digital” as a “spectatorial condition” whereby “we filter and graze, skim and forward.” Laricchia (2022) captures essential information about cameras, which are:

[...] optical devices used for recording images, either as individual still photographs or as part of a series of images such as in a video. Cameras operate using electronic sensors or photographic film to capture visible light or other electromagnetic spectrum segments. The first lasting photograph was made in 1826, captured on pewter covered with bitumen. Today, most consumers own a camera in some form, although the increasing popularity of smartphone cameras has meant less demand for stand-alone camera products. Since reaching a peak of over 121 million in 2010, shipments of digital still cameras have decreased to around eight million units.

“The perceived opportunities for action [in play] exist in objects such as toys but also in other parts of the environment” (Bergen 2015, 436). Here, these opportunities emerge from the physical environment, such as doll houses and room boxes in the domestic space, but also from technology the player has access to while interacting with toys. “Technologies mold and expand individuals’ relationships with objects” (Ruckenstein 2013, 479), which has consequences for play. This also impacts how new literacies are constructed. “The affordances of new technologies and the saturation of media in different forms are reshaping when and how stories are told” (Garcia 2017, 715).

Paul Dourish introduces the notion of “coupling” with technology. Objects are coupled with technologies, and when technologies are coupled with our bodies, they provide variable and flexible coupling opportunities for people to use them (Dourish 2001; cf. in Ibister 2016a).

Although a camera (or mobile device with a camera function) can be metaphorically interpreted as a toy, it still has a function outside of playing. A photography device can be considered a toy when it is intentionally perceived as a toy camera (i.e., a “toy camera,” e.g., Diana- or LOMO-type cameras, or further back in history with the Brownie cameras designed by Frank Brownell; see, e.g., Schlereth 1985). Toy cameras are simple film cameras whose material (including the lens) is almost exclusively made of plastic. Despite their name, toy cameras include a photography feature, meaning they can take “real” photos. Toy cameras can be used to capture firsthand toys on film, but here, the attention turns to digital cameras, which represent play machines from the perspective of the thesis. When photographing toys (or engaging in photoplay), the digital camera becomes an extension of its player, whose image-producing function allows the photoplay to be shared on social media platforms in a digital format providing possibilities for digital play. In this case, the camera also

becomes a secondary “toy” to be used in play.³⁶ Therefore, it is the first digital device conceptualized in this thesis as a *play machine*.

Whenever adults imagine and create, says Gray (2015, 126), they are, to some degree, playing. To an increasing extent, adults simultaneously employ cameras in combination with dolls, action figures, and soft toys to create *photoplay* (Heljakka 2012a), still or animated toy photography, or videography. As a result of their interaction with these character toys, mature players use their self-expression and storytelling skills to narrate the “lives” of their dolls, which are then shared on online platforms. Toys with a face — the so-called *character toys* — have found their way into the experience world of players of all ages, and various dolls that are particularly well-suited to posing, dressing, and putting on hairstyles are very popular with both children and adult players. Adult world-play with contemporary character toys such as *My Little Pony* (Hasbro) and dolls like *Blythe* (Tomy Takara) and *Ken and Barbie* (Mattel) use the backstories of the toys (meaning their physical appearance, name, and possible personality description) either as a springboard to extend the original narratives or challenge these invitations to play altogether by creative customization practices regarding altering of the toys’ aesthetics and contesting of their industry-given backstories, such as narratives about personalities. In other words, in the object play practices of adults, original meanings given to the toys by their designers, producers, and marketers are either re-played, re-imagined, and even revolutionized.

The intentions of a toy designer and the expectations placed on the toy object about the uses are ultimately based on assumptions, the realization of which can be examined by analyzing player experiences. In this context, the concept of play knowledge becomes significant. *Play knowledge* (including usage information and context information, i.e., how and in what context an object has been used) refers primarily to information related to play patterns (Heljakka 2015). A digital camera is an essential tool for capturing play knowledge. Still, as observed, when used as part of photoplay, it can also be regarded as a “toy technology” and a play machine in itself.

Photoplay represents toy-related and culturally significant play knowledge that, when documented and shared, contains features of both creative and playful activities. When researching photoplay, my focus is on 1) the creative, regular,

36 To complicate the image-making and recording capacity of toys even further, we may turn to Barbie, the iconic fashion doll. Toy manufacturing together with popular culture illustrates how camera technology has previously been integrated into a physical toy character, namely Barbie. A creation of Mattel, the discontinued Barbie® Video Girl™ is described on Mattel’s website as follows: “It’s Barbie® doll vision! Create movies from Barbie® doll’s point-of-view with a real video camera inside Barbie® doll (the camera lens is in the necklace and the video screen on back). Includes USB plug-in cord. For ages 6 and over” (Mattel Global Consumer Support 2023). The hybrid doll was ironically referred to in the dialogue of *The Barbie Movie* of 2023: “And Barbie Video Girl. I have a TV in my back. You know whose dream that is? Nobody. Nobody’s dream” (Gerwig & Baumbach 2023).

repetitive, productive, and therefore playful features of toy play made visible on social media and 2) the play knowledge that players of toys produce. Again, play knowledge is based on the documentation produced and presented by the players themselves on the one hand and the other hand on the material structured by the researcher (for reference, see Heljakka 2015; 2022).

By employing characters, the results of photoplay illustrate existing similarities between toy stories and gameful worlds. *Avatars* are a familiar concept in digital games. For example, Wohlwend and Pepler (2013) observe that designing a personalized avatar was the first step in entering the online community *barbiegirls.com*. “When people play together as avatars, the game transforms from a private, personal journey into real social interaction” (Ibister 2016b, 52). Westcott (2008) observes how much of the digital play experience is mediated by the presence of a game avatar or player character — the player’s representation in the game in a similar vein, in technologically enhanced photoplay, toys representing humanoid, animal, or fantastic life forms function as avatars that appear as material objects in the physical world and as digital representations of these characters when captured by cameras.

Therefore, we can argue that the character toys of interest in this thesis are a physical equivalence to avatars in games. They come with hybrid qualities continuing the physical toy with a digital presence on social media and play with them is guided by the manifold interactions being offered by the toy.

In this way, modern play with character toys is not necessarily limited to the toy itself. In addition to cameras and mobile devices, the user experience involves the simultaneous location of play on many different “platforms,” such as a) public spaces like urban environments and nature (e.g., attractions), b) private spaces like built environments (e.g., dollhouses, dioramas, and room boxes), and c) social media environments (Flickr, Facebook, Instagram) in combination with camera technologies.

The play performed in the context of this study emerges as imaginative, spatial, and hybrid. First, playing with toys assisted by camera technologies can be understood as *technologically enhanced object play*, which employs the toys as tactile entities and relies on object practices (Rehak 2012), meaning activities such as collecting and customizing toys.³⁷ Again, the storytelling becomes visible through three spatial arrangements: displays, dioramas, and doll dramas. In this location-inspired and

37 Roger Caillois (1961) sees play as unproductive, albeit regulated and imaginative. Both the construction and the modification of the toy are most often conscious and therefore motivated or purposeful activities that change the appearance of the toy relative to the original object created by the toy designer. By modifying the toy, for example, by customizing it, the player will expand its affordability in a way that resembles gameplay patterns: the limits of the toy are tested and tested all over again. Thus, in addition to traditional free-form play activities, toy play can also be seen as a purposeful and productive activity.

media-enabled play, the player is the protagonist driven by a visual strategy (Granata 2014). Photoplay begins with the organization of objects, in this case, toys. Displaying is an activity recognized in collectors' play endeavors but has its origins in childhood play:

[...] it is essential to record that all children but the most inhibited ones go at the opportunity of arranging toys on a small stage with a specific confabulatory eagerness, some more somberly and systematically, others with a "flash" of a sudden "idea." Depending on their age, some may bid for time by first asking some questions or handling some toys (in which case their initial selections can be quite suggestive), but soon they become absorbed in a task governed by some imperative theme and by a certain sense of style until the construction is suddenly declared finished, often with an expression of posture and face which seems to say that this is it – and it is good. (Erikson 1977, 30)

Displaying toys is an important form of play in both children's and adults' toy cultures (Heljakka 2013). The popularity of making toy displays has many similarities to arranging collections. Toy play is an unorganized simulation (van Leeuwen & Westwood 2008). Yet, adult forms of toy play illustrate players' fascination with the organization of objects within space — making displays and dioramas (interiors and landscapes). This observation resonates with Berger's notion of the tendency of *homo narrans* to like telling stories to provide meaning to the chaos surrounding them (Berger 1997, 174). Photoplay often employs dolls, which are narrated through the act of photographing. Storytelling is considered necessary in giving the doll a "life": "Stories give the doll significance. A doll can be technically perfect(ly made), but if no story is generated around it, it stays soulless," says doll maker Maria Juudin (Kerokoski 2021, SK B2-B3).

According to Leong and Bodrova (2012, 30), the last stage of children's make-believe play involves Dramatization, Multiple Themes, Multiple Roles, and Director's Play. When dramatizing, a child plans elaborate themes, scenarios, and complex roles and spends more time planning than acting out the scenario. They can play more than one role at a time, and the roles that emerge in play have social relationships. Whereas a child can pretend rather than actually have a prop, and s/he does not need a prop to stay in the role, the props of play are essential for adults. Just like in the narrative play of children, objects like character toys can have roles and identities in adult toy play.

Similarly to a child, an adult toy player creates scenarios that can be arranged over several days. Play can be interrupted and restarted, adding and changing objects within the built scenarios. However, a difference between the narrative play of children and adults is that while language is used to delineate the scenario, roles, and action and book language is incorporated into role speech in children's role play with character toys, instead of vocalized storytelling, adults write out the stories and dialogues of the toys as captions of photoplay, which are then posted on social media

platforms. Again, similarly to children, adults play a series of coordinated scenarios that change in response to previous ones or players' desires and use themes from familiar popular media tropes appropriated from narratives known from various media texts.

Creative and imaginative object play are central facets of world-play. According to Molesworth and Denigri-Knott (2007), even fantasy creation is prompted by other media, like science fiction and fantasy novels and films. On the contrary, *socio-dramatic play* refers to the enactment of actual and potential experiences of an intense personal, social, domestic, or interpersonal nature. Again, *dramatic play* is play that dramatizes events in which the player is not a direct participator — for example, the presentation of a TV show (Hughes 2002).

Doll dramas (dynamic, serial, co-created, continuous) with rich characters, scenes, and themes are drawn from and mimic fantastic storytelling, such as TV series, movies, and real-life phenomena, both personal and social; they show the joys and burdens of human relationships, commentary on contemporary society, etc. On some occasions, photoplay of adults is based on world-playing inspired by real-life events, even the player's own life. Adult toy play presented as photoplay often involves either existential dilemmas recognized in human life or, on the contrary, humorous parodies of these complexities of adult life.

According to Kücklich (2004, 38), “playability is coupled with replayability,” the repetition of play activity, repeated and remodeled content of play. This is how doll dramas play out, and thanks to their serial form and re-playability, these socio-dramatic and dramatic acts of play carry a resemblance to formats of photo-comics or televised, serial (and sometimes provocative) storytelling, sometimes reminiscent of soap operas or telenovelas.

Referring to John Fiske's *Television Culture*, Kücklich (2004) discusses the satirical re-enactment of television shows. Marsh (2005) argues “that popular media, while problematic, provide a significant site of learning in new literacies and technologies that allow opportunities for productive critique” (cf. in Wohlwend & Peppler 2013, 142). In a similar vein, the photoplay of adults paints a picture of adult fantasies that are materialized through the simultaneous use of digital cameras, toys, and various arranged, built, or natural environments, but also the complexities of contemporary life, such as the perceived necessity of sharing images of perfect and hyper-stylized lifestyles — interiors, travels, fashions, and relationships on social media as ideas that guide the playing.

Julian Kücklich (2004) writes about “a cultural shift taking place from spectators to players,” referencing the work of Stephen Kline and associates (Kline et al. 2003, 18). The occurrence of this movement is also a relevant point to discuss in terms of the thesis at hand: While movement may have happened from the more passive realms of playful consumption in reference to television, spectatorship equally belongs to those participating in play in the 21st century. There is an audience for the doll

dramas, a phenomenon primarily produced in conjunction with (audiovisual) social media platforms, a sort of playful spectatorship and fandom for the toy stories of the present, realized in documentation and posts shared on social media. The seriality of doll dramas brings the acts of toy play closer to game mechanics and ways of playing “sandbox” games, like *The SIMS*:

Players interested in telling radically different sorts of stories have made use of The SIMS as a tool for generating their own graphic novels and movies, by editing video recordings of gameplay and sharing them on fan websites. These stories do explore emotionally fraught social situations – bullying, weddings, breakups, and even eating disorders. (Ibister 2016a, 39)

Although profoundly visual in their storytelling, doll dramas also communicate through textual storytelling. Captions for photoplay, for example those shared on Instagram, hold essential information that moves the story further by articulating the adventures of the toys’ dramatic interplay or their movements as part of *toyism* (or, toy tourism, for reference, see Heljakka & Rääkkönen 2021). This observation parallels what Ibister noted earlier about (digital) gameplay with avatars: “Even in this era of advanced graphics, the most malleable material for digitally crafting identity and social interaction is still text” (Ibister 2016b, 53).

Using toys as extensions and avatars as parts of photoplay and doll dramas relates to the “presentation of the self,” as highlighted by Goffman (1959). This means that as products of creative play, the doll dramas cannot be separated by the players responsible for them — nor their identity work and play with identities including their own.

Social practices on the web stimulate players to mimic behavior. For adults using digital camera technology as toy play, this means that published photoplay viewed by like-minded adults produces more photoplay by those who are inspired to acquire toys of their own and start producing and distributing displays, dioramas, and doll dramas of their own.

According to media scholar Henry Jenkins (2006), women produce almost all fan fiction, and “fanfic” readers have been women in most cases (Jenkins 2002). Fan fiction functions as a point of reference for the doll dramas elaborated on in the first case study of the thesis, Article I, as the works of fan fiction are conceptually adjacent to the narratives and photoplay created in association with world-playing — creating displays, dioramas, and doll dramas. In this sense, it becomes possible to see how the leisurely endeavors of toy play become productive play, which carries similarities to playbor.

The data for this study were collected via interviews with and observation of adult players, all female-identifying, aged 25–40+ years. Visual data were collected on social media such as Instagram and Flickr and supplemented with notes taken at toy conventions and adult-organized play dates. The interview materials were examined

through content analyzing techniques to detect patterns of behavior related to imaginative and spatially emerging object play to answer the main research question: “How does adult toy play function as world-building and world-playing?”

According to the findings of this study, adult activities with toys are deliberate in terms of planning the use of time, space, investments, and resources dedicated to play — playtime is a pastime that usually happens during leisure and viewed from the perspective of this study, through engagement with material and technological resources.

The more open the object toy is (e.g., character toys such as plush toys, action figures, and dolls), the fewer “instructions for use” are attached to it by the designer or manufacturer. Similarly, the more closed a toy is, the more closely its functionality is related to a certain predetermined way of playing (for example, sets of building blocks with technical features) and regularities that can be compared to the factors familiar in games: mechanics and rules. Due to the more *open affordances* designed for the toy object, toy play can be considered a voluntary, creative, imaginatively challenging, and goal-oriented activity. Thinking of it as a productive activity, play with toys can also have features of creative problem-solving and cognitively titillating play in due course.

The playful affordances of dolls examined in the study are diverse: Primarily, it is essential to see these character toys not only as collectibles but also as necessary means of creative and imaginative self-expression. The individualized and customized dolls are photoplayed in various situations and environments. Through toy enthusiasts and fan communities, the toy object is thus built into a reflection surface for emotions and appreciation, both for solitary and social play. The narrative artifact (Selander 1999) continues in toy stories created by players that are transmitted, shared, and discussed on various social media channels through visual and verbal messages. Dolls are collected, customized, and communicated about. In light of the findings of this study, toy play for adults, as a form of world-building and world-play, is, above all, a communal activity and thus representative of play in its social form.

Play with digital cameras, toys, and storytelling manifests as a solitary and social activity. Doll play takes place primarily in the interaction between the player and the toy, most often in the intimate setting of the home. Doll play has traditionally been practiced indoors, where toys have been assigned their own places, for example in a dollhouse or diorama as part of one or more still lives³⁸.

Solitary play, or play conducted in the presence of one player using the technology only (capturing images of toy displays and dioramas as in photoplay), happens in the offline context, while social play occurs in terms of using communication technologies, as social media platforms are used to share the often serial and narrativized results

38 However, as illustrated in Article III of this thesis, various character toys are also captured through photoplay in outdoor environments.

of the photographic sessions with the toys. In this way, photoplay essentially entails social play, as the documentation of play is expected to be spectated once shared.

KEY FINDINGS OF THE STUDY SUMMARIZED:

Key findings of this study are summarized in the following to answer the main research question: **“How has play moved human players of the Western world in 2010–2020 in terms of physical, cognitive, and emotional mobility/movement?”**

- Through an investigation of adult play, we found that play is no longer ephemeral to a large extent, as it is captured on screens of digital cameras and simultaneously documented as photoplay.
- Before the domestication of smartphones, adult players most often used digital cameras in their photoplay to capture built-play scenarios, such as *displays*, *dioramas*, and *doll dramas*. The play machine that the digital camera entails enables physical toy play to enter digital “playgrounds” and may thus be understood as a critical component of their digital play behavior of adults with interest in character toys and a desire to develop intriguing and continuous narratives around them.
- *World-playing* with toys unfolds as both a solitary and social form of play — displays and dioramas may be created solitarily, but doll dramas imply sharing the toys’ adventures.
- Movement in association with photoplay happens in multiple dimensions: physically in the locus of the home, cognitively in the use of creativity to produce photoplay, and emotionally by forming unique relationships to the toys considered as player extensions and avatars.

Key findings to answer the sub-question, **“How are the acts of play realized through digital technology use, and what functions does the playing have for the players in the study?”**

- Activities related to photoplay with toys include the narrativization of toys in indoor spaces (such as displays and dioramas) with the help of digital cameras and photography, documentation, and storytelling are a creative endeavor that contributes to the skill-building and identity play of adults in many ways. These acts of play contribute to the formation of play knowledge.

- Adult world-play with toys entails movement of the imagination and fantasy, photoplayed stories of spatial arrangements with character toys as physical or manipulative actions, and screen-based digital efforts, i.e., *hybrid world-play*. Consequently, play in the digital world moves toy-playing adults (and toys!) physically in indoor space, between offline and online worlds, cognitively through increased skills, and emotionally through sustained attachment to character toys, with which relations are built through solitary and social play.
- Sharing doll dramas on social media makes photoplay with toys communicative — and thanks to comments exchanged on social media platforms like Facebook and Instagram — a collaborative and even co-creative activity in which toy enthusiasts share and cultivate meanings associated with their personalized playthings. When shared and followed on social media as photoplay, adult interaction with character-type playthings become potentially mimetic and “playborous” — a resource for storytelling allowing re-playing, re-makes, and re-definitions.



Figure C.

5.2 Article II: Playing with Connected Toys

“There is a toy box, and there is a smart device. These realms are beginning to collide,” Kudrowitz and Follett have observed (2014, 245). In the study investigating play with connected toys — “Persuasive toy friends and preschoolers: Playtesting IoToys,” Article II (Heljakka & Ihamäki 2019) — we reviewed four digital and Internet-connected toys with preschool children aged 5–7 years to explore their physical and digital features and affordances, and the types of play activities they prompt in the context of early education. The toys investigated in the study are conceptualized as *persuasive playthings* that allow hybrid and connected play, both solitary and social. The aspect of movement in IoToys is manifold — it relates to the capacity of toys to generate physical, imaginative, and cognitive movement in the players, and to the toys’ own ability to move. The persuasion technique of these toys points to the invitation to play they send through their interactive affordances, which have many consequences for play, including the generation of emotional responses related to nurturing of, caring for, and forming relationships with the toys. Let us first consider the aspects of the “toy box” connected with smart devices, “intelligence,” and the interaction of these play machines.

The evolution of intelligent toys started in the late 20th century. Already in 1998, Resnick and colleagues predicted the emergence of smart and Internet-connected toys by claiming:

Old toys will become smarter. New toys will become possible. All toys will be connected. There will be new ways of playing, designing, learning, storytelling; when a teddy bear sends a hug halfway around the world, when the heads on a child's necklace communicate with another to make lights sparkle or music sound, we will be playing with the toys of tomorrow. (Resnick et al. 1998)

In essence, connected toys are interactive: “An interactive toy differs from a regular toy in that it directly and purposefully interacts back. An interactive toy will respond to the player on it. For example, an interactive teddy bear would laugh, giggle or tell a story when the user tickles or squeezes it” (Hall et al. 2022, 3).

IoToys (or Internet-connected toys) represent an evolution of what was, in toy industrial terms, once considered “electronic media.” In 2009, Johnson and Christie wrote about how electronic toys are limited and repetitive. At least in some way, the IoToys (or, Internet of Toys) of present times seems to overcome this hindrance, as observed by Sylla et al. (2022):

The world of children's toys has continued to evolve with advances in embedded electronics, digital capabilities, and wireless connectivity. Smart toys and robots represent an increasingly vibrant range of play objects that combine different capabilities such as networking, processing and intelligent reasoning.

IoToys can be considered media and material objects (Mascheroni & Holloway 2019, 17) not explicitly centered around screens. IoToys are *toy products*, as articulated by Kudrovitz and Follett: “A toy product is an item that is intentionally designed, manufactured, and sold for the primary purpose of play” (Kudrovitz & Follett 2014, 237). They allow object play as material objects, meaning “play which uses infinite and interesting sequences of hand-eye manipulations and movements” (Hughes 2002). Still, they are also playing machines with mobility of their own. Previous research has defined smart toys as “playthings that do things” (Ackermann 2005).

I might add here that toys constitute a potent media of their own, and besides an apparent collision — or rather convergence — of toys and intelligent devices is supplemented by online media. In this way, “Physical toys have become media that ‘mediate what has not been mediated before’” (Bunz & Meikle 2018, 18).

Marsh (2017) has expanded the notion of connected play to explore how IoToys creates networks of relationships (1) between children, (2) between children and play objects, and (3) between play objects (cf. in Berriman & Mascheroni 2019). The Internet of Toys refers to toys that connect to computer networks and thus are 1) connected to online platforms via Wi-Fi and Bluetooth but which can also connect to

other toys, 2) equipped with sensors, and 3) specifically related to children (Holloway & Green 2016), also referred to playthings with hybrid qualities in this thesis.

“The most appropriate toy for a child is one that will challenge his interests and abilities and be closely matched to his skills and maturity” (Boehm 1986, 2). Marsh and colleagues (2014) find that the appeal of digital toys, with their affordances, depends on children’s knowledge of those objects, “as well as the emotional aspects of the affective dimensions of play and creativity” (Lundtofte 2020, 224).

“The first popular example of IoToys was toys-to-life, action figures such as Skylanders or Disney Infinity, that are connected to a video game by means of radio frequency identification (RFID), near-field communication (NFC) or image recognition software” (Mascheroni & Holloway 2019, 1).

Referring to children’s play with technologically enhanced toys, Sutton-Smith observed how “very little research has ever been given to a discovery of what the children actually are doing and achieving with their play for themselves” (Sutton-Smith 2004, ix). Holloway and Green (2016) ask how these new technology-enabled playthings are integrated into children’s culture and how Internet-connected toys may change play practices. The second case study of this thesis continues this investigation by looking at these aforementioned questions in the context of playful learning within early education pedagogy.

5.2.1 Screen-based or screenless toys?

Some IoToys, such as the Dash robot investigated in the study described in Article II, are played with through an app. Essentially, however, many currently Internet-connected toys are not operated through a screen — their interactivity stems from in-built computers and sensors. Sensors can add functionality, and functionality adds affordances. Earlier initiatives with interest in combining interactive technologies without the use of screens have been proposed by Soute and colleagues (2010), who developed the term Head Up Games, or HUGs (Soute et al. 2010; cf. in Boon et al. 2020): HUGs “liberate players from facing down to attend to screen-based interactions” (Soute et al. 2010, 435).³⁹ Similarly, as proposed by the author, IoToys can be thought of as representatives of *HUT*, or *Head Up Toys*. This has consequences for the mobility that occurs in play: “Toys that don’t need a screen can be more versatile and less cumbersome as children can move around with them and interact with them in different ways” (Plowman & Stephen 2014, 47). Potentially, future instances of

39 One suggested solution to ease the friction between screen consumption and play are so-called “Head Up Games” (Soute et al. 2010). In the supersystem of 21st century play, these can be hybrid board games as well as location-based games that nudge players to interact with their physical surroundings through the use of mobile devices.

these kinds of toys may be used in more ways in outdoor space, as demonstrated in the instance of speculative toy fiction discussed in the sixth publication of this thesis.

5.2.2 Guided digital play and hybrid playful learning

Despite complex technological systems, intelligent toys are becoming increasingly affordable, especially for Western consumers, and are considered likely to become widespread in educational and leisure play contexts. For example, sales of intelligent toys covered by the Internet of Toys are expected to triple over the next five years (Juniper Research 2017).

IoToys represent what Stephen et al. (2013) consider child-oriented technologies. Giddings (2019) describes children's relationships with IoToys as layered, in which material technology and intangible imagination intertwine.

Currently, many digital toys promise fun and edutainment (or, educational play with entertaining features) for children ages five years and up. Still, Sara Grimes (2015) is cautious about configuring the child as easily amused. In the industrialized world, educators believed playing with toys should not be whimsical but always useful (Oldenziel & Hård 2013, 276–277), making “edutainment” a case of serious, goal-oriented play.

Free play differs from adult-instructed activities because it is child-initiated and child-directed (Skolnick Weisberg et al. 2015). However, the self-directed element of the learning that occurs in the context of free play is crucial as it promotes rich social, intellectual, and emotional development (Gray 2011; 2013; cf. in Spiewak et al. 2016). Here, we argue for the benefits of free play that is sometimes understood as non-functional and hence non-productive.

Connected toys can blur the boundaries between formal and informal learning (Montgomery 2015, 268). As studies undertaken in recent years show (Heljakka & Ihämäki, 2018; 2019), there has been a growing interest in early childhood education to find out how intelligent toys could be used as part of more structured playful learning through guided and free play, or *toy-based learning*.

The study by Hall et al. (2022) demonstrates that for experts' interactive toys have higher perceived educational value than traditional toys or other forms of play. However, this is intuition or insight rather than based on direct evidence to support this view. For instance, Plowman (2004, 211) describes the skepticism for the claims made for learning with these “interactive learning partners” and, thus, their educational value as the word “smart” is frequently used as a marketing device to imply “a level of intelligence in the toy that will transfer to its user.”

“The activities that are appropriate for young learners of the third millennium are dynamic, interactive, and interconnected” (Woolsey & Woolsey 2008, 130). A critical way to explore the possibilities offered by modern toys is to explore them through play as part of the everyday context of early childhood education. The early education

environment provides a structured realm where open-ended and guided play can occur. Learning environments are changing rapidly, with digitalization extending to early childhood education environments. For example, new learning content can be downloaded when smart toys connect to online environments. It is worth noting how learning is approached not only through play and playfulness but also through playful and toy-based learning, with smart toys as technologically enriched toys, as IoToys and other intelligent toys become more widely part of preschool education. Hybrid technologies and forms of playful learning have entered into the early education context: “While technology certainly offers the possibility of mindless interaction, in the hands of thoughtful teachers, it is a tool for creating, collaborating, and communicating, and for play” (Fantozzi et al. 2018). Consequently, learning environments transform into hybrid spaces, where “instead of differentiating virtual and physical play, we should (re)think to play with multimodal playscape lenses” (Palaiologou et al. 2021).

The study on IoToys conducted for the thesis also represents adult-led play. Skolnick Weisberg et al. (2015) assert that guided play (adult-initiated but child-directed) can be used for teaching preschool children. Guided play refers to “learning experiences that combine the child-directed nature of free play with a focus on learning outcomes and adult mentorship” (Weisberg et al. 2016, 177). *Guided digital play* is one of the subtypes of playful learning in which preschool teachers can guide digital playing with a learning purpose: Guided play can be used for teaching preschool children. It may enhance the discovery of undemonstrated functions, whereas direct instruction may inhibit this kind of exploration (Skolnick Weisberg et al. 2015). Although the IoToys include educational value, in order for their educational promises to be fulfilled, educators need to guide young children’s digital play in preschool learning situations (Heljakka & Ihamäki 2018, 98).

5.2.3 Studying the affordances of IoToys

Interactive toys can produce new affordances (Thrift 2003, 402). “In the case of traditional toys, communication and control of toys spurs from the child, whereas communication with IoToys emerges from the toy which also ‘smartly’ positions the child to be equipped to make decisions and suggest alternatives” (Palaiologou et al. 2021). Traditional toys have a physical presence, but technologically oriented toys offer other stimuli: Visual-based feedback, such as light and visual stimuli, can attract children’s attention (Geke & Ludden 2013; Resnick et al. 1998; c.f. in Berriman & Mascheroni 2019). “Digital toys designed with light-up interfaces are usually more complex in functionality.” Such toys usually incorporate games, challenges, or difficulty levels (Berriman & Mascheroni 2019). Mascheroni and colleagues (2016) have described the approaches toward digital play in one way as a vehicle and, in the other, as an impediment to children’s learning. “Smart toys may be networked

together with other smart toys or WiFi in order to enhance play value or educational features [...]. Smart toys have intelligent characteristics, such as being able to speak or undertake purposeful tasks, often claiming to support learning particularly in Science, Technology, Engineering, and Maths (STEM) subjects” (Hall et al. 2022, 4).

Additionally, the Internet of Toys allows children of this generation to interact with remote players. At the same time, these intelligent toys are updated with new content depending on the player’s activities.

Smart toy friends are hybrid toys and most often represent animated characters: robots, fantasy characters, plastic, and even plush toy-like playmates. The key is to understand how their affordances that stem from different kinds of interactivity provide for play. Therefore, we were interested in exploring how children discover and actualize various affordances of the IoToys under scrutiny.

Berriman and Mascheroni (2019) have found that toys and digital features can act as prompts, provide feedback, and engage attention through bodily movement, facial expressions, and vocal sounds. The value of these capacities is to be decided by players, and as Ruckenstein (2010, 511) argues, “children are remarkably quick to drop a toy if they see no value in interactions with it.” For this reason, Ruckenstein adds that “beyond affordances, a toy needs to have evocative power, and holding-power.” It is also essential to notice that engagement modes vary, even with the same toy (Hutt 1981). Our research aimed to consider the wow factor and its consequences for play beyond the firsthand encounter with the toy. “While an affordance speaks to an artifact’s straight-forwardness (clarity to signal its whereabouts), something more is needed to sustain human interest, let alone enchant” (Ackermann 2005).

Flynn et al. (2019, 68) assert that “although digital play occurs in a different context, it can resemble playing with traditional toys; both involve engagement in exploration and the trying of new things.” Most often, toys encourage imaginative, object, or bodily play. In a digital world, smart toys can be used in all forms of play, considering their multisensory offerings. Marsh et al. (2016, 9) see hybrid play with these tools utilizing both digital and non-digital features, allowing play to move smoothly across the boundaries of space and time in a way that was not possible before the digital age.

Smirnova (2011) takes a critical stance on interactive toys by claiming that they prevent and reduce play actions. She categorizes toys of this kind as entertainment that does not contribute to imaginative play. Smirnova (2011, 40) explains that animated toys block independent creative play, and the children who play with them “seem to become an appendage of the toy in that the toy guides their actions.” In the worst case, following Resnick (2006, 10), “programmed toys appear to stunt creative thinking.”

Following an analysis of digital toys conducted by Berriman and Mascheroni (2019), investigations on IoToys toys can focus on analyzing the target age group,

purpose, digital and physical components, and a description of how the toys are used or interacted with. From their analysis and interpretation, researchers Hall et al. (2022) identified three primary recommendations for smart, connected toys, namely (1) the need for interactive toys to provide a safe, secure, and private way to play and learn; (2) increased research, experimentation, and investigation to explore interactive toy claims and potential; and (3) increased interdisciplinary and intersectoral collaboration and innovation (Hall et al. 2022).

Wilson (2003) says that the usability of programmed technologies comes not only from how they are meant to be used but also from how they are used. Ruckenstein (2010, 504) agrees by saying that “in order to see how children use toys and technologies for pursuing particular kinds of orientations to the world, one needs to empirically engage with them.” Indeed, the capacities of IoToys are considered vast: “Internet-connected toys can offer new, important opportunities for play, learning, health, and educational support, thanks to their interactive and personalized features” (Chaudron et al. 2017, 6).

Erdogan et al. (2019) rightly note that children do not entirely decide for themselves what, where, when and with whom to play, and “when children work on understanding the world around them it may be adults who see ‘play’” (Sutton-Smith 1986, 11). Thus, the vocabulary children and adults use for children’s play may differ from one another. For example, children may not at all point to (digital) technology use when discussing their play. Therefore, it is crucial to include children’s voices as part of the research interested in them (see, e.g., Nicholson et al. 2015).

“People of all ages can be affected by the media, but preschoolers form the group that is affected most” (Ostrov, Gentile & Mullins 2013; cf. in Çetintaş & Turan 2018, 57). Nevertheless, “remarkably little research focuses explicitly on what play means to children” (Meire 2007, 3). “Qualitative research can provide a detailed picture of children’s attitudes toward media usage” (Çetintaş & Turan 2018, 58).

Precisely for these reasons, together with my colleague, I wanted to discover how preschool children would respond to the IoToys under scrutiny in a setting for guided play and playful learning, simultaneously acknowledging the “pedagogization” of children’s play (Rogers 2013; cf. in Cowan 2020, 22) — in this case, the edutainment provided by the IoToys, and in this way, the instrumentalization of play for the sake of learning and research.

With my colleague, we set out to study the four digital toys to gain more knowledge about their various features and their capacity to invite players to interact. Similarly to the study conducted by Conti et al. (2020), we decided to focus on preschoolers; in Finland, this sample included 5–7-year-olds as in these years, “children develop intuitive thought, characterized by realism, animism, and artificialism” (Piaget 1951).

Article II of the thesis, titled “Persuasive Toy Friends and Preschoolers: Playtesting IoToys” (Heljakka & Ihamäki 2019), focuses on the Internet of Toys and the hybrid

and connected play performed with them. The research, conducted in pre-pandemic times, focuses on IoToys as “persuasive toy friends,” which were tested as part of play tests carried out with preschool-aged children in the context of early education in Finland. The study centered on the movement of toys and the movement of players’ imaginations and bodies by exploring the affordances of the toys.

In our play-tests, neither the teachers nor the researchers told children what actions to take. Instead, we followed a guided play approach, which is a blend of adult initiation and child direction and allowed the children to function as informants and co-constructors of knowledge (Eckhoff 2017). Therefore, we trusted that children’s reflections on their play would provide important contributions to understanding how the digital, material, and hybrid affordances of the IoToys are employed as part of a play-test relying on open-ended play in a preschool context.

The participating children also joined a group interview situation, in which they were asked about their ideas of the capabilities and possibilities of Internet-connected toys as playthings. The study focused on four toys based on their gender-neutrality, character-type aesthetics, awarded innovativeness, and popularity and availability on Amazon USA, namely the educational toys *CogniToys Dino*, *Fisher-Price Smart Toy Bear*, *Dash* from Wonder Workshop, and the non-educational *Hatchimal* toy, which includes a sophisticated mechanism enabling the *Hatchimal* to “unbox itself” (i.e., to peck its way out of the egg in which it is sold).⁴⁰ Moreover, an additional criterion for selecting the toys was the assumption that their play value stems from interaction beyond communication through a screen. In the following, each toy is described briefly in the following by highlighting its key features:

- The connectedness of *CogniToys Dino* results from syncing with a smartphone. *CogniToys Dino* has speech-enabled technology that allows players to speak directly to the toy and ask questions to receive age-appropriate answers. In this way, the toy resembles voice-operated assistants like Siri and Alexa.
- According to Fisher-Price, the *Smart Toy Bear* is an interactive learning friend with the brains of a computer but without the screen. The toy promotes socio-emotional growth through play with updated content, an app, and voice recognition. Socio-emotional learning points to skills such as sharing, communicating, and managing emotions (Plowman & Stephen 2014, 28).

40 In all cases in which the toys “talked,” they spoke in English, which may have produced some limitations in terms of interaction.

- The *Dash* robot, intended for 5-year-olds and up, provides educational entertainment (or, edutainment) that can practice coding and make the toy move through the app through simple coding exercises. *Dash* from Wonder Workshop acts as if it is “alive” by moving and talking. According to its maker, the toy supports open-ended play by using a remote-control app to make the toy move around and play sound effects.
- When *Hatchimals* peck their way out of a plastic egg, the toy goes through three stages of development, and players can teach it to walk, dance, and play games.

In our study, we set out to value child-friendly explanations of their interaction with the toys: Yamada-Rice (2017) claims that design elements and social science approaches to understanding children’s interactions with the toys should be taken into consideration to adequately understand them. Qualitative methodology was employed using observations of preschool-aged children interacting and test-playing a set of IoToys as part of early education in Finnish kindergarten. In our analysis, we focused on the persuasion strategies used in four contemporary character toys described above (which take the forms of fantasy figures, cutified dolls, robotic toys, animal-like creatures, and so on).

“When preschoolers are offered a toy to play with that has an ambiguous causal mechanism, the first thing they do, without being told, is figure out how the toy works through exploratory play” (Fisher et al. 2008, 306). In our study, we sought to capture children’s first responses to the IoToys under inspection and to understand how the toys invite their players to intrapersonal interaction between a toy and a player and how the Internet-connected toy friends suggest player participation in interpersonal interaction, meaning social play with others. Instead of being overly focused on the learning aspect, my co-researcher and I were curious about the play ideas children would develop through interaction with the IoToys.

Technologies augment our everyday social interactions (Ibister 2016a). Fantozzi et al. (2018) admit that technology use can be solitary, but it may become social as others join in once they see others play. In this way, play develops into co-creative and collaborative activities with the play machines. In a preschool environment, it is obvious that playthings are shared among children and, thus, generate social play.

It is essential to see the dimensions that support technological toys’ movement, mobility, and agility. Movement, lights, and sound are familiar features from many historic toys, but when connected and networked, these features become even more diverse.

Children can appropriately and creatively exploit the material possibilities of objects more quickly than adults to convey their messages. Adults, again, are more bound by familiar conventions (Kress 2003; cf. in Wohlwend 2008). Exploratory Play means play to access factual information consisting of manipulative behaviors

such as handling, throwing, banging, or mouthing objects, for example engaging with an object or area and, either by manipulation or movement, assessing its properties, possibilities, and content (Hughes 2002). Exploratory play as an activity is investigative. Again, imaginative play is play where conventional rules that govern the physical world do not apply (Ibid.).

According to Johnson and Christie (2009), the effects of digital toys on play are most visible in dramatic and constructive play. Moreover, Palaiologou et al. (2021) discovered that children create imaginary situations when using technology, which leads to make-believe play. Considering the findings of our study, it is possible to agree with Edith Ackermann, who writes: “Contrary to belief, animated toys do not kill a child’s imagination. Rather, they capture it in novel ways” (Ackermann 2005).

To avoid misconceptions about children’s engagement with the IoToys, we allowed them to inform us about what play ideas they associated with each toy after they had been introduced to them and could interact with them without adult interference.

To avoid misinterpretations and misunderstandings in scrutinizing children’s commentaries on how they would see themselves playing with the toys by themselves and in the company of others, we asked them to draw the most memorable of the four intelligent toys. Preschool teachers then assisted the children in answering this question in words and writing their answers next to the drawn toy character. In this way, we could be more certain about giving each child a genuine possibility to share their ideas about the envisioned play.

In the guidelines section of the multinational study on digital play conducted by Marsh and colleagues (2020, 41), the researchers observe how a vast amount of digital content accessed by children is in English. Therefore, they note, “further exploration is needed of the ways in which children’s digital play moves across languages.” The English-speaking *Junior Smart Bear*, suitable for slightly younger people, contains storytelling content with which you can practice simple everyday activities — good manners, times of the day and days of the week, or even English.

The group interview data and observational data from the case study were analyzed using thematic analysis (Braun & Clarke 2006). By analyzing the rich data, we witnessed how children also created original texts in play (Bergen 2004; cf. in Johnson & Christie 2009): Even though not all of the investigated IoToys afford movement (the *CogniToys Dino* does not walk, or in fact move at all), we found that children associated the toys with abilities not in reach of present IoToys, such as *flying*.

KEY FINDINGS OF THE STUDY SUMMARIZED:

In reviewing the persuasion strategies of connectivity, nurturing, and social play in association with Internet-connected playthings, we were able to answer the main research question: **“How has play moved human players of the Western world in 2010–2020 in terms of physical, cognitive, and emotional mobility/movement?”**

- IoToys cater to possibilities for both leisurely play and playful learning.
- Affordances of IoToys employed in our study can be categorized into *physical affordances* (material dimensions and properties) and *pre-programmed* (technological) *affordances* (sound, light, and movement, interactivity, and connectivity), which may be conceptualized as *educational affordances* (through the content the toys communicate, or invitations to play with stories, mini-games like coding exercises, tasks related to learning about good manners, etc.), and *affordances for pretend play and personal meaning-making*.
- IoToys with a mobilizing tendency, such as *Dash*, support children’s physical play by inviting children to *bodily movement*. The IoToys under scrutiny urged the participating children to *mobilize their imagination* and *advance their cognitive* skills through playing with sounds, learning English, and reading. IoToys, according to the study, can move the players emotionally by persuading them to form relationships with and nurture them.
- In reference to IoToys, *connectivity* refers to the toys’ abilities to access content mediated by digital communication technology and connectivity in terms of emotional responses to the toys, giving attention and nurturing child-toy interaction and encouraging players to seek social interaction with others.

Key findings to answer the sub-question **“How are the acts of play realized through digital technology use, and what functions does the playing have for the players in the study?”**

- IoToys are gender-neutral in their design and their proposed play patterns. The Internet-connected toys under scrutiny invited the preschoolers to play gender-neutral types of (physical) play, such as playing tag, hide-and-seek, and imaginative role-play, as in playing house and school with the toy friends.

- Children-led insights on using IoToys highlight the affordances they would desire in future playthings. Our study showed that preschoolers enjoyed the open-ended (imaginative and creative) aspects of play with the IoToys prompted by the sound, lights, and movement of the toys, despite their structured invitations to play, such as rich educational content. Consequently, the future design of this type of toy should encompass various possibilities for open-ended play triggered by physical, technological, and educational affordances.
- Based on our findings gathered and analyzed in our play-tests, the complementing design values of connectivity, nurturing, and social play were added to previously articulated ideas on the design of intelligent toys.⁴¹

Since conducting the research explained in our chapter, research and knowledge on IoToys have expanded significantly. For example, following the observation made by Palaiologou et al. (2021, 2115), “early childhood education needs to build capacity in terms of staff pre- and in-service training and resources to integrate haptic technology in their pedagogy.”

More precisely, future work in this field might ask: “How have technology advances impacted IoToys, and how will they impact them now and in the future?” Additionally, how might these toys be considered in terms of their sustainability from two perspectives, namely: In which ways do designers and the industries of play pay respect to the longevity and play value of IoToys?

Finally, it is important to understand that children who play with new toys like the IoToys highlighted in this study will become adults who are practiced in these new connected environments (Thrift 2003, 390). Therefore, it is easy to agree with the ideas presented in a blog post from 2019, which declares that “IoToys are here to stay, and it’s time we moved beyond media panics and hype” (Mascheroni & Holloway, July 3, 2019).

41 Further guidelines for the design of future technology toys are presented at the end of the Discussion section of this thesis.



Figure D.

5.3 Article III: Playing with the Smartphone

Article III — a book chapter titled “Toy tourism. From Travel Bugs to characters with wanderlust” (Heljakka & Ihamäki 2020) explores how the idea of wanderlust includes human travelers and extends to human-created objects — mainly toys and souvenirs — through exploring toy mobility. The toy tourism (or, toyism) practiced in the 2010s illustrates the ongoing tradition of mobilizing toys in parallel with a move from digital cameras to smartphones with high-quality digital cameras, making a case for Playing with the Smartphone, as illustrative of leisurely play with the play machines.

As shown in the previous studies articulated in publications I and II of the thesis, mobility in terms of play relates to mobile affordances of toys, playthings as portable and connected devices — the play machines — and the physical and mental movement of and within the players.

Essentially, mobile media are used on the move (Pink et al. 2018). Marsh et al. (2020) found that children’s digital play spans many places and spaces. In the context of this thesis, it becomes clear that so does the digital play of adults. Article I described how “play itself first takes place in the intimacy of homes in the name of solitary play

and then moves to online playscapes through documented play.⁴² Once shared, the playful interaction continues on the digital platforms of social media” (Heljakka & Harviainen 2019, 362).

Mobile devices and social platforms are objects and techno-social interfaces (Moore 2011) that afford playful impulses (Raessens 2010). Sicart (2014, 19) writes how “the case of smart phones illustrates not only the malleable nature of toys as playthings, but also the capacity for some objects to afford playful behaviors.” The uses of smartphones in play are many. In more concrete terms, Berriman and Mascheroni describe the mobile phone as an excellent example of a digital material object that is a portable device used on the move. Mobile devices allow players to both record and share the playing. In Moore’s (2011, 379) philosophical view, the mobile phone is perceived as “a metaphor for the mobility of play,” which Bogost (2016, 134) sees as a microcosm for which many uses and behaviors are possible:

A smartphone is a source of connection, of companionship, of information, of leisure, but also distraction, of compulsion, of disconnection, of obsession – a whole microcosm is contained amidst its glass and aluminium and silicon and software.

Cain (2019) goes as far as calling the smartphone “the most compelling toy ever created,” and this for adults in particular.⁴³ It is also for this reason that it becomes easy to see the smartphone as a play machine.

According to Berry and Schleser (2014), the rise of smartphones happened in 2007, but their uses in play emerged earlier. For example, mobile phones have been game-enabled since 1997. However, mobile phone games mainly took off in the 2010s. By the end of 2021, 5.3 billion people subscribed to mobile services, representing 67% of the global population.⁴⁴

Vincent (2006) sees mobile phones as representative of affective technologies. Furthermore, Berry and Schleser (2014, 3) claim that smartphones “have had a profound impact on our understandings and interactions with space and place.” Consequently, and potentially, playing with smartphones may move us both physically and emotionally. One of these interactions with the digital play of 2010–2020 is photoplay, as described in Article I.

42 Here, the documentation of play manifests in photoplay, or toy photography.

43 Dossey (2016, 80) writes how “Our electronic appendages now go with us everywhere. Our personal digital devices have become sensory transplants,” and notes that because of their ability to connect us, at the same time, these devices disturb our solitude.

44 As reported by the GSM Association, in a growing number of markets, most adults now own a mobile phone, meaning that future growth will come from younger populations taking out a mobile subscription for the first time. Over the period to 2025, there will be an additional 400 million new mobile subscribers, most of them from Asia Pacific and Sub-Saharan Africa, taking the total number of subscribers to 5.7 billion (70% of the global population) (GSMA, *The Mobile Economy 2022*, 4).

“There is a close relationship between mobile phones — currently smartphones — and their users, as they are always turned on and at hand” (Brito et al. 2019, 113). “Personal and almost always available, a contemporary mobile phone can potentially foster developments of new user cultures, including ones involving casual creation and sharing of contents related to digital photography” (Mäyrä 2011, 1). As explained in the case study reported in Article III, smartphones extend the possibilities of hybrid play (Heljakka 2012b; Tyni et al. 2016; Heljakka & Harviainen 2019), as they allow for simultaneous exploration of the affordances of traditional toys, physical space, and the capabilities of mobile (digital) technology.

Berry and Schleser (2014) say that mobile media shape storytelling. As discovered in Article I, on photoplay, the camera becomes a necessary play machine for the event, and the location chosen becomes a playing field. As demonstrated earlier, the photograph provides a particularly suitable communicative platform for creative and imaginative toy stories. In addition to the toy, the momentary encounter with the material world and the imaginative story, in which the playing photographer acts as the story’s narrator, are at the center of photoplay. Further, “stories always literally *take place* somewhere: Stories do not occur in a vacuum but in particular areas, whether these are identifiable or not” (Reijnders et al. 2020, 9). As shown, these areas can be staged in the case of displays and dioramas, but they may also inhabit public, even famous places as locations for play.

“Through the imagination, human consciousness is extended in time and place [...] the imagination is coupled with an urge to *locate*” (Reijnders et al. 2020, 6). Location has been an essential aspect in mobile game research, specifically in games played in an urban environment. Location has formed an inevitable perspective in research on location-based technology and media. Previous research shows how spatial information and the media influence people’s experiences by reinforcing attachment to a place (Goggin 2017, 31–33).

The geographies of play have expanded from domestic environments to include hybrid environments, which require navigation in physically and mentally operated playscapes. In these spaces, mobility occurs as physical movement in the “real” world and as the flexibility of the mind in terms of using one’s imagination as part of the digitally enhanced play.

According to Gordon Burghardt, a scholar interested in ethology, or animal forms of play, “imaginative play may underlie creativity, innovation, and new ways of operating within the physical, organic, and social worlds in which all creatures are embedded” (Burghardt 2015, 35). “Imaginative play is a celebration of our personal originality” (Sutton-Smith cf. in Bockler 2004). Sutton-Smith claims that imagination as a form of play is mobile, not the instrument of any single motivation (Sutton-Smith 2017, 215).

It is possible to see how physical objects such as toys trigger and set the imagination in motion. At the same time, they inspire movement. “In the beginning of this century,

the automobile, like the bicycle, was a toy, a plaything for those who could afford to buy one. It was initially used mainly for recreation and sport, representing a new concept of personal mobility and taste for independent travel” (Pantzar 1997, 51).

Toys have been given movement since the early beginning of mechanical toys: Moving toys developed from the 1800s onwards, side-by-side with advances in clockwork construction and the technology of metal plate punching (*Of Toys and Men*, exhibition press materials). Toy mobility has since expanded into play practices related to *toy tourism*, a type of play focusing on toy mobility and storytelling, the topic of study for the third case study of this thesis, namely Article III discussed here.

As written by Boehm, “toys travel well”:

Regardless of the method of transportation, appropriate toys can be excellent traveling companions for children and help to make travel a more enjoyable experience. There are several toys that have been designed especially for use in transit. Others are simply good toys that also happen to travel well. In general, the best toys for travel are those that are compact, simple to operate from a sitting position, and contain few, if any, detachable or small loose pieces. (Boehm 1986, 111)

The industries of play and producers of toys have inspired the mobility of toys from the mid-20th century onwards. To exemplify, Mattel urged Barbie players to at least travel in their imagination to famous travel destinations in the 1960s:

Barbie went to visit Amsterdam, celebrating its flower market, the countryside’s windmills, meadows rife with roaming cows, and clean rows of flower bulbs: “Imagine Barbie skating, with an elegant, red shawl trailing her, hand in hand with Ken and Skipper.” In concert with its international strategy, Mattel launched a Travel Costume Series in 1964. (Oldenziehl & Hård 2013, 285)

Wilson (2012; cf. in Ash 2013) suggests that mobile technology leads to a new form of “conspicuous mobility.” Technology enabling this kind of movement “weaves a narrative about the specifics of one’s presence in space — enabling users to broadcast that curated a narrative of the places they frequent, the neighborhoods they travel within, and the kinds of consumptive activities they afford” (Wilson 2012, 5). Lauwaert (2009) has stated that portable devices dislocate play from the interior locality. Devices as play machines mobilize play on our behalf (Moore 2011), but at the same time, players mobilize the devices and other artifacts used for play and combine their possibilities to enjoy and pursue play. As illustrated in Article III, these ideas challenge common concerns regarding digital play, mostly believed to take place indoors.

According to commonly expressed concerns from news media and public opinion, outdoor play has decreased. For example, in recent years, free, unstructured outdoor play has declined markedly, and according to Mintz, interviewed by the

American Journal of Play (2010, 145), has been replaced “to a striking extent” with solitary play and, for children, with adult-supervised activities.

Often competitive, goal-oriented, and regularity-based gaming (i.e., Caillois’s concept of *ludus*, 1961) and play that relies heavily on digital devices have been seen to differentiate human players from social interaction in the everyday environment, pushing them indoors as a contrast to “historical play” and, more traditionally, Sutton-Smith writes: “Many of us grew up close to forests and farms, and our play included animals, harvests, mountains, secluded beach landscapes or city roads (even suburban promenades), and endless ball games” (Sutton-Smith 2017, 182).

The benefits of outdoor play in terms of children’s play have been listed by Louv (2015), who states that the variety of structures, textures, and loose parts found outdoors affords various physical, creative, and social play opportunities. To remedy this, initiatives on how to increase the outdoor mobile play of children have been created, for example, by Britain’s National Trust, like their Bucket list for children/pre-teens, or “50 things to do before you’re 11,” featuring activities such as climbing trees, stone skipping, mud-pie making, flying a kite, running down a hill and hunting for bugs (Davey 2012, 116).

Location-based games (Benford 2005) offer one approach to seeing the connections between technology-invited movement as part of the play. Enabled by mobile technology, location-based games require physical mobility from their players and some even physical and social activity. These games aim to provide the user with a more diverse gaming experience for players of many ages. They are based on three technologies: mobile devices, wireless networking, and location recognition.

Due to their versatility, location-aware games can produce rich gaming experiences in their tendency to move their players in many ways, both in physical sports and mentally, in educational and emotional terms, unlike critical speech public discourse that often opposes this form of play. Central to modern play, this feature is often overlooked in media discourse as more interest is given to “screen time” and other aspects of digital gaming that are generally perceived as harmful. Still, there is evidence of how the mobilizing effect of digital technology positively influences human movement; for example, in the study conducted by Marsh et al. (2020), the children as informants discussed, among other things, the positive impact that digital technology has had on their physical mobility.

Given that even young children are literate and competent to manipulate digital devices from a relatively young age, device-based innovations in play that urge the players outdoors to play more socially are too few to mention, with *Pokémon GO* as an exception.⁴⁵ Another example of hybrid play that occurs outdoors is geocaching. Notably, both *Pokémon GO* and geocaching are played by both children and adults.

45 On the official website, Niantic, the creator of *Pokémon GO*, gives a “Common Sense” rating of 13+ of the game. See <https://nianticlabs.com/parents>.

Mobile play is in no way limited to the playing of digital games: Camera phone apps, together with location-based services, are providing “new social, creative, and emotional cartographies” (Berry & Schleser 2014), which invite their users to engage in many kinds of movement. These possibilities focusing on the various movement of players, playthings, and devices such as play machines, are of interest to players of many ages.

With help from the imagination, a playful mind may move anywhere. Again, with a mobile, smart device, a player can document and digitalize her narratives of play everywhere. Reijnders et al. (2020, 3) see the imagination connect the consumption of mediated landscapes and the act of visiting actual places in physical reality, which are essential facets of toyism and toys’ adventures.

Together with the tools made possible by digital technology, such as smartphones with camera functions and new types of playgrounds (social media with various applications), toy tourism is based on the encounter between the player and the location of travel, the playthings, and the play device that the smartphone is.

In toy tourism, character toys travel through many forms of mobility to places near and far. Nowadays, there are travel agencies specializing in toy travel, allowing anyone to send their toy character to well-known tourist destinations and receive photos from them as souvenirs.

Whereas (human) personal mobility is burdened with ever-greater scrutiny and supervision, “nowadays it is things that travel most easily” (Morley 2020, 55). The study on toy tourism was conducted in a pre-pandemic time when human mobility was less limited by travel restrictions.

“While repetition is certainly an important aspect of play, it is far from being a sufficient criterion for deciding whether or not something *is* play” (Kücklich 2004, 9). Nevertheless, the mimetic (repetitive and re-played) quality of play with things and technologies made visible on social media makes it possible to understand contemporary play as a form of human-object-(digital) technology relation that influences and invites play to spread as a social phenomenon. Instances of photoplay related to toyism allow spectating of play on platforms like Instagram, where toy enthusiasts and fans of character toys follow the adventures of “toy personalities,” which sometimes come to resemble the continuous doll dramas explained in Article I.

Toy tourism unfolds as an individual and social practice shared and showcased on social media applications. Toy play is dependent on the use of personal imagination. Still, when it comes to social media, it is also an activity colored by the collective imagination, in which the personalities and stories developed for the toy begin to refine as a result of interactive collaboration. It is precisely because of their technological and social media connections that toy play has acquired more game-like features, such as interaction between players, which emerges through goal-driven challenges implanted in play. Indeed, at least four factors associated with

the playing of games and game cultures are noticeable in toy tourism: a) regularity, b) creativity, c) purposefulness, and d) performance, which, together with the social media feedback system, allows for a more diverse understanding of adult play and its linkages with location-based play. At the same time, toy tourism has serial and repetitive features following the ideas of mimetic play and re-playing.

KEY FINDINGS OF THE STUDY SUMMARIZED:

Key findings to answer the main research question, “**How has play moved human players of the Western world in 2010–2020 in terms of physical, cognitive, and emotional mobility/movement?**” are summarized as follows:

- The trajectory of the toy’s own historical nature as a souvenir has expanded in the 21st century into *toy tourism*, which is, through photoplay, shared on social media service platforms. Recently, toy tourism as a term has evolved into a neologism, namely *toyrism* (Heljakka & Rääkkönen 2021).
- According to Gutnick et al. (2011), portability is a popular feature of play machines, and in toy tourism, it is essential for both the device and the traveling toys. In toy tourism, *toys are given mobility* as portable objects in activities of the mobile human and, alternatively, by sending the toys out to travel through toy travel agencies or geocaching.
- The relations of toy tourism to movement are manifold: Toy tourism (or toyrism) implies the *physical mobility of toys*, *mobility of the imagination of players*, and *long-term emotional attachment* to the traveling toy characters.
- Smartphones with camera features play a fundamental part in toy tourism, which may also be conceptually understood as a multilocation-based “game.” In *paidic* toy tourism, the activity forms freely without the boundaries of a pre-structured game (such as an app) and is supported by the communities of toy enthusiasts, while instead, in the context of geocaching, a *ludic* form of toy tourism, the traveling toys as Travel Bugs move from geocache to geocache within the limits of a pre-structured, goal-driven (and sometimes even competitive) game. Smartphone technology enables photoplay and a connection to social media, which turn a solitary play activity into a social one.

The following key findings answer the sub-question “**How are the acts of play realized in play through digital technology use, and what functions does the playing have for the players in this study?**”

- Toy tourism, to a large extent, is a voluntarily co-created and collectively supported play form and represents social play firstly due to its connection to sharing photoplay on social media and secondly in place of its linkage with the well-established game of geocaching. As a result, toy tourism is dependent on factors like human motivation to bring toys along on travels, to move them around in interesting locations (tourist sights or geocaches) during those travels, to narrate the toys’ stories of their adventures and make these stories public on social media where they offer material for spectating play for like-minded toy enthusiasts with aspirations to see the world through the toy’s eyes.
- Toy tourism as a mobile and location-based activity manifests as both *paidic* and *ludic* activities, illustrating evidence for multifaceted toy play at a mature age.
- The notions of imaginative and creative play are vital facets of toy tourism. Play — in this case — narrativization of the toys’ adventures involves using the imagination as toy characters act as protagonists with their own personalities, appearances, and motivations for their wanderlust.



Figure E.

5.4 Article IV: Playing with Screens with/through Social Media

The purpose of this study, titled “Liberated through teddy bears: Resistance, Resourcefulness, and Resilience in toy play during the COVID-19 Pandemic” in Article IV (Heljakka 2021), was to examine, describe, and increase the understanding of remote digital play burdened by player isolation during the beginning of the COVID-19 pandemic. By focusing on play patterns with soft toys, or plush as these toy characters are sometimes referred to in the North American context, the author strives to understand the relevance of soft toys and social media sharing for “pandemic toy play,” conducted by an intergenerational audience. The movement in the case study refers to the movements that occurred in play between the realms of physical environments (physical toys in the locus of the home with its window screens) and digital environments (digital “playgrounds” of social media consumed through screens), indoor and outdoor space, and different generations between players — children and adults.

“While modernist technologies were viewed basically as machines of production and in instrumental terms, postmodern technologies are viewed as communication tools that permit movement in cyberspaces, virtual realities, and computer-mediated environments” (Firat & Venkatesh 1995, 253). What is of interest in this thesis is how the play machines together with communicative aspects of contemporary media technologies prompt movement between people, enable communality, and ultimately establish initiatives also related to *playing for the common good* (Heljakka 2020).

Ellen Seiter coined the Internet as a kind of *playground* (2005). Indeed, social media is established as a site for play, where the hybridity of play between physical and digital realms becomes perceivable. Social media platforms also function as windows to player cultures: many of the players are already content producers, as the same technology can easily be used to send and receive (Livingstone 2004). Cronin says that instead of being perceived as victims of new media, young people actively contribute to the new media landscape by creating content, for example on Flickr and YouTube (Cronin 2011, 88). Besides these well-known and popular platforms, movement occurs between communication environments such as Facebook, Instagram, and TikTok, depending on the player’s age, motivation, and wish to connect with a specific audience.

Pink and colleagues (2018) have noted the leisure and playfulness of using social media. While society is influenced by the powers of technological systems, and the potential toxicity of social media behavior is a pejorative facet of digital culture, play lives, thrives, and moves on each platform it finds. Although doll dramas and toyism, as discussed in Articles I and III as play phenomena enriched by the use of play machines, emerged before social media platforms, social online sharing toy play is at the core of adult play with contemporary character toys.

Sociality is vital for playing, but play may take solitary forms: “play is social *interaction* as much as it is private *action*” (Henricks 2015b, 101). Solitary play (silent dialogues with the self, self-reflective play, play of the mind, imagination, and creative thinking) and social play (interaction with play materials and communication with other players, social environments, and contexts) are present in contemporary play. As illustrated in Article I, play happens because of human motivation to explore and embrace playfulness, which means that interpersonal play, or solitary play happens. In contrast, intrapersonal or social play demands that playing manifests as communication. The case study described here, Article IV, focuses on playing with screens and playing on social media. The publication, a journal article titled “Liberated through teddy bears: Resistance, resourcefulness, and resilience in toy play during the COVID-19 Pandemic,” illustrates how a new form of hybrid play, co-existing simultaneously in offline and online contexts, emerged at the beginning of the pandemic. Any study undertaken represents a particular moment in time, and this is the case of research conducted during the COVID-19 pandemic beginning in 2020. However, online realms began to form three decades ago: The World Wide Web was introduced

in 1991. Research by the Global WebIndex shows that 59% of the world's population uses social media globally. The average daily usage is 2 hours and 31 minutes (Global WebIndex, January 2023 in Chaffey 2023). The outbreak of COVID-19 resulted in a monumental increase in online and digital activities. For example, according to some statistics, the volume of playing digital games increased by 35% (Wave 2020). Despite the fact that similar statistics have not been created for playing with toys, the case study at hand attempts to capture how toys were used alongside digital devices and social media platforms to convey a message of hope that traversed the limits of age groups, nationalities, and united physical and digital environments of play.

Play has been described as “any activity that is engaged in for fun, rather than survival” (Lillard 1993). However, as the fourth case study undertaken for this thesis demonstrates (Article IV), play may sometimes contribute to surviving the firsthand mental shock of a global (health) crisis despite its joyous associations with leisurely play. According to Bogost's (2016, 233) idea, we don't play to distract ourselves from the world but to partake in it. Dramatically, play has functioned as a contributor to human survival at concentration camps, during the Holocaust, in times of war, and during the pandemic — not exclusively as a form of behavior of children but as a life-long and life-wide phenomenon. In fact, the play of adults is critical to maintaining a good society (Henricks 2015c, 386–387).

Article I states that “creative toy play as a form of object play can take serious forms besides the self-expressive, recreational, and escapist” (Heljakka & Harviainen 2019, 360). Researchers Back et al. (2017) conceptualize *conformant play* as the “normal” engagement model and *transgressive play* as violating the structures framing play, such as cheating. Although the latter idea does not directly translate to toy play, it is clear that players sometimes use toys in ways that their designers may never have considered, as in the teddy challenge investigated in Article IV. This form of play demonstrates progression instead of transgression, further away from its roles in leisure, learning, and productive play, and closer to play as a political force through a collective movement.

The roots of communal play (Huizinga 1938) are grounded in rituals and *communitas*. Pandemic toy play, in the context of the teddy challenge scrutinized in this case study, represents a communal form of play involving manipulation and displaying of toys (object play) and storytelling with them (narrative play), shared on social media (digital play) between generations (intergenerational play).

The teddy challenge, as a signifier of play during the COVID-19 pandemic, can also be theoretically structured as a form of play with physical, functional, fictional, and affective dimensions: Contemporary toys as three-dimensional, material playthings may, in other words, be considered as *physical* entities that can be manipulated in terms of object play. Usually, the toys are *functional* in terms of their (re)playability; they are intended for play of some kind and afford, for example, possibilities to pose and display them in different ways. Toys of the contemporary kind often also include

a *fictional* aspect; they may, due to their personality as character toys, have a backstory of some sort. In the simplest sense, they may have a name and personality described in a few sentences. On the other hand, they can be tied to transmedia franchises or story worlds. Toys are also objects and vehicles that communicate emotions (Shillito 2011). Therefore, the toy play experience usually includes an *affective* component, meaning the player forms an emotional bond with the plaything. The study presented in the article demonstrates how all of the above-mentioned dimensions of toy experiences — physical, functional, fictional, and affective (Heljakka 2018b) — are relevant when considering uses in the context of the pandemic.

In 1998, the teddy bear was elected to The Strong National Museum of Play's National Toy Hall of Fame. The year 2002 was celebrated in North America, Europe, and Asia as the 100th birthday of the origin of the teddy bear (Varga 2009). When writing this summary, the teddy bear celebrates its 120th birthday as one of the oldest transmedial toy phenomena.

As discussed in the article, teddy bears and other “cutified” plush toys present a persuasion to be cuddled and nurtured, but as proposed in the article at hand, they can also “give back” by providing their human counterparts crucial support and a playful communicative means in times of crises. The teddy bear, as a prominent *toy activist*, shows how plush toys are not only brought to places of mourning (Varga 2009) as signs of sorrow and grief but also treated as powerful entities with the agency, shielding human beings from the adverse effects of social isolation caused by quarantines during the COVID-19 pandemic.

Sutton-Smith thinks of toy play as a solitary manipulation of objects *and* toys as objects of knowledge (Sutton-Smith 1986, 237). Recent research on play during the pandemic positions toys like plush (i.e., teddy bears) as *objects of resilience* (see Heljakka 2023).

In addition to their meanings as personal protectors with capacities to comfort and empower their players, toys, according to the study, are objects onto which shared meanings may be projected. This means that besides being material for interpersonal play, toys can be employed as part of intrapersonal activities and communication, in which storytelling is essential. Moreover, as this research illustrates, intergenerational players can share toys.

Intergenerational play — even transgenerational or cross-generational play — “covers a wide range of possibilities” (Cohen & Waite-Stupiansky 2012, 78). What are the benefits of intergenerational play practices?

In addition to the contributions that intergenerational play may make to children's creative development, it may also sustain the creative spirits of those adults who remain open to and involved in these experiences with the younger generations.
(Bergen 1989, 237)

Learning and social engagement are also important as part of healthy aging. According to the European Map of Intergenerational Learning, people of all ages can learn together and from each other. Generations work together to gain skills, values, and knowledge. Intergenerational learning fosters reciprocal learning relationships between different generations, develops social capital and social cohesion, addresses significant demographic changes in Europe, and enhances intergenerational solidarity. (EMIL Network Europe)

In intergenerational play, the play worlds of (seemingly) innocent childhood and of worldly adults collide and converge. Thomas Henricks formulates a continuing challenge for students of play to demonstrate the similarities and differences in play activity between children and adults across the entire lifespan (Henricks 2015c, 386). Shared play experiences across the lifespan can improve cognitive development, social development, physical development, and healthy emotional development (Davis, Larkin, & Graves, 2002; c.f. Cohen & Waite-Stupiansky 2012, 62). According to Bengtson (2001), multigenerational relationships will be more critical in the 21st century for three reasons: (a) demographic changes of people aging, (b) the importance of grandparents fulfilling family functions, and (c) the strength of intergenerational solidarity over time (c.f. in Cohen & Waite-Stupiansky 2012).

One example of intergenerational relationships is the one between grandparents and grandchildren: grandparents and grandchildren often support each other as play companions (Davis et al. 2012). “Grandchildren view grandparents as positive role models and mentors and a source of emotional security” (Kornhaber 1996). Grandparents, on the other hand, “gain a sense of joy and pride by being part of their grandchildren’s lives” (Kemp 2005).

Davis et al. (2012) have noted the paucity of research in intergenerational play practices. In particular, they observe that more academic research needs to be conducted to examine intergenerational play or technologies to support it. It is somewhat surprising that in the Western context, there is a notable gap in studies with an interest in the joint and shared practices of players of different ages, especially those involving similar playthings, and in the context of technology-oriented play as part of the use of the same play machines. As suggested here, such research would increase and broaden the understanding of how players of different generations could participate in the transmittance of play knowledge, i.e., valuable information about the multifaceted play patterns related to object play rooted in the use of physical playthings but with a possible connection to other tools and playscapes beyond the physical manipulation and interactions between the player and the plaything (Heljakka 2016; 2022).

Intergenerational play practices have significance for learning about technologies:

As children become increasingly adapted to technological devices in their everyday lives, the play they engage with their elders is bound to change and adapt, bringing the older generations along. For example, using interactive video and audio communications allows children and grandparents the opportunity to communicate — and play — across distances in real time. (EMIL Network Europe)

As Cohen and Waite-Stupiansky (2012, 78) suggest, “researching the possibilities provided by technology would be an important next step for studies of intergenerational play.” The researchers address the relevance of letting players of different generations engage with each other: “Providing the opportunity to bridge older and younger generations highlights the importance of tapping into the potentialities of using play in interdisciplinary programs to understand play theory and research across the life span” (Cohen & Waite-Stupiansky 2012, 61).

As demonstrated in the case studies of this thesis, today’s toys are played with in both physical and online environments. Therefore, they can be considered tools for play that encourage creative activity. As discovered in Articles I and III of this thesis, the toy and the camera (or other mobile device that includes the camera) work together to challenge the player’s creativity in photoplay. Like camera technologies, social media sharing has become integral to toy play. Online playscapes now provide windows to rich, multifaceted play surrounding contemporary toys (e.g., Heljakka 2016). “When toys are photoplayed and shared on social media, intrapersonal toy play becomes socially shared interplay in which the imaginations of many toy enthusiasts come to play together” (Heljakka & Harviainen 2019, 374).

Gutnick et al. (2011, 37), who discussed co-viewing in their research report, suggested that media producers design “content that actively involves parents *and* children.” In their description, the researchers also mention co-participation. In pandemic toy play — the topic of interest for the study discussed here — both dimensions of consuming screen-mediated material were concretized with the emergence of (co-playing) the *teddy challenge*.

Following an idea suggested by Marsh et al. (2020), parents would benefit from advice on encouraging movement between the digital and non-digital. In 2004, Doris Bergen noted how “only a few studies have combined computers with toys” (Bergen 2004, 196). The teddy challenge offers a perfect example of how movement between the realms of physical-digital, children-adults, and indoor-outdoor play was generated in times of crisis.

The general idea of the teddy challenge is simple: Teddy bears or other plush (soft) animal toys are displayed on the window screens of private homes for passers-by to spot and enjoy.⁴⁶ The challenging aspect integrates a gamified goal answering the call of how many teddies can be spotted on a walking tour, for example, the neighborhood context. But the gameful aspect of the teddy challenge represents one motivator to spot the toy displays only — according to the research conducted, the teddy displays were also enjoyed thanks to the rich storytelling they conveyed.

“Mixing competition with collaboration in a single game allows players to share positive emotion with their own team, and also enjoy the powerful buzz of group competition” (Ibister 2016b, 93). Although the teddy challenge manifested as a game that would potentially steal the participants’ focus off their pandemic concerns for a while and offer a brief occasion to receive enjoyment from the teddy displays, the challenge may be understood in terms of dealing with deeper issues than pure enjoyment. The serious forms play have been part of game research for a long time. In 2004, Julian Kücklich wrote that it is time for games to deal with more serious matters (Kücklich 2004, 3–4). Casual or competitive gaming and creative play aside, a much more serious function of the teddy displays could be seen in their emotionally moving capacity to spread a message of hope in the form of *ludounity* — “by playing together, we will survive this together” (Heljakka 2020).

“Social playability can be implemented into the game itself (as in the case of multi-player games) but often arises spontaneously out of the interplay between players and observers,” says Kücklich (2004, 23). The study by Hayes (2003) found that the most meaningful encounters between generations occurred during non-structured, open-ended play activities. This is what the teddy challenge was about — a spontaneous and playful reaction to a global health crisis in the firsthand moments of uncertainty when a cure for the COVID-19 virus was unknown and the future of humanity was at risk.

Sutton-Smith (1993) has described toys as “emotional crutches.” The study on the teddy challenge is an example of playing with window screens of the physical world as well as the screens of the camera. Mobile devices and social media have revealed that toys — soft plush creatures in particular — are symbols of loss and sorrow, but precisely because of that, they are also bearers of optimism and hope. Without the assistance of the technologies mentioned above, toys alone could not have sparked a globally viral phenomenon. But through the displaying, photoplaying, sharing, and communicating between generations, the teddy challenge grew into a phenomenon of play previously unseen.

46 Parallel to domestic spaces, teddy bears and other toys were also displayed in public space, such as in store windows and even in vehicles, like ambulances. Even high-profile governmental agencies joined the teddy challenge, as prime ministers and ambassadors had toys placed in the windows of public buildings.

While “play alone is unlikely to be a simple solution for complex social issues” (Cowan 2020, 27), the emergence of the teddy challenge as a collective expression of ludounity demonstrated how play has the tendency to lift the spirits during times of uncertainty and, to some extent, spread the message of resilience and survival. Consequently, play moves our beliefs and trust toward better times ahead.

KEY FINDINGS OF THE STUDY SUMMARIZED:

The following key findings answer the main research question, “**How has play moved human players of the Western world in 2010–2020 regarding physical, cognitive, and emotional mobility/movement?**”

- The study exemplified that there are still uses for physical play with non-technological playthings such as traditional soft toys (or plush) like teddy bears. This play may represent play between generations, or intergenerational play, like the teddy challenge play phenomenon, which moved players mostly in imaginative and emotional ways by employing various screens — physical window screens, computer screens, and social media platforms. This required imaginative and creative abilities as part of object play practices manifest in the toy play of players of different ages.
- To spread the message of *ludounity* and *playing for the common good* (inviting the players to interact in the name of togetherness), the playing requests assistance from screen-based technologies and, once reinforced by social sharing, may become a global and viral phenomenon.
- The study showed how players are resourceful and innovative in creating novel play scenarios in uncertain times combining indoor and outdoor space, physical and digital resources for play, and young and old players. Through their remote play performed in times of social isolation, players presented resistance to mentally challenging situations and promoted *playful resilience*.

The following are key findings to answer the sub-question, “**How are the acts of play realized through digital technology use, and what functions does the playing have for the players in this study?**”

- Intermixing physical play based on a popular plaything with screen-based technologies and social media sharing may lead to a global and viral play phenomenon relevant to an audience of intergenerational players.
- The teddy challenge started with creative and narrative object play by displaying the toys in windows. During the first phase of the COVID-19 pandemic, players were urged to spot teddies in the windows, photograph their favorite displays, and participate in the challenge through social media sharing. The play phenomenon thus included a game-like structure and invitation to play associated with displays, photoplay, and social media sharing.
- Toys used as part of pandemic toy play can act as both emotional crutches and *objects of resilience*. Therefore, it is possible to think that the functions of collective toy play during pandemic times may have long-term consequences, which may also contribute to mental well-being on an individual and a social level, fighting adverse health concerns, such as depression.



Figure F.

5.5 Article V: Playing with Social Robots

Article V, a conference paper presented at *CHI Play'20* titled “Playing with the Opposite of Uncanny: Empathic Responses to Learning with a Companion-Technology Robot Dog vs. Real Dog” (Heljakka, Ihämäki, & Lamminen 2020), describes a study conducted together with a technological “pet” and a natural dog with preschoolers of the Finnish early education context and makes an example of end-of-decade play. The *Joy for All Golden Pup* used in the study is a battery-operated consumer-level robotic dog (Jones & Deeming 2008) and a “synthetic creature” (Pesce 2000). Due to its aesthetic, the Golden Pup is conceptualized as “the opposite of uncanny” — part of the title for our conference paper and the fifth publication of this thesis. This concept hints at the cuteness of the robotic dog, which makes it a valuable play machine in an investigation interested in researching the learning of pro-social skills.

In the 2010s, play materials interested in empathy development emerged in the toy market. “New toys have become one of the chief test-beds for the new ways of emotions” (Thrift 2003, 390). Physical and thus analog toys and games such as Kimochis (2023), “The Failure Toy,” and “Empathy Toy” (Twenty One Toys 2023)

found their way to the marketplace, promoting opportunities for social-emotional learning from an intrapersonal and interpersonal perspective. Pro-social movement of emotions is not foreign to digital games either — for example, Will Wright (2007) has said of *The SIMS* that the simulation or sandbox game evokes empathy in players. As shown in Article II of this thesis, novel, technologically supported toys persuade emotional responses not only through their aesthetics of cuteness, like the teddy bears explored as part of the teddy challenge in Article IV, but through their in-built interaction.

Bartlett and colleagues (2004, n.p.) have envisioned that “in the not-too-distant future, Intelligent Creatures (robots, smart devices, smart vehicles, smart buildings, etc.) will share the everyday living environment of human beings.” During the same year, Lydia Plowman noted in a chapter on talking toys how the Alliance for Childhood (2000) had described robotic dolls as the “worst toy idea of the year”:

The pressure group believes that programmed toys distract children from “real play,” fool children into thinking the toys are alive, manipulate their thoughts and reactions, and prompt unhealthy emotional attachments. Such toys are described as a straitjacket on play. (Plowman 2004, 211)

Nevertheless, according to Mark Pesce (2000, 220), “robots have become our indispensable mechanical companions.” As a consequence of this development, we are invited and persuaded to become friends with digital technologies and to become attached to the devices in which digitality is embedded. The domestication of technological devices, taming and normalizing digital technology within domestic space and everyday practices assisted by easy-to-use technologies are all persuasion strategies channeled through multimodal affordances. Being persuasive is an integral feature of IoToys scrutinized in Article II and other types of toy technologies, such as robotic dogs as a type of social companion robots.

Robots capable of communication are termed social robots. Lionel et al. (2020) believe that robots are becoming more vital to society. Machines are becoming more like multimodal play partners. In their research report, *Kaleidoscope on the Internet of Toys*, to capture this development, Chaudron and colleagues (2017) discuss an ongoing *robotification of childhood*. Social robots represent the direction of this development. Social robots may be entities that “can autonomously interact with humans in a socially meaningful way” (Chaudron et al. 2017).

According to Mascheroni and Holloway (2019, 9), social robots can be *embodied* and *sociable*. Following Dautenhahn (2004) and Breazeal (2003a), Melson et al. (2005, 1615) conceptualize social robots as computational artifacts that “have some constellation of the following characteristics: they are personified, embodied, adaptive, and autonomous, and they can learn, communicate, use natural cues, respond to emotions in humans, self-organize, and pull on people in psychological rather

than artifactual ways.” These play machines enable playful, embodied interaction, as defined by Dourish (2001) in the following way: “Embodied interaction is the creation, manipulation, and sharing of meaning through engaged interaction with artifacts.”

Embodiment and representation of embodied behaviors are two characteristics that make robots different from other technologies (Dautenhahn, 2007; Kramer, von der Putten, & Eimler, 2012; Thrun, 2004; cf. in You 2018) as they are capable of embodied physical action. These are kinds of (EPA) robots (Lionel et al. 2020). In this way, robots can be perceived as computational objects and embodied intelligent agents (Druga et al. 2019).

In the fifth case study presented here, namely Article V of the thesis with the title *Playing with the Opposite of Uncanny: Playful Learning with a Companion Technology Robot Dog vs. A Real Dog*, deals with a social robot in the form of a robotic dog, which represents a sub-branch of EPA robots. This robot companion, in essence, is conceptualized as an entity that opposes the notion of uncanniness or un-homeliness. The term *uncanny* originates from Sigmund Freud but was popularized by Masahito Mori in the context of human-robot-interaction research, or HRI.

As suggested elsewhere, the “uncanniness” of playthings depends on where it falls on the axis between the simulation of nature, the fantastic, and some of the *morbid* (Heljakka 2013, 346). This aesthetic is discussed here with the notion of “uncanny.” Nelson formulizes the “uncanny” as something that literally cannot be “kenned” or known by the five senses. She writes that Freud’s famous definition of the uncanny (un-homely (un-human), or *unheimlich*) relates primarily to a resurgence of primitive “discarded beliefs” — the omnipotence of thought, fulfillment of secret wishes, return of the dead, and so on (Nelson, 2001, 17).

Lionel et al. (2020) believe that robots are becoming more vital to society. Machines are becoming more like multimodal play partners. In Japan, there are “robot-assisted activities” (RAA) and “robot-assisted therapy” (RAT) (Melson et al. 2008). While robot assistants are becoming more common in various industries and healthcare, they are still relatively uncommon in the educational space and even more so in the domestic environment. Nevertheless, some toy robots marketed as social companions have already found their way to the toy market in the form of robotic pets, which this study investigates.

Writing on toys as part of literary fiction, Rebecca Gorman O’Neill (2017) observes that toys are more or less immortal in toy-related tropes. With the newest technology to characters positioned now as toys, this capability becomes literate: toys are not only animated and movable machines but an artificial life-form that, with the help of electricity, may have a ‘heartbeat’. What makes these play machines intriguing (and complex) artifacts to study is their perceived “liveness.” This perceived liveness results in one part of their physical structure without a screen. “Child-robot interaction does not depend on classic interfaces, such as keyboard or screen, but is

increasingly ‘natural’: it operates through speech, gestures, and vision, rather than through text or symbols” (Fong et al. 2003; cf. in Peter 2017). Humanoid (or human-like) robots are preferred to robots that appear mechanoid (Lionel et al. 2020), but what if the robot is *zoomorphized*, referring to the robot taking an animal form?⁴⁷

According to Fernaeus et al. (2010), there is increasing interest in *robotic toys*, particularly in Interaction Design and Children (IDC). They define these “play partners” in the following way:

Robots are intended for basic leisure activities such as play, creativity, playful learning, entertainment, and relaxation. Importantly, robotic toys are interactive and have a software component, which distinguishes them from other mechanical or low-tech artefacts, e.g., those resembling the appearance of robots from fiction.

Robotic toys, such as robotic pets investigated here, resemble a “living” object to be played with and cared for (Berriman & Mascheroni 2019), like the persuasive IoT toys investigated in Article II. The fifth publication in the thesis demonstrates play with social robots, namely a robotic dog.

Human–dog relationships function as a working framework for exploring robotic pets. In Western societies, over half of people share their daily lives with pets. According to the *Merriam-Webster Dictionary*, pets are domestic animals kept for pleasure rather than utility. At the same time, pets are known to influence human behavior. For example, they facilitate human social interactions (Rault 2015). Interaction with animals contributes to children’s health, social competence, and learning (Beck & Katcher 1996; Melson 2001; cf. in Melson et al. 2005).

Robots available for children are primarily zoomorphic (animal-like) or humanoid (human-like) in appearance (Mascheroni & Holloway 2019, 10). Children, especially, form emotional bonds with robotic dogs (e.g., Weiss et al. 2009). At the same time, it is possible to perceive social robots as a resource for play with a creature-like quality (Ackermann 2005). Social robots, such as robotic dogs, are “designed to interact with humans on an emotional level” (Zhao 2006, 408). Through play, robots gain accentuated meaning as “others.”

Multiple social cues can lead to a more persuasive robot (Ham et al. 2015; cf. in Conti et al. 2020). Central aspects of robotic pets are their aesthetic and ontology as entities between live animals and artificial life, bringing toy animals to the next level with their gestural interfaces, sensor technology, and responsiveness. These play machines call for companionship but also convey a vulnerability due to their physical fragility.

47 Robots are classified as “*zoomorphs*” if they mimic live, current, or imaginary animals (Krueger et al. 2021).

The face of the doll makes children react to it emotionally (Smirnova 2011). Soft toys function similarly. Suh and colleagues (2011) discovered that individuals can become emotionally attached to technology. Indeed, robotic toys that represent “post-human (children’s) techno-culture” (Giddings 2019, 76) can be emotionally expressive. Yet, in Smirnova’s (2011) view, interactive toys drive children further away from play, almost functioning like “anti-toys.” According to the researcher, the movements and sounds dumb down children’s imagination: “The in-built mechanism enforces a certain way of play with the toy and prevents real play, i.e., it blocks any initiative from children” (Smirnova 2011, 42–43).

Alongside interactive capabilities, aesthetics play a role in human relationships with robots: Cute has been labeled the dominant aesthetic of digital content (Wittkover 2012) and cuteness (Harris 2000; Allison 2003; Cross 2004; Sherman & Haidt 2011; Ngai 2012; Dale 2017; May 2019), alongside kawaii engineering as suggestive design tactics. “There may be a perceived inhuman or dehumanizing aspect to digital technologies in general that we instinctively attempt to mitigate by transforming digital technologies into exemplifications of the cute, sleek, or cool” (Wittkover 2012, 215). As Daniel Harris (2000, J4; in Wittkover 2012) put it, “something becomes cute not necessarily because of a quality it has but because of a quality it lacks. A certain neediness and inability to stand alone as if it were an indigent starveling, lonely and rejected because of a hideousness we find more touching than unsightly.” Humans are susceptible to perceived motion, and as Hoffman and Ju (2014) point out, this capability is used by designers such as robots. Both motion and emotional responses are important for social robots like robotic dogs. Movement in such entities means perceived “liveness”:

When interviewing children in the 1920s, Swiss psychologist Jean Piaget found that they took up the question of an object’s life status by considering its physical movement. For the youngest children, everything that could move was alive, then only things that could move without an outside push or pull. (Turkle 2011, 27, orig. in Piaget, Jean, The Child’s Conception of the World, Routledge and Kegan Paul, London, 1928) [La Représentation du monde chez l’enfant (1926, orig. pub. as an article, 1925)]

One example of using *animatronic* technology in a toy expressing the aforementioned “liveness” is *Furby*: “The true breakthrough was to be the *Furby*, a virtual electronic pet aimed at children of 4 and up developed in 1998 by Tiger Toys, now a division of Hasbro, which consisted of a body, a motor, various sensors and a large amount of software” (Thrift 2003, 397). Thrift (2003, 396) questions the categorization of these entities as toys and instead sees them as “something between a personal organizer, an adult companion, and a status symbol.”

The naissance of robotic dogs goes beyond *Furby*, as in the case of “SCAMP (Self-Contained Automotive Mobile with Personality), a 16-inch-high furry puppy first

produced in the 1980s which came complete with 300 different whines, bleeps, and grunts and was programmed to have twelve different ‘moods’” (Thrift 2003, 396).

Perhaps the most known robotic pets are Sony’s *AIBO* — a mobile robot (Bartlett 2004), a robotic dog, and the seal robot *Paro*. However, *Paro* is not considered a toy. In fact, *Paro* is classified as a medical device in the USA (Rault 2015).

Being pure entertainment (and also *play*) machines, robots like *AIBO* and *Paro* have a purpose beyond play, namely companionship and therapy. Sutton-Smith (1992, 5) notes how “therapeutic toy usage is one of the most striking developments in the institutionalization of play in this [20th] century.”

Jones and Deeming (2008) have noted that emotionally responsive technologies are still uncommon in the home environment. *Paro* is mainly used as part of healthcare, but *AIBO* can be perceived as a domestic technological entity, providing entertainment and companionship for some.

Seen from the perspective of social companion robots like the robotic dog investigated in our research, these play machines cater possibilities to contribute to the areas of human health and leisure.

In our study, focus shifts from HCI (human-computer interaction) to CRI (child-robot interaction) and playful learning in the context of children. Jones (2017) notes how the fascination with toys has led us to breathe life into them in many different media. It is possible to argue that life is also breathed into toys via digital technology. Berriman and Mascheroni (2019) formulate how the perceived “liveliness” can be seen as co-realized by child and toy — children treat robots as more than mere artifacts (e.g., Melson et al. 2009). Sherry Turkle (2015) describes these devices as relational artifacts that allow children to explore “matter, life, and mind.” The child engages in play practices that test the robot’s liveliness (Berriman & Mascheroni 2019). According to earlier research, “a surprising majority of children conceptualized and interacted with AIBO in ways like a live dog” (Melson et al. 2005).

“As robotic pets become more highly interactive and ‘lifelike,’ they may blur categorical distinctions between technological artifact on the one hand and biological being and psychological agent on the other” (Melson et al. 2008, 93). “In their pretend play, children endow things with life all the time, blurring the boundaries between animate and inanimate” (Ackermann 2005).

Ackermann (2005) thinks that the manner of animated or smart toys is not to please or forgive but to reveal their “otherness,” which they accomplish through three strategies, namely artificiality, believability, and conviviality. Artificiality points to the “thingness” of the toy, believability to its acts as believable, and conviviality to letting the “child” in but maintaining its integrity. Intriguingly, “animal-shaped toys may prompt children’s moral of caring and cognitive development through pretend play” (Sung 2018, 250).

Earlier research shows how children respond to a social robot as a minded social being (Melson et al. 2008, 101). About *AIBO*, Bartlett et al. (2004) note that “unless

AIBO does something unacceptable for a dog (like speak with a human voice), it remains essentially a dog.”

During 2010–2020 research was conducted more broadly on child-robot interactions and their implications as part of children’s lives (see, e.g., Belpaeme et al. 2013; van Straten et al. 2020). To exemplify, Conti et al. (2020) see robots in the learning context to function as extensions of old storytelling methods, including playful tools such as puppets, dolls, or pets.

“Creating playful environments requires us to consider children’s views about their experiences” (Howard & McInnes 2012, 739). Palaiologou et al. (2021) suggest “a poly-pronged approach to pedagogy”, including the digital, virtual, visual, and physical, which enhance children’s multimodal playscapes. For this reason, I teamed up with research colleagues to investigate the capacity of *Joy for All* Golden Pup robotic dog and social companion, to work as part of preschool-aged children’s playful learning.

“Children directly explore the material world through multimodal play” (Wohlwend 2008, 128). Traditional toys have a quality that makes them more alluring in one sense, compared to many robotic toys of the present: Their soft “interface.” Softer, more cuddly, and more “lifelike” were qualities asked for *AIBO* in the future (Melson 2009, 562–563) — the participants wished for a fur-covered robot. This wish has been responded to by other toy companies like Hasbro, which produced the Golden Pup robotic dog under the *Joy for All* brand: Today, it is no longer relevant to distinguish between the low threshold of traditional toys with, for example, their cuddly interface and the highly technologically advanced smart toys (Fontijn & Mendels, 2005) as both dimensions may exist in the same toy — a welcoming surface and interactive features. Here the materiality of the plaything really matters, as it may have consequences for player reactions. For example, in a previous study (Aguiar & Taylor 2015), children were found to associate a plush toy dog with friendship and a virtual dog with entertainment. In our research, we position the Golden Pup not only as the *opposite of uncanny*, but with capabilities that function as a resource for learning about (human) emotions.

The *Joy for All* robotic dog is similar to *AIBO* in that it requires power, carries a battery, and has motors and sensors. However, it has a significant difference in its soft surface, which *AIBO* lacks. New technologies are “haptic in the sense that they are kinesthetic, stimulate senses of touch and motion” (Palaiologou et al. 2021, 2101). Our study acknowledges that the multimodality of the robot dog, Golden Pup, may have consequences for both playing and learning: The Golden Pup comes with a soft and cuddly exterior and “hidden affordances” (i.e., affordances that do not convey its existence through perception, Gaver 1991) such as sensors. Furthermore, “the cuddly interface can offer an advantage and the potential for fun interfaces that might address both the affective and the effective dimensions of learners’ interactions” (Luckin et al. 2003).

The *Joy For All* companion robot is a robotic dog miming aspects of the biological animal (Melson et al. 2009). Nigel Thrift claims that the close resemblance to a live animal does not present problems for children. He states:

Now children are comfortable with the idea that inanimate objects think and have a personality. But they no longer worry if the machine is alive. They know it's not. The issue of aliveness has moved into the background as though it is settled.⁴⁸ But the notion of the machine has been expanded to include psychology. (Thrift 2003, 398)

Play machines with sophisticated interactive capabilities that emulate biological entities, like the robotic dog under scrutiny here, may propose challenges (Melson et al. 2009, 549, 554). For example, they provoke questions about the distinction between animals and machines and invite us to ask questions such as: Is the robotic animal “not really a real dog” but at the same time not merely “a pretend dog”?

Live dogs are the “masters of domestication” and because dogs have excellent social skills with humans, current research applies human–dog relationships as a workable template to understand HRA (human-robot activities) (Krueger et al. 2021). For this reason, our study also involved a live dog. Continuing the exploration of how toys, digital technologies, and mobility are encapsulated in the use of play machines, the interest in this study guided the question of what potential a robotic dog, in parallel to a live dog, offers for playful learning of pro-social skills in early education.

While planning the study, an opportunity arose to join forces with a practitioner of early education, particularly animal-assisted early education. To find the capacities of the robotic dog versus a “real” dog, our team, consisting of the author as a researcher of toys and play, joined researchers with backgrounds in evolving technologies and early childhood animal-assisted learning to embark on a pilot study. To combine a live agent in the equation, this study focused on comparing playful learning conducted with a robot dog with playful learning situations carried out in the presence of a live dog, who each acted as learning companions in the two groups.

According to Belpaeme et al. (2013), interactions between robots and children differ from those between adults and robots. For example, presenting robots as autonomous agents may help promote children’s social-emotional development (Chernyak & Gary 2016). In our study, both “dogs,” used in separate groups (one group with the toy robot and another with the live dog) of preschoolers with the same tasks related to SEL (socio-emotional learning), were not differentiated in referring to their “liveness” vs. artificiality.

48 Simultaneously, the liveness of the play machine proposes ideas regarding its capability of keeping this forever: “The robotic dog would never die,” one child pondered (Melson et al. 2009, 556).

This study investigated play as part of children's prosocial and animal-assisted activities in the preschool context. By researching the impact of the presence of a robot dog in parallel to a live dog, we aimed to understand the possibilities of including digital technology vs. a live entity on preschoolers' apprehension of prosocial skills. To explore the firsthand responses of preschoolers to the robot dog versus a natural dog, the three learning sessions were recorded as audiovisual recordings supplemented with field notes.

We produced the study in the educational domain in the context and learning environment of early education in Finland. The research is based on materials generated with (n=15) preschoolers during (n=3) playful learning sessions. The primary data collected consisted of field notes and audiovisual recordings of the playful learning sessions. We set out to investigate similar questions to Belpaeme et al. (2018) by asking: What is the contribution of the robot dog's appearance and behavior to playful learning situations? And what are the potential roles of a robot dog in an educational setting? Learning through play is a vehicle for socio-emotional development (LEGO Foundation course), so we aimed to answer how a play machine of this kind could contribute to the learning process. Our primary research question addressed the capability of the robotic dog to function as part of socio-emotional learning (SEL) as part of guided play scenarios.

Guided play entails adult-supported play: "Guided play crucially incorporates an element of adult structuring of the play environment, but the child maintains control within that environment" (Skolnick Weisberg et al. 2015, 10). Following this idea, together with the preschool teachers, we set up a playful learning situation in which children were granted room for exploration and adults could ask open-ended questions while the children were playing.

Belpaeme et al. (2018) point to the physical presence of social robots, which makes them different from traditional learning technologies, such as laptops, tablets, or smartphones. Social robots may function as tutors or peer learners and be engaging and enjoyable. In this way, they can be understood as learning companions. Our research illustrates that they can also support learning by functioning as facilitators of playful learning.

Based on their research, Farneaus et al. (2010) formulate that robotic artifacts might trigger more complex expectations than mundane technology. Resnick (2006, 6) reminds us that "[r]egardless of how innovative or evocative they are, new technologies cannot, on their own, ensure playful-learning experiences."

Nevertheless, Conti et al. (2020, 3) state that robots can be powerful tools in the teacher's hands. Hence, an educator's lens is beneficial in studies interested in learning. Rather than measuring the outcomes of actual learning with the robot dog, our study took an interest in the potentiality of using a social companion of this kind in association with SEL undertaken in a context suited for playful learning, meaning

the preschool environment welcoming playful behavior and enhanced with new toy technology.

SEL is a learning process to manage emotions, feel and show empathy for others, establish positive relationships, and make responsible decisions (Collaborative for Academic, Social, and Emotional Learning CASEL, 2019). Breazeal (2003b) addresses how emotions are critically meaningful in understanding the capacity of social robots. Despite the goal of facilitating the learning of pro-social skills through exercises of guided play, the preschool children's interaction with the *Joy For All Golden Pup* involved petting and scratching the robotic dog — manipulations that are familiar not only with live animals, like pets, but also in association with object play with plush animals.⁴⁹ Still, there are differences between soft toys, animals, and technological pets, like social robots: Inert toys like traditional teddy bears, says Ackermann (2005), are both malleable and stable. Giddings (2019, 75) writes that they “imbued life and intelligence only by the imaginative and manual action of the child him or herself”

This meant for our study to investigate how social robots may become play partners, not replacing human contact but enhancing human-to-human communication. The key findings of the pilot study illustrate that the children anthropomorphized the Golden Pup by attributing it with life-like qualities and treating the robot dog more as if it were human-like rather than attributing human-like behaviors to the living dog.

Questions that remain unanswered are whether or not it is a good thing to use animal substitutes replacing real animals and, like Turkle (2006), question the capacity of “deceitful interchange” that follows the persuasive strategy of the play machines, reinforcing the belief that the machine really cares for us in our interaction:

Do plans to provide relational robots to children and the elderly make us less likely to look for other solutions for their care? If our experience with relational artifacts is based on a fundamentally deceitful interchange (artifacts' ability to persuade us that they know and care about our existence) can it be good for us? Or might it be good for us in the “feel good” sense, but bad for us in our lives as moral being? [...] These questions ask what we will be like, what kind of people are we becoming, as we develop increasingly intimate relationships with machines. (Turkle 2006, 3, emphasis in original; cf. in Varga 2009, 83)

49 Melson and colleagues (2008, 100) make an important observation: “Children who are more deeply attached to their dogs respond to a robotic pet differently than children who are not dog owners.” In this study, we did not ask the participating children about the live pets in their families. However, it is possible that earlier experiences with live animals, and dogs in particular, have consequences for interaction with robotic pets like the *Joy For All* robotic dog used in our study.

Following Krueger and colleagues, it is also necessary to explore the social implication of artificial companion animals by asking, for instance, whether they teach children to nurture or waste empathy on robotic animals that should be invested in human beings (Krueger et al. 2021). These are essential but difficult questions, yet they must be considered in future research. It may be a question for future research to apply the emerging area of robotic pets to the list of play machines that require advanced digital (toy) literacies emphasized with the expertise of the *robotification* of play.

KEY FINDINGS OF THE STUDY SUMMARIZED:

The following key findings answer the main research question: **“How has play moved human players of the Western world in 2010–2020 regarding physical, cognitive, and emotional mobility/movement?”**

- Digital media extend the possibilities for children’s (playful) learning. This applies to social robotics: Play machines like robotic dogs can be part of early education that moves the players cognitively and emotionally. This promotes possibilities for the learning of socio-emotional skills or SEL.
- There has been an emergence of *natural user interfaces (NUI)* and their approachability in challenging the plastic and metal in commonly known machines: The use of life-like coatings of robotic pets instead of sleek shells will lead to a move away from oculo-centrism to more multisensorial approaches in play, including the use of tactile means, hence moving the focus from visuality of play to what can be sensed through interaction through touch.
- Simultaneously, we should remember that while technology as an instrument may help advance mental, physical, emotional, and linguistic abilities, it can’t replace human interaction, especially when considering children (Saracho 2015). This observation should be extended to the capacities of live animals to contribute to playful learning scenarios to distinguish between dogs and robots.

Key findings to answer the sub-question “**How are the acts of play realized through digital technology use, and what functions does the playing have for the players in this study**” follow:

- The aesthetics of robotic dogs (as the “opposite of uncanny”) are key considering their use as part of playful learning of SEL. In our study, the robotic dog, perceived as cute by the players, invited the preschool children to form relations with the robotic dog through playful encounters guided by the learning sessions. By nurturing the robotic dog, the children learned about emotions through discussions within the preschool group.



Figure G.

5.6 Article VI: Playing with Speculative Toy Fiction

“Let the future tell the truth,” said the futuristic scientist Nikola Tesla (Cheney 2001, 230). The sixth and final case study produced for this thesis — Article VI: “Reading Ron Right: Speculative Toy Fiction, Friendship, and Design of Future IoTs” (Heljakka 2022) — focuses on future visions in the area of technologically oriented research on toys and play by presenting a case of *speculative toy fiction*, considering the future evolution of Internet-connected toy technology. The publication — a conference paper published in November 2022 — illustrates how the play machines designed and developed in the 2010s may influence the further design of more elaborate versions of this genre of playthings when speculative accounts are taken into consideration in envisioning affordances of future toys.

As detailed in Article VI, the investigation of speculative toy fiction includes robotic agents of many kinds. Krueger and colleagues (2021) consider the importance of relations between humans and robots, in any form, and whether they manifest as short-term or long-term relationships:

Robotic agents will be life-long companions of humans in the foreseeable future. To achieve such successful relationships, people will likely attribute emotions and personality, assign social competencies, and develop a long-lasting attachment to robots. However, without a clear theoretical framework — building on biological, psychological, and technological knowledge — current societal demands for establishing successful human–robot attachment (HRA) as a new form of inter-species interactions might fail. (Krueger et al. 2021)

In his influential essay, Nigel Thrift predicts that the role of toys will be important as trendsetters. He writes: “In the past, new technologies were born in the workplace and ended up in toys. In the future, toys will be the trendsetters” (Thrift 2003, 389). Again, design theorists Kudrowitz and Follett (2014, 241) suggest that “toy designers need to imagine how technology that’s emerging today might be incorporated into future playthings when the technology becomes affordable for mass production.”

By analyzing the transcript of dialogue of the film *Ron’s Gone Wrong* (Smith & Vine 2021) and conducting a content analysis of media articles (reviews and interviews) of the film, the aim of this study is to illustrate the critical affordances of the Internet-connected toy, an encapsulation of speculative toy fiction. In this way, the study excavates the (possible, if not probabilistic) future terrain of toy development without taking a stance on its quality as a utopian or dystopian view of times coming, but rather the dimensions of the toys’ affordances as compared with the features of existing toys.

The term “speculative fiction” was coined by Robert A. Heinlein in 1941. According to Oziewicz (2017), speculative fiction is a subgenre of science fiction that deals with human rather than technological problems, focusing exclusively on possible futures. Baumer and colleagues (2020) point out how “fictional narratives have played a role in interaction design through scenarios and personas since the emergence of HCI as a field.” Nevertheless, studies specifically concentrating on technological toy fiction remain few. With the study presented here, the author wanted to contribute to this emerging field.

While the analysis of the movie *Ron’s Gone Wrong* functions as a speculative toy fiction case study, the genre is not entirely new. Narratives of toys are a standard in literary fiction dating back hundreds of years and have probably inspired iconic cinematic storytelling and films like the *Toy Story* series. However, speculative fiction showcasing future robots is scarce. One example, such as a story featuring a future robot, is *WALL-E*.

Children’s films allow viewers to “escape from an everyday reality that is not always pleasurable and fun and may post challenging dilemmas” (Tranter & Sharpe 2011, 37). In their analysis of the famous movie *WALL-E* (2008), Tranter and Sharpe (2011, 34) wrote that the feature film “reveals societal and cultural anxieties so that several messages are identifiable.” Similarly, *Ron’s Gone Wrong* reveals societal and

cultural anxieties related to a childhood explained by technologically oriented play and social media cultures. The film critiques social media logic by confronting the ethos of “likes” and attempts to show how genuine relationships are built on knowing your friends throughout and appreciating them despite their faults.

A robot can be caricatured and resemble animated figures (Fong et al. 2003). Ron, one of the film’s two main characters, is a B*Bot, which can be conceptualized as a child-orientated technology (Stephen et al. 2013). The official movie novelization tells the tale of the day when B*Bots were launched:

*Everyone could remember where they were the day the B*Bots arrived. It was broadcast across TV stations, live feeds, streaming services, and phone screens to an audience of billions. Bubble, the coolest high-tech company on planet Earth, had done it again. But this time what they were promising was a product smarter than the smartest phone and more social than any social media app. They were promising a new kind of friend for everyone. (Phegley 2021, 1)*

“Ron” is the robotic innovative toy, a “B*Bot” who becomes close friends (and a substitute for human friendship!) with its owner and player, “Barney,” a young boy of 11 years who does not have many human friends before his adventures with Ron. Barney, the story’s main human lead character, wants a B*Bot to make friends (Gogler 2021). Despite its faults — or because of them — Ron becomes a hero by guiding his human owner to make friends.

Although cutified⁵⁰ and innocent-looking, Ron represents radical innovation (Kudrowitz & Follett 2014). Essentially, Ron is a future example of IoToys, able to connect to the Internet, just like the actual (existing and marketed) toys investigated in Article II of this thesis. However, as a fictional entity, Ron belongs to the future landscape of speculated fiction, with a sophisticated 360-degree projective surface and the ability to move effortlessly on any terrain. In other words, its body makes a three-dimensional screen, customizing itself to its owner’s liking. Players can even switch up the colorful skins of their B*Bots from bunny rabbits to Mexican wrestlers, in a nod to interactive games like Roblox” (Lemire 2021).

Ron is a plastic, “embodied and physically instantiated” robot (Lee et al. 2006; c.f. in Peter 2017) with a natural interface representing haptic technology that operates through speech, gestures, and vision. At the same time, Ron is limited in terms of electricity, as it is powered by solar energy. Besides its shiny appearance, the toy is not meant as a status symbol only but as a “toy friend” to connect with, who aims to learn all about its owner. In the movie, B*Bots are not “playthings on the child elite, selling to just a few well-off households” (Thrift 2003, 397) but instead are depicted as a toy

50 Cutification has been identified as a sub-branch of toyification (see Thibault & Heljakka 2019).

that everyone (at school) has. “Classrooms of the future will likely feature robots that assist a human teacher” (Belpaeme et al. 2018), but in *Ron’s Gone Wrong*, the B*Bots function as entertainment, not education. In the school environment depicted in the movie, humans still carry the responsibility for teaching, and B*Bots are displayed in the school corridor during classes.

In their study, Lionel et al. (2020) found that robots working as assistants, who presented a playful personality, were perceived as more socially attractive and intelligent. Like *WALL-E*, Ron is a misfit robot that, despite its malfunctioning, sets out on a mission to “learn” his owner’s personality, manners, and likings as thoroughly as possible.

New technologies create new opportunities for meaning-making (Yelland 2011). In the context of *Ron’s Gone Wrong*, futuristic and simultaneously speculative fiction offers a pathway to consider the evolution of Internet-connected toys and food for thought for future technology-oriented toy design. Based on the analysis of Ron’s affordances and comparing them with earlier suggestions on how to design child-oriented technologies such as toys, the conference paper, Article VI of this thesis, presents a set of guidelines that is of potential interest to design practitioners and researchers focusing on playthings, most of all the play machines that are of particular interest for this thesis.

Pantzar claims (1997, 64) that “technologies have transforming potential which could be identified possibly only retrospectively.” In my view, speculative fiction proves otherwise — for example, through speculative toy fiction (Heljakka 2022), it is possible to catch a glimpse of what the future might hold.

KEY FINDINGS OF THE STUDY SUMMARIZED:

The following key findings answer the main research question: **“How has play moved human players of the Western world in 2010–2020 regarding physical, cognitive, and emotional mobility/movement?”**

- Animated toys, like the fictitious social robot companion Ron the B*bot, or a representative of the future of IoToys open possibilities for reflection and exploration of relationships outside of human presence (Ackermann 2005). In this sense, speculative toy fiction serves anyone involved in designing interactive and Internet-connected future toys.
- *Ron’s Gone Wrong* offers ample examples of affordances that envision how play moves us physically and emotionally through possible play machines—with a completely new kind of body, consisting entirely of a screen, Ron has a ‘360 degrees projection’ and ability to connect online: Physically, Ron the B*bot represents an effortlessly moving robotic friend who can become

mobilized in several ways. At the same time, the toy beautifully depicts the emotional investment of an artificial toy friend, with altruistic tendencies opening conversations on how play moves us regarding the fruits of the toy design of the future.

Key findings to answer the sub-question “**How are the acts of play realized through digital technology use, and what functions does the playing have for the players in this study**” are as follows:

- In this instance of speculative toy fiction, play between the lead characters Barney and Ron happen in many ways: Ron is a physical toy as much as an Internet-connected and robotic social companion. Through its affordances, which are physical, functional, fictional, and affective in nature, Ron as a B*Bot affords many kinds of play ranging from dressing up the robot (object play and role play enabled by its *physical* dimensions), interacting with the toy through its technologically enhanced functions, digital connectedness-enabling the ability to connect to online environments, such as social media platforms (sound, light, and movement, which will allow for taking the robot on walks and adventures or even to use it as a ride-on toy, i.e., *functional* dimensions), narrativizing and anthropomorphizing the toy through, e.g., naming the robot (*fictional* dimension), and building an emotional relationship with the toy through its emotionally inviting characteristics, e.g., cute aesthetics, friendly gestures, and behavior (*affective* dimensions).
- In the movie, the toy friend befriends Barney and points to the significance of future toys’ ability to recognize the importance of counteracting undesired human phenomena such as loneliness, a topical issue in today’s society, which presents a challenging, yet intriguing theme for research interested in future toys as play machines for the years ahead.

Publication	Main findings	Scholarly contribution	Ideas for future research
<p>Article I</p> <p>“From Displays and Dioramas to Doll Dramas. Adult World Building and World Playing with Toys,” <i>American Journal of Play</i>, volume 11, number 3, 351–378.</p>	<p>Adult world-play with toys entails movement of the imagination and fantasy, photoplayed stories of spatial arrangements with character toys as physical or manipulative actions, and screen-based digital actions, i.e., hybrid world-play.</p>	<p>Conceptualizing <i>adult world-building</i> and <i>world-playing</i> as imaginative, spatial, and hybrid world-play</p>	<p>Further studies may address the propensity of displays, dioramas, and doll dramas as a form of identity play that may or may not connect to unreal fantasies or to the players’ actual lives.</p> <p>Another avenue for future work would be to map out world-playing practices of children and youth who narrativize character toys.</p>
<p>Article II</p> <p>“Persuasive Toy Friends and Preschoolers: Playtesting IoT Toys.” In Giovanna Mascheroni & Donell Holloway (Eds.) <i>The Internet of Toys: Practices, Affordances and the Political Economy of Children’s Play</i>. Palgrave Macmillan, 159–176.</p>	<p>The affordances detected were three-fold: 1) physical play affordances, 2) pre-programmed play affordances (including educational affordances), and 3) affordances for pretend play and personal meaning-making.</p> <p>Based on the findings gathered and analyzed in our play-tests, the complementing design values of connectivity, nurturing, and social play were added to previously articulated ideas.</p>	<p>Highlighting the <i>play affordances, children’s perceptions of toy play patterns, and design values</i> for IoT toys as tabulated in the chapter</p>	<p>In future studies of IoT toys, further agency must be given to the educators and parents, but most of all, the playing children. An essential part of this is to ask them about their ideas related to physical, cognitive, and emotional movement on playing with the play machines understood in the context of the study as hybrid toy friends.</p>
<p>Article III</p> <p>“Toy tourism. From Travel Bugs to characters with wanderlust.” In Nicky van Es, Stijn Reijnders, Leonieke Bolderman & Abby Waysdorf (Eds.) <i>Locating Imagination. Popular Culture, Tourism & Belonging</i>. Routledge, 183–199.</p>	<p>Toy tourism as a mobile and location-based activity manifests as both paidic and ludic activities illustrating evidence for multifaceted toy play at a mature age.</p> <p>Toy tourism (or toyism) implies the physical mobility of toys, mobility of the imagination of players, and long-term emotional attachment to the traveling toy characters.</p>	<p>Detecting, analyzing, and articulating the <i>sub-categories of toy tourism</i>, namely</p> <ul style="list-style-type: none"> a) free-form traveling of players with their toys b) semi-professional toy hosting programs c) Travel Bugs within geocaching d) professional toy tourism agencies 	<p>To study the toy travels in more detail by focusing on long-term journeys and reporting them.</p> <p>Sending out toys to travel through a professional agency and studying the management of this toyism experience from the viewpoint of professional (non-human) tourism management. Investigating toy tourism from an intergenerational perspective.</p>

Publication	Main findings	Scholarly contribution	Ideas for future research
<p>Article IV “Liberated through teddy bears: Resistance, resourcefulness and resilience in toy play during the COVID-19 pandemic.” <i>International Journal of Play</i>, December 2021, 387–404.</p>	<p>There are still uses for physical toys in play, like teddy bears in intergenerational play. Players are resourceful and innovative in creating novel play scenarios in uncertain times and, by doing so, present resistance to mentally challenging situations and promote playful resilience.</p> <p>Intermixing physical play based on a popular plaything with screen-based technologies and social media sharing may lead to a global and viral play phenomenon.</p>	<p>Conceptualizing the term <i>ludounity</i> and the concept <i>playing for the common good</i>, and showing their relevance for play during the COVID-19 health crises</p>	<p>Toys, as employed in association with pandemic toy play, can act as both emotional crutches and objects of resilience — more research could be conducted on the role of these toys, e.g., in times of war.</p>
<p>Article V “Playing with the Opposite of Uncanny: Playful Learning with a Companion Technology Robot Dog vs. A Real Dog.” Proceedings of <i>CHI Play’2020</i>, Virtual event, 2–4.11.2020, 262–266.</p>	<p>Natural user interfaces (NUI), such as life-like coatings of robotic pets, will steer a movement from oculo-centrism to more multi-sensorial approaches in HRI and CRI.</p> <p>The interaction capabilities and aesthetics of robotic dogs are essential, considering their use as part of the playful learning of SEL.</p>	<p>Conceptualizing the robotic dog as the “<i>opposite of uncanny</i>” by referring to its cute and approachable character</p> <p>Exemplifying how robotic dogs can be used in research in parallel to a live dog to make comparisons between robot-assisted learning vs. animal-assisted learning</p> <p>Adding to the understanding that a robotic dog more than a living dog may assist in simulating human interaction more than human-animal interaction</p>	<p>Continuing the explorations of the capacities of robotic dogs to enhance SEL by designing even more opportunities and scenarios for guided play as part of early education.</p> <p>Implementing the idea of using a robotic dog in different contexts, such as adult and senior play environments, to understand the potential of the play machine to enhance well-being attained through play.</p>
<p>Article VI “Reading Ron Right: Speculative Toy Fiction, Friendship and Design of Future IoT Toys.” In Proceedings of the 25th International Academic <i>Mindtrek</i> Conference 16-18.11.2022, 334–338.</p>	<p>Speculative toy fiction serves anyone involved in the design of interactive and Internet-connected toys of the future.</p> <p><i>Ron’s Gone Wrong</i> offers ample examples of affordances that serve to envision how play moves us with future play machines in multiple ways.</p>	<p>Coining the term <i>speculative toy fiction</i> and addressing its usefulness in analyzing possible future directions for design</p> <p>Synthesizing a set of design guidelines for IoT Toys of the future</p>	<p>Using the study as a starting point for explorations in mapping out human-robot friendship in fictional narratives as well as part of design fiction, which aims to solve societal challenges such as loneliness and bullying.</p>

Table 2. A summary of the main findings, scholarly contributions, and future research ideas per publication.

6 Discussion

Human beings have always toyed and played with things. Object play as a form of play behavior that involves various props has intrigued players from the early beginnings of toy history. In the thesis, I began to discuss play by giving an example of a(n) (art) historical perspective on children's play, namely Pieter Bruegel's painting from the 1500s. As illustrated by this painting, *Children's Games*, historically perceived playing involved other players and physical objects. Already in the 1500s, many playthings existed and were used in Bruegel's art — play could manifest in physical and material ways and, perhaps most notably, as a mobile activity that takes place outdoors. If a similar painting was made of the playing children of today, an artist would probably include indoor space in the representation, depict significantly more toys and games in the artwork, and would most definitely make use of the technologies used by the players to illustrate how play is ever more often accompanied by devices or machines operated both indoors and outdoors, as envisioned in the AI-enhanced replaying of the painting (Figures A-G).

Due to technological development, play is more perceivable and more perceived than ever before. It is observed, followed, presented, documented, spectated, and evaluated. Children's play and games have been analyzed from the late 18th century onwards (Sutton-Smith & Rosenberg 1971). In the past decade, studies on digital play have evolved rapidly. This thesis draws on earlier research that illustrates how play and creativity can be fostered through the use of technologies (Marsh et al. 2018). The background literature comes mainly from early childhood (education) studies, interaction design studies, and play studies.

“The human mind seeks to categorize many aspects of the world” (Melson et al. 2009, 547). This thesis took an interest in the evolution and effects of technologization and, mainly, digitalization of play over ten years. The thesis has aimed to provide a glance at play in 2010–2020 by focusing on toys, technologies, and mobility in a digital world. The main objective of this thesis was to increase understanding of how play moves us physically, cognitively, and emotionally in terms of digitalization and connectedness of device-based play, also categorized as digital play. The focus of the thesis has been to answer the question of how movement occurs in digital and Internet-connected play. The guiding sub-questions pursued were the following: How does play happen with various devices, and how has play with play machines evolved over the past decade?

As early as 2009, Johnson and Christie already called for more research on technologically enhanced toys. Earlier research recognizes that as children become more and more adapted to technological devices in their everyday lives, the play they engage with is bound to change and adapt (Cohen & Waite-Stupiansky 2012). Still, the public discourse on technologically enhanced play seems imbalanced in favor of the negative aspects that playing with devices (and often through screens) entails.

Even though technologically driven or technologically enhanced play is being widely domesticized, networked play, however perceivable for those interested in technologically oriented play, may still need to be made more prominent and understandable for the general public. This becomes evident in the discourses surrounding play, in which the activities grounded in using devices are often understood as something apart from play. But *what* is casual, curious, and creative human interaction with machines if not play?

As highlighted earlier, in Henricks's (2006) words, to "play with" an object is to experience the satisfaction of trying to control it. In terms of this thesis, this idea could be extended by replacing the word "object" with "technology." Because we familiarize ourselves in play and domesticate technologies, they become part (and partners) of everyday life. As the thesis has demonstrated, play evolves around physical (and *phygital*) resources and established and emerging and already-established technologies. (Phygital results from the integration of physical and virtual world. See e.g., Del Vecchio et al. 2023) The data reviewed in the articles present evidence of the multidimensional nature of digital play as part of leisure, learning, and productive endeavors, even playbor.

There is a fear often articulated and made visible in news media — the question of the decrease of play time and contemporary children's supposed restricted ability to play, which are often proposed as threats to contemporary childhood. At the same time, scholars such as Brian Sutton-Smith have envisioned that the 21st century will be the Century of Play, i.e., what he calls the ludic era (Sutton-Smith 1997). For this reason, my attention in the context of this work was steered toward the devices and things that contribute to the formation of play, discussed here as play machines and digital toys, and their meaning for what is termed here as digital play.

The thesis at hand shows how an understanding of the nature of toys has expanded during the 2010s, driven by digital technology: Some see mobile devices themselves as new types of toys, with smartphone and tablet screens channeling content and possibilities for digital play and fantasy worlds as well as edutainment. For example, smart toys, which entered the mass market more widely in the 2010s, are increasingly connected to digital technology and information networks drawing on "material" that invites, inspires, and encourages play of people of various ages.

Digital games stand as the most prominent example of play "material" as content for playing audiences since their beginnings at the end of the last century; however, this thesis attempts to lay out broader perspectives on digital play, which emerges through player interaction with physical (tangible) play material, physical surroundings, and consists, to a large extent, of activities still determined (and limited) by the fact that the human player is a physical, organic, and living entity. While the non-human agent is slowly becoming a more relevant actor in digitalizing and networked play as IoToys and robotic pets have entered the playscapes of leisure,

edutainment, and the occupational sphere of work-life contexts, the human being plays with play machines separate from herself.

The introductory part of this thesis sought to answer questions such as: Which societal transitions have led to the strengthening of these beliefs, and which lines of development have contributed to the fears and hopes associated with the evolution of play? How have the things made for play come to have a close relationship with digital technology and media? And what really has changed in play during the past decade?

To understand how play moves us at the dawn of a new century has required an open and courageous mind of the researcher, one with a background in art and design, cultural research essentially connected with visuality and materiality, and more recently, with some flirtation with the areas of game studies and HCI, or human-computer interaction.

The thesis represents a humble thread in the research tradition focusing on the relationship between digital technology and multidimensional movement in play. The merits of the research are the mosaic of case studies that represent various facets of new branches of technologically oriented play, namely digitalization and digital connectedness.

The research reported here, which aims to be both descriptive and evaluative, makes interdisciplinary contributions to toy research, play (and game) studies, research on human-computer interaction (HCI, with a particular focus on interaction design interested in play-based interactions), and early education. While play is primarily about behavior related to our participation with the world, other players, and our inner lives, play with technologies is also about cultures of production, spectatorship, and consumption. Therefore, digital culture functions as an umbrella term and theoretical framework for the conducted research, allowing the author to traverse the boundaries of academic realms such as early education and game research. As a multidisciplinary scholarly contribution, it aims to illustrate the existence and vibrancy of play beyond the childhood years, unlimited by the possibilities of traditional playthings only. The findings and suggestions for future work summarized in Table 2 may be of use to those interested in the possibilities digital technologies bring to leisure, learning, and productive endeavors undertaken with toys and technologies that provide possibilities for movement.

According to Kücklich, play as a form of behavior functions as a workable “language” through which to speak about “new media,” interpreted here as play machines::

[n]ew media are simultaneously limiting and liberating, open and closed, controlling and controllable. This ambiguity might be addressed in other terms. Still, the terminology of play seems to offer a unique opportunity to speak of it in a language that acknowledges this ambiguity as an asset rather than an annoyance. (Kücklich 2004, 40)

Mobile devices, social media, and networked objects and Internet-connected environments create new manifestations and dimensions for play by, for example, augmenting traditional play with the use of digital technology. Mobile devices offer “unprecedented mobility to the affordances of previously static technologies and experiences” (Moore 2011, 381). How does contemporary play using these resources move the players?

This thesis has addressed how contemporary play often manifests as play with devices; most notably, play is carried out in the presence and utilization of screens and seductive spectacles in terms of content created for play.

In sum, the research conducted for this thesis found that:

- Adult world-play with toys entails movement of the imagination and fantasy, photoplayed stories of spatial arrangements with character toys as physical or manipulative actions, and screen-based digital actions, i.e., hybrid world-play. Movement in these instances happens cognitively within toy players’ imaginations and creativity in photoplay; physically within the intimacy of the home as part of toy displays and dioramas; and digitally through socially shared doll dramas online. Emotional movement is generated as players form player relations with the toy characters. (Article I)
- The affordances detected in preschoolers play with IoToys were threefold: 1) physical play affordances, 2) pre-programmed play affordances (including educational affordances), and 3) affordances for pretend play and personal meaning-making. Based on the findings gathered and analyzed in our play-tests, the complementing design values of connectivity, nurturing, and social play were added to previously articulated ideas. Movement with IoToys results from the players’ physical (and social) interaction, from cognitive and imaginative engagement by employing the toys’ affordances (physical, pre-programmed, and educational affordances), and from emotional bonding invited by the “toy friends” persuasion strategies for nurture and care. (Article II)
- Toy tourism as a mobile and location-based activity manifests as both paidic and ludic activities, illustrating evidence for multifaceted toy play at a mature age. Toy tourism (or toyism) implies the physical mobility of toys, mobility of the imagination of players, and long-term emotional attachment to the traveling toy characters. Movement results from physical (and geographical) mobility of the toys as part of the cognitive and imaginative engagement with the character toys’ travels offline and online, and emotionally, from the (often long-term) relationships established between players and the toy personalities with wanderlust. (Article III)

- There are still uses for physical toys in play, like teddy bears in intergenerational play. In pandemic toy play, players are resourceful and innovative in creating novel play scenarios in uncertain times and, by doing so, present resistance to mentally challenging situations and promote resilience. Movement results emotionally and imaginatively in the players' minds by engaging with the teddy bears and their stories displayed in windows, and physically as part of making the toy displays, or on players' walking tours with the (game-like) goals of the teddy challenge in mind. (Article IV)
- Natural user interfaces (NUI), such as life-like coatings of robotic pets, will steer a movement from oculo-centrism to more multi-sensorial approaches in HRI and CRI. The interaction capabilities and aesthetics of robotic dogs is essential, considering their use as part of the playful learning of SEL. Movement with a robotic dog results from the players' physical (and social) interactions with the robotic dog; from cognitive and imaginative engagement by employing the toys' affordances and support from early education experts guiding the playful learning situation aiming at prosocial skill-building; and from emotional bonding invited by the "dog's" cute appearance as the "opposite of uncanny." (Article V)
- Speculative toy fiction serves anyone involved in the design of interactive and Internet-connected toys of the future. *Ron's Gone Wrong* offers ample examples of affordances that serve to envision how play moves us with future play machines in multiple ways. (Article VI)

Riede et al. (2018, 49) observed that from an archeological perspective, "much of children's object-centered activity leaves no traces." The use of digital technologies in association with play has challenged the ephemeral nature of play. While play in physical environments leaves marks on these environments and on material playthings, digital play tends to leave its mark in digital environments. So does the hybrid play carried out with toys in combination with play machines. The case studies presented in this thesis are illustrative examples in this perspective.

Adults' views on digital play vary from its being a reward (for children) or a distraction from work (for adults) (Marsh et al. 2020). Nevertheless, in the studies carried out for this thesis, it becomes possible to see that digital and Internet-connected play has functions across leisure and learning, extending all the way to the productive play often associated with the work lives of adults.

Following Berry and Schleser (2014), mobile media adds up to the possibilities of self-expression and self-presentation in online worlds. In essence, play is, besides self-actualization, an expressive activity. For this reason, contrary to previous understandings of play as a non-productive activity, 'techno play' must be understood as productive.

Marsh et al. (2020) have observed how playing with digital technologies involves content creation. Thanks to creations like the fruits of photoplay, proof of human play can be found in the realm of digital culture. Documentation and shared play content circulate on social media platforms. The mimetic quality of play combined with technologies and media makes the tracing of play possible and the acts of play perceivable. Consequently, the researcher of play no longer needs to be a digital archeologist but rather a digital archivist and analyst. Material on and about digital play — recordings and documentation of players and research papers — is vast and seemingly ever-growing.⁵¹

The digital footprints (and thus, our entire *digital legacy*, see Maxwell 2020) we leave in virtual environments grow exponentially in the virtual realm, which on the one hand, proposes challenges to research, but on the other, these traces offer tremendous potential for those interested in the human use of technology and behavior related to this use. Thus, *play knowledge* becomes a crucial informative resource for future research.

The richness of (audio)visual documentation and descriptions of both adult's and children's play separately and together as intergenerational play presented in this thesis serves as fragments of play knowledge linked to the developments of digital and Internet-connected play, which researchers and experts of play cultures can return to analyze the features of play in even more ways that have been detailed in the featured publications.

Players are central informants in delivering information about how play exists in each period and how it emerges in various contexts. As the individual case studies of this thesis suggest, players tend to move fluently between their physical play environment, digitally mediated content, and online platforms for play, depending on the instances of play. This hybridity of play is a result of mobile and Internet-connected technology and, to an ever-larger extent of players' capabilities to navigate the playful world with its possibilities and communities despite the limitations cast on play by societal realities: Play belongs to all age groups and, if allowed, thrives across leisure, learning, and productive endeavors. Moreover, play contributes to health and fights isolation, loneliness, and depression.

Marsh and colleagues (2020) suggest that the children's media industry, including makers of games, could give more attention to making products (games and apps) that encourage the crossover between digital play and physical skills. On the one hand, based on the research conducted for this thesis, it is possible to

51 Due to the limitations of working on a Ph.D. thesis, decisions on how to limit the research need to be taken sooner than later. For this reason, the newest background literature gathered for this summary part of the doctoral work was published in 2022, and some references that stem from 2023 were added as a final touch.

see that three-dimensional physical toy characters fulfill such needs of coupling digital technology use — camera technologies in particular — to enhance creative handicrafts in players of all ages. On the other hand, according to the findings of research on contemporary, Internet-connected toys, IoToys that can move also invite their players to physical movement. As demonstrated in the case studies, the mobilizing tendency of technologically supported play includes physical mobility related to an “off the couch” mentality (Cumbo et al. 2014) and a flexible mindset ensuring mobility of the mind. This is why the role of imagination for play can never be overtly stressed; even in the company of physical playthings and technological play machines, the imagination, creativity, or application of self-directed goals of *homo ludens* is unlimited.

Playthings evolve with the developments of media and related technologies — technologies that enable access to (social) media influence play — and finally, the merging areas of playthings and media technology, as in connected toys, affect the overarching cultures of play.

Technologically oriented play has long been viewed to include potential risks for human well-being through negative consequences on health through addiction, encapsulation, and passivity. In connected and networked media ecologies and cultures, privacy and safety questions and data protection arise in children and all players, young and old. Concerns about passivity, even stagnation in both body and mind, are associated with screen use and screen time. The limitations of devices on physical lethargy, in the worst case, cause obesity in children and youth. Communication fatigue caused by a constant stream of information and content mediated through devices and screens is believed to result in mental passivity, stagnation, defects in emotional regulation, and offline human interaction.

Alternate views on *the digital leap of play* investigate it beyond concerns linking to the use of digital devices and media consumption: Seen in a more positive light, the variability in hybrid play offering digital or otherwise technologically enhanced play activities balances the experiential space of play widening our understanding of how non-digital and digital play co-exist in a harmonious relationship. Play with devices involves technologic voluntarism, if not technological determinism, meaning that there is a belief in the positive influence of technology use on human behavior — playful use of digital devices not only enslaves but, at best, enables, extends, and enriches human play.

This thesis has taken a broad interest in play that happens with (digital) cameras, Internet-connected toys, smartphones, social media screens, social robots, and speculative toy fiction. In this way, digital technology factors as a significant influence on play in all sub-studies.

Following the idea presented by Nigel Thrift (2003), author of the insightful essay “Closer to the Machine? Intelligent Environments, New Forms of Possession and the Rise of the Super Toy,” one of the aims of this thesis has been to answer the call to

investigate play with these new kinds of playthings, as Thrift challenges: “Clearly an important step in the research of this kind is to look at how children (and adults) use these toys.”

The advantages of digital and connected play are numerous, as shown by the case studies taken for this thesis. Digital play involving digital toys enhances and improves the *technological agency* of players. From the perspective of the studies presented in this thesis, this play technology offered the first possibility for players to be mobilized through play, suggesting the movement of the plaything and the players.

Marsh (2017) has noted the critical transformation of the spatiality of play, meaning fluid movement across previously understood boundaries between the physical and the virtual. Indeed, the playgrounds of today encompass much broader realms than before. Play expands to digital worlds, but digital worlds mediated through mobile devices also seem to extend the playing psychologically — imaginatively, cognitively, and physically — location-wise. How *play* with machines moves us today is mainly in similar terms — players are driven not only by the innate thingness, aesthetics, narrativity (and — aliveness!) of the playthings but also by the play patterns dreamed up by the players themselves. Much of solitary play manifests as an imaginative practice or play of the mind. In contrast, in social play, the players come up with activities and engage with common understandings of how the playthings are used as focal points of movement of the social imagination as well as the movement of our physical bodies and movement within virtual contexts of social media platforms. With the possibility to move our attention to envision the future, the playful mind can go anywhere.

Healey and Mendelsohn (2019, 4) state: “Technology has played a vital role in supporting the use of toys, and it is anticipated that the role of technology in addressing developmental interventions will increase over time with the guidance of research.” In early education, finding a balance between playthings that provide open-ended play and, for example, ensuring that smart toys cater to more structured, game-like forms of play is a matter for educators to consider. It is important to realize that toys of this kind may enhance learning through the mobilization of body and mind. Many technologically driven playthings, such as smart toys of the present, including the Internet of Toys scrutinized in Article II, the robotic dog investigated in Article V, or the speculative toy robot B*Bot presented in Article VI of this thesis, are essentially *moving machines* that equally demand some movement from the player — either dexterity of the body or one of the mind. Materiality and immateriality intersect in these elaborate play machines, meaning a combination of non-digital (here, physical) and digital, and linkages between inanimate and animate.

As the data suggest, digital technology seems to function as a prompt for play: Technology has manifold meanings for playing, for what constitutes a plaything, how players engage creatively with devices as the assistants, enablers, and enhancers of

play, and for how technologically driven play inspires new play patterns — and in due course, moves us physically, cognitively, and even emotionally.

The featured articles present evidence on how play moves us, enabled and assisted by digital technology. Active mental movement achieved through imagination and creativity contributes to learning, creativity, and self-expression (Deterding 2016). Play makes both children and adults creative: “Play is vital for child development, especially creative growth” (Gude 2010). To exemplify, digital play is greatly influenced by human creativity like photoplay (Article I) and active modes of doing by creating and producing, not only in knowing the skills to employ digital technologies but also understanding how they can serve us as part of creative play. Therefore, examining the diversity of play forms and creative outputs tells us about the realization of the intended (and unexpected, or peripheral) uses of toys and digital technology, such as children’s ideas on the affordances of Internet-connected toys or the teddy challenge that manifested as an intergenerational form of play. Sutton-Smith claims that toy marketers’ preschool toys will improve their cognition, visual discrimination, motor skills, tactile skills, creativity, pre-academic learning, cooperative play with empathy, individuality, and self-confidence (Sutton-Smith 2017, 183). This observation of play of the 2010s is in line with perceptions about, for example, the IoToys that were play-tested in the study highlighted in this thesis (Article II).

On the other hand, as the case studies described in the thesis have illustrated, device use may lead to active bodily movement in different environments and contexts: Playing with Internet-connected toys, such as coding robots, enables vigorous physical activity by setting children’s bodies in motion indoors (Article II). Playing with smartphones allows for documenting toy tourism or *toyism* practices that occur outdoors in adjacent or faraway locations (Article III).

In unusual circumstances, play in physical and social isolation can thrive in a digital social context. The playing conducted between 2010–2020 also captures the peculiarities of pandemic toy play exemplified by the teddy challenge, in which a heterogeneous global group of players invited each other to play the teddy challenge and simultaneously spread the message of ludounity and play for the common good (Article IV). This instance of play proved the resistance, resourcefulness, and resilience of a set of intergenerational players who expressed their creativity through physical toy displays, storytelling, and social media sharing.

Curiosity and creativity are fundamental when considering digital play’s possibilities for learning. While Sutton-Smith envisions that by playing, one may learn to play better (1995, 281), it is helpful to think that playing entitles better learning experiences and supports cognitive and intellectual growth. This thesis aims to orientate in a direction that offers ideas on how digital technology use as part of play-based, toy-based, or otherwise playful learning may increase our understanding

of how technologically enhanced play advances us besides physical and emotional movement, as well as cognitive enhancement.

In many cases, play and technology can coexist and work in tandem to support learning. Bird and Edwards (2015) call for a clearer understanding of how children learn to use technologies through play to help teachers realize the learning potential of technologies within play-based approaches to pedagogy. The key to this integration is the thoughtful selection of technology (Fantozzi et al. 2018, 89), and this contributes to purposeful play in integrating skills, knowledge, and technological literacy, sometimes using multiple modalities and devices (even screens!) simultaneously.

Communication through play is often mediated through play — artifacts, devices, and shareware. Referring to Marc Scott (2013), Jayemanne and Nansen (2016) point to the concerns around children’s use of gestural devices: Children only learn about the shallow layer of apps and interfaces by engaging with these technologies. Instead, as Yelland (2018) claims, research should focus on the multimodality of resources, places, and spaces for children’s play. “The multimodality of digital media (i.e., using different forms, such as image, text, audio or touch, to present content) can enhance learning” (Plowman et al. 2012).

As long as the screens on smartphones, tablets, computers, and toys dominate to form the primary interface for steering the interaction between the human being and her play machines, and before sensor-based or audio-controlled devices with hidden technologies become the most relevant entities for human-computer interaction, we must rely on an oculo-centric, or vision-based, perspective on play at the cost of other modalities and allow more tactile actions to take place than just pushing, tapping, sliding, and so on.⁵²

So far, playful learning is not entirely a matter of learning with machines and Artificial Intelligence; it is a pedagogy guided by educators and employs technology and devices as tools and instruments in human-led learning situations. The master and servant logic is still relevant. In this way, it is not the technology that teaches. Instead, it helps to learn, as shown in the studies dealing with IoToys (Article II) and a social companion robot — the robotic dog alongside a living dog (Article V). As accentuated in the studies presented in this thesis, the learning outcomes of edutainment such as technologically enriched toys may differ depending on their employment — or whether they are used in unstructured or more guided forms of play.

52 Screen use is not altogether a bad thing — the COVID-19 health crisis has demonstrated how (distant) e-learning increased the use of screen-based technologies for both children and adults. Screen-based devices also enabled players to interact and communicate in new and creative ways, as shown in Article IV of this thesis.

In 2016, Jackie Marsh and colleagues claimed that “what changes in digital contexts is not so much the types of play possible, but the nature of that play” (Marsh et al. 2016, 250). The motivation for the thesis has not been to argue for the existence of digital play but to exemplify its various manifestations. As the West is moving toward a post-digital world, and considering the interest of the thesis at hand, a *post-digital play world*, it becomes more and more unnecessary to try to distinguish “traditional” forms of play from the digital and hybrid instances of it. Play is play. It is universal but materializes (and digitalizes) in different ways depending on the players, playthings, devices, environments, and contexts it moves with and in, and the motivations it seeks to fulfill, whether for the sake of leisure, learning, or playbor. This becomes especially prominent in futuristic visions of the developments around play involving toys as social companions — a realm of research I have conceptualized as speculative toy fiction. Even highly developed toys of the future carry with them invitations to play that are, to some extent, universal and sustainable, seeking to invite play that moves our bodies, minds, and hearts.

For a moment, let us go back to *Children’s Games*. A significant amount of play illustrated in Bruegel’s painting involves physical movement as part of a repertoire of actions. If mobile devices and Internet-connected toys were added to the picture, some of this movement could present itself in other ways. Nevertheless, it would not cease to exist. The mobilizing tendency always exists in play in one way or another. Even screen-based technologies contribute to players’ mental, cognitive, and physical movement. Better yet, it moves players closer to each other, even if this closeness does not manifest as physical closeness between players. Technology *enables* social play: As demonstrated by the research on play during pandemic times, it is possible to see how play thrives and survives even in challenging times.

While play is guided by interpersonal imagination and as a mode of creative self-expression, participating in play makes it an intrapersonal matter. Play is always social in the sense that it is communication: It arises from gestural interaction, non-verbal or verbal dialogue, and the interpretation of visual and multimodal referents conceptualized in this thesis as affordances.

Like toys and technology constantly evolve in parallel, inspiring and feeding each other’s development, play enters new areas through new tools and environments. Understanding the nature of contemporary play requires involvement in playing and interaction with its many traditional and mechanical devices as well as digital, connected, and technological ones.

One thesis finding is how new, utilitarian technologies become play machines. In their article, Ho and colleagues (2018, 13) predict that “the ubiquitous nature of technology will likely mean that tablets and other mobile devices will become more prevalent toys and learning tools for children in the future” (also see Kabali et al. 2015; Rideout, 2014). How technological play manifests starts from the play machine, the

plaything itself, an intelligent *toy*, or an extension thereof, most often a mobile device including a camera or *smartphone*. Kudrowitz and Follett (2014) observe the role of emerging technology as an *accessory* for the toy (for example, using a smartphone to control a toy car). This hints at digital technology being an *extension* of play.

In forms of more amplified technological play, the solitary activity is shared through a social platform, and communication with other players happens visually and verbally through the platform (Instagram, YouTube) in the interaction between human and human, human and toy, toy and toy, etc. Sometimes, this communication results in mimicry, meaning repetitive and imitative behavior of the play content (for example, through photoplay).⁵³ Moreover, technology is used to develop *serious toys* (such as social companion robots and robotic pets; see Ihamäki & Heljakka 2021), and networked technology produces content for play through Internet-connected playthings (such as IoToys).

The affordances of play are material, visual, tactile, and digital — and as demonstrated in this thesis, they are psychologically mobilizing as play moves our affections, and they are physically mobilizing due to the functional properties of play materials. All these affordances can merge into contemporary playthings, systems, and environments. According to the studies undertaken for this thesis, the affordances for play in the digital era represent three forms summarized in the following:

- 1) non-connected (i.e., traditional with no relationship to digital technology)
- 2) connecting (used in combination with mobile technology such as smartphones, as second-level toys and play machines in themselves)
- 3) connected (connected technology integrated into the play machine)

Sherry Turkle reminds us that “we make our technologies, and they, in turn, shape us” (Turkle 2004). Given that, to a certain extent, we have agency over the features of future play machines, we should communicate some closing ideas on the design and evaluation of interactive technologies considered in the thesis as play machines.

53 In his writing *Toys and Play*, Walter Benjamin observes that “doing the same thing over and over again,” the transformation of a shattering experience into habit — that is the essence of play” (Benjamin 1999, 120).

Article II laid out a set of guidelines developed based on “ground rules” presented in 2001 by Smart Toy Lab’s D’Hooge and Goldstein and conceptualized as design values for technology toys. According to the ideas presented in the original study by D’Hooge and Goldstein (2001, 1–2), *interactive toys* should:

- 1) be fun
- 2) open-ended
- 3) enable the child to be in control
- 4) offer a challenging and creative experience
- 5) be educational
- 6) grow with the child
- 7) involve a personal computer
- 8) be considered high technology
- 9) represent innovation
- 10) include at least one genuinely magical feature

Based on the study presented in this thesis as Article II, these design values must be complemented with *connectivity*, *nurturing*, and *social play*. Furthermore, as demonstrated in Article VI, these design values were further advanced in association with research on speculative toy fiction and the fictitious B*bot Ron, an Internet-connected “toy friend of the future,” and other recommendations given in the developing area of research on IoToys. I consider these to be valuable aspects of potentiality to consider for researchers, designers, and adults who supervise, guide, and control the use of any play machines in the domestic or educational context and suggest that play machines of the future and research interested in them should consider the following viewpoints:

Fabregat, Costa, and Romero (2004) have claimed that much work must be done in order for toy design to consider the end user. Recommendations for stakeholders involved in the design, use, and governance of play with near-future Internet-connected toys and robots (Heljakka 2022) are listed in the following.

I challenge anyone who interacts with play machines of the future to consider their value in terms of digital play, and consider their design from the following perspectives:

- Maximize natural interface.
- Consider play as a life-wide and life-long phenomenon, and accordingly, encourage age-appropriateness.
- Enable possibilities for playful learning.
- Design for adaptable, multifaceted educational value.

- Provide fun, excitement, portability, and the ability to pose the plaything.
- Facilitate social interaction in physical, digital, and hybrid play environments.
- Encourage collaborative engagement.
- Enable personalized experiences.
- Consider cultural diversity.
- Ensure safety and sustainability.
- Enable open-mindedness and freedom to play.
- Consider SEL and pro-social skills, and promote social sustainability.
- Play-test with players of different backgrounds and ages prior to and after release.

Finally, to close the discussion on the desired qualities of tomorrow's "super toys," there is one elemental dimension to be added based on the consecutive findings of the studies presented in this part of the thesis — the recommendation and guideline for design regarding *affording movement of the physical, cognitive, imaginative, and emotional kinds*.

7 Conclusions: Toward paidic understandings of play in the post-digital era

“The 21st century will be the Century of Play,” Brian Sutton-Smith has envisioned. Indeed, in 2023, the play seems to have gained a more perceivable status in culture. Referring to the work of Daniel Miller, Sutton-Smith diagnoses the state of contemporary play as follows:

As more and more people value their lives in terms of their opportunities for adequate play and entertainment, he says, the work ethic becomes displaced by the play ethic, which is more equipped to evaluate life according to these standards. This new form of human consciousness, Miller contends, is nonascetic. It highly values novel and pleasurable experiences, creativity in or out of work, and change and flexibility in all activities. (Sutton-Smith 2017, 235)

This thesis aims to examine, describe, and increase the understanding of how technologically oriented play moves us in contemporary society. I set out to investigate the role of digital technology as an agent and accelerator of play and therefore participate in the discussions surrounding technological transformations of cultural phenomena in the digital and Internet-connected age.

I embarked on a four-year research journey between 2018–2022, zooming in on a spectrum of perspectives investigating technology-driven play. I was no technologist at heart, let alone a technophile. But I do not consider myself a technophobic person either, but rather a humanist driven by tremendous curiosity toward the new paths play has taken over the second decade of the 21st century.

As digital play has been broadly viewed as a competitor of traditional play (see, e.g., Mustola et al. 2016), I took the challenge of studying the lighter side of digitalizing and Internet-connected play, focusing on the positive dimensions, benefits, and advantages of digital play.

Smith (2010) critiques a “play ethos” in which relentlessly positive assertions are made about the nature of play (particularly from a Western perspective) (cf. in Cowan 2020, 12). It would probably have been more fashionable to take a more critical stance on the influence that digital technology has on play. Still, an optimist and playfully resilient mind always gravitates toward finding positive aspects of phenomena, while moving toward new frontiers in academic knowledge. For these reasons, it is fair to say that a specific techno-enthusiasm colors the reporting of the case studies conducted for this thesis, also conceptualized as my “toy problems.”

The guiding questions pursued were: How has play moved us during the past decade? And more precisely, **“How has play moved human players of the Western world in 2010–2020 in terms of physical, cognitive, and emotional mobility/movement?”** The sub-question inquires what kinds of digital play are encountered in interactions of people of different ages as part of technologically enhanced leisure,

learning, and environments, where play is increasingly happening remotely with and through machines and social media platforms by asking: **“How are the acts of play realized in each instance of play through digital technology use, and what functions does the playing have for the players in each study?”**

Digital play has emerged as a prevalent play type (Erdogan et al. 2019). Even though digital play may be most associated with the playing undertaken in digital games, this category of play media should be the focus of only some research. Understanding the *digital leap* play has taken during the past decade necessitates a broader view than the one encompassing gameplay. Popular as gaming is among different generations, it is not the only aspect of play worth studying at the beginning of the 21st century. I reiterate: All play is not about playing (pre-structured) games. Simultaneously, all gaming, from the perspective of this thesis, is play. To be fair, however, it is possible to see similarities between toy play and gameplay.

Still, games and the research dealing with various matters around gaming make a strong case when it comes to finding touchpoints between studies and interaction with toys and other play machines.

Playing infiltrates human behavior in the contexts of leisure and pleasure and, predominantly, education and working life. Whereas games carry vast potential in driving human curiosity toward learning and productive professional pursuits, what feeds creative individuals even more are the open-ended realms of play. Indeed, this area demands more from the players than the aim of fulfilling pre-determined tasks. At the same time, though, play is also fed by constraints. Therefore, one key argument of the thesis is that certain limits are always needed for play to flourish. From the perspective of this thesis, these limits are set up by the capacities of play machines.

“Play is a way of operating a constrained system in a gratifying way” (Bogost 2016, xi). As the thesis has suggested, these “constraints” may come from devices, environments, and toys. Actual toys, besides other technological devices called play machines in this thesis, are a powerful medium that should not be neglected in future research. “For they may well herald the first steps into new kinds of more performative spaces in which the play of encounter is much more highly mediated” (Thrift 2003, 400). “Toys must be engaging, intuitive, indestructible” (Thrift 2003, 389). And indeed, if they are, “Long after Windows 95 fades, toys and stories will survive” (Ibid.).

The contributions of this thesis are manifold. The studies presented rely on the interaction of contemporary play and players in a time when digitalization and connectedness have extended to various playthings: toys, games, playful environments, and to the cultures of digital play where these instruments are used.

Carroll and Tafoya (2000, 8) claim that a description of a phenomenon cannot pretend to be exhaustive or definitive. Nevertheless, examining a phenomenon from many angles adds to the believability and reliability of the efforts taken. The bulk of the evidence presented in this thesis shows how the play of 2010–2020 demonstrates

linkages to more significant cultural developments, such as the oculo-centrism of contemporary society and the digitalizing and connected age. Visuality is still a critical aesthetic category of interest to players. The most significant feature of early 21st-century play is its relationship to visuality. The eye-catching nature of current play is primarily influenced by the use of digital technology, i.e., smartphones and other mobile devices that control play, such as tablets. Still, technology is not limited to the use of the visual sense and screens alone. The concreteness and tactility of the user interfaces used in play, such as the materiality and shape of the toys, are also important for play. The portability and mobility of devices incorporating mobile technology and traditional toys tend to mobilize the player's body and imagination. In this way, the play of the 2020s is exploratory tourism in both physical and virtual environments. Contemporary play is also social, as the documentation and sharing of play have greatly influenced the interest in today's play and the expansion of its playgroups. At the same time, affectivity is of more and more interest to play scholars, meaning that human emotions and embodied experiences are given more weight in analyses of play.

Again, the increasing presence of mobile digital technology as part of contemporary play (and object play practices) is undeniable, according to the thesis at hand. Technology use is not synonymous with play, but digital technologies stimulate and enrich play, while play helps technologies evolve. Through accounts on player behavior, we learn more about how the affordances of various systems, devices, and platforms are put into play by their users and, as a result, gain insights into how digital play emerges.

To the best of my knowledge, this is the first doctoral thesis examining and combining the variety of playthings and digital technologies, or play machines, from several perspectives regarding player age and the context where play takes place. This is to say that the multidisciplinary research conducted for the thesis at hand highlights the play of children, adults, and seniors in the contexts of early education, leisure, and playbor in a unique way and demonstrates how they employ digital cameras, smartphones, Internet-connected toys, screens of social media, and social robotics in their play in the contexts of leisure, learning, and productive endeavors. The multiple case studies have been instrumental in revealing some of the mobilizing potential and tendencies of digitalizing and Internet-connected play. I hope the thesis offers a smorgasbord of informative and interesting case studies to savor, enjoy, and learn from.

Already in 1980, Sutton-Smith wrote: "It is my view that we are so completely surrounded by, even immersed, in play that we cannot at present know its full involvement in our lives." The *everywhereness* of play in terms of digital technology and connectedness might seem ungraspable. Still, for a researcher of toys and play, it is evident that play moves as a phenomenon and reveals its presence for those ready

to interpret creative and self-expressive actions as play. In other words, in the 21st century, play is a ubiquitous phenomenon.

Malaby (2009; c.f. in Dippel & Fizek 2016) writes that “anthropology has witnessed the omnipresence of playfulness independently from digitization processes.” Similarly, play has a steady foothold in digital cultures. Examinations of digital culture provide glances at “online” human behavior. Humans are driven to play by many motivations — entertainment, humor, spectacle, and scandal. Under the shallow digital surface, however, lies a deeper web of human networks driven by play as a creative, productive, communal, and, when needed, even activist form of behavior.

According to news media, parents, and educators, one of the greatest fears about the impact of extant digital technology on play has been the concern that play mediated by technologies will suppress *traditional* play, often considered the most genuine form of play and, therefore, the most valuable.

Lawry and colleagues (1995), who studied conceptions about boys and electronic games in the 1990s, found that it was not the technology of computer games that reduced children’s play with other children, but rather the type of game that impacted this (cf. in Bartlett et al. 2004). According to the knowledge gained from the studies presented in this thesis, play is not vanishing from peoples’ lives, nor should the evolvement of digitalization and connectedness be seen as threats to the phenomenon of play and what many perceive as traditional play. In this light, it is no longer appropriate to view classic play as the highest quality form (Edwards 2013; cf. in Marsh et al. 2016). In fact, with their work on digital play, Marsh and colleagues (2016) demonstrate that counteractive views on the dichotomizing of digital and non-digital play can be proved inaccurate. An example of the irrelevance of drawing a hard line between digital and non-digital ways of playing is an observation made by Jeffrey Goldstein, who has noted how digitally enhanced toys may also be played in traditional ways (Goldstein 2012, 3). Another way to increase understanding of the unnecessary division between digitality and non-digitality, already pointing toward what has been said about post-digital play, is to look at the findings presented in this thesis. To exemplify, as stated in Article II, “we confirm that connected toy friends are multidimensional playthings that afford connections between the player and the toy beyond digitality” (Heljakka & Ihamäki 2019, 176). Perhaps, then, it is more fruitful to consider the possibility that we have entered an era of post-digital play in which digital and hybrid forms of play dissolve into what has been regarded as traditional play.

To support this idea, in a multinational study published in 2020, Marsh and colleagues found that technology plays an integral part in children’s varied play lives and, according to their findings, does not exclude other forms of play.

In the 1990s, Sutton-Smith wrote that “most modern parents still prefer children to work with playful tools (e.g., computers) rather than play with working toys (e.g., Teddy Ruckspin [sic]).” According to the studies at hand, in the contemporary world, interactive toys have raised their status to the level of computers and other technological tools, which in reverse, are considered a category of toys of their own.

Bird’s (2020) research on children’s play with imaginative technologies such as games, contributes to ideas around technological behavior and digital citizenship. The findings presented in the thesis at hand give a reason to consider that digital forms of play and the use of digital toys contribute significantly to the digital citizenship of players of all ages.

Technologies do not paralyze children but instead empower and move them: Jayemanne and Nansen (2016) discuss the mobilizations between mobile devices and children across domestic, virtual, and publicly networked spaces. Sutton-Smith has noted how children often seek to have a separate play culture of their own (Sutton-Smith 1997, 125). This urge to retreat to realms of play not frequently visited by the mature certainly applies to the playscapes of contemporary digital environments.

The centrality of play in the lives of young children is apparent. Play has been described as a “forgotten right” (Hughes 1990) of the child. In the future, this right should be extended as a right for all players regardless of age. What if this finding would be applied to digital toys and other play machines as well?

Sutton-Smith (1997) has stated that the complexity of play correlates with age. For many, play means a form of entertainment. However, the meaning of play is much deeper than amusement, even though playing is still mostly happening during leisure time. Van Leeuwen & Westwood (2008) highlight a need for mature players to engage in toy play, referring to “the advent of The SIMS and the resultant clear demonstration that there is a demand for toy play — for freeform, non-goal-oriented play activities” (cf. Bateman & Boon 2006, 27).

To continue, intergenerational play as a realm connecting children and adults in the name of joint play covers a wide range of possibilities: “There is little doubt that play is the unifying factor in allowing participants the opportunity to communicate and share the joys and wonders that play provides” (Cohen & Waite-Stupiansky 2012, 69; 78). Sutton-Smith was early to realize the intergenerational quality of contemporary play by writing how “it is another feature of the modern world that we are not as separate from our children as our grandparents were from theirs. We spend more time at the same entertainment, even if it’s only television; we play with our children more, and we do not hesitate to keep some of our old toys about the house; certainly, the Teddy Bears” (Sutton-Smith 1986, xi *Boehm The Right Toys*). Although Sutton-Smith passed away before the COVID-19 pandemic with its specific forms of toy play such as the teddy challenge studied in Article IV, he was right in perceiving the classic toy (the teddy bear) to encompass intergenerational appeal and value.

Play may involve spectators (Heljakka 2016; Heljakka & Harviainen 2019; Marsh et al. 2020). What was realized in the teddy challenge was technologically enhanced, intergenerational play in which grandparents (and other adults) often adopted a supportive role, and the children took part in playing as spectators and an audience. Moreover, digital communication platforms such as YouTube and TikTok or location-based games like *Pokémon GO* attract players of different ages. In this way, even digital terrains of play become shared spaces. Jon-Paul Dyson writes:

[...] even as this electronic play has removed participants from face-to-face encounters in the neighborhood and playground, one effect of this growth in virtual play has been to reconnect the play worlds of adults and children. The joint play of adults and children, commonplace in agricultural societies but separated in industrial economies, has reemerged in the digital age, on Farmville if not the farm. (Dyson 2015, 48)

Nonetheless, the past decade has witnessed an upsurge in the interest in play as a form of edutainment and a generative form of playbor. This means that playful attitudes and activities are acknowledged more intentionally in education, work life, and life-long learning.

Understanding technologically driven play requires a variety of literacies, ranging from digital literacy to media literacies: “The use of new technologies is an integral part of becoming multiliterate in the twenty-first century” (Yelland 2011, 10). Mäyrä (2017a) approaches this from the conceptual angle of *ludic* literacy. Wohlwend (2008) characterizes “play as a literacy of possibilities.” According to Wohlwend’s thought, play is embodied literacy.

Play assists in taming technology and, in this way, contributes to technological multiliteracy. For example, in their research, Druga et al. (2019) extend the concept of literacy to include AI literacy, referring to literacy skills gained with embodied cognitive agents like robots.

The contributions of these studies included an observation of the ubiquity of the technologies of digital cameras, Internet-connected toys, smartphones, screens of social media, social robots, and finally, play machines as fantastic products of speculative toy fiction. Understandings of how these play machines are employed as part of play patterns, contribute to contemporary toy literacy.

Apart from social media — which I understand as a platform rather than as a “device” — handheld play machines literally come close to the players’ bodies. They are, indeed, black mirrors when not in proper use, but our visual identities are reflected through them when in operation through screens and the playthings controlled through the screens. They are extensions of the players, just like playthings in traditional thought. They have, in fact, become playthings of their own, and the “technology” gradually disappears in them; they take the form of characters, pets, and humanoid “dolls.” They become harder to distinguish from the “toy friends” as we knew playthings before the digital era.

In the context of this thesis, we can see that play with devices slowly transforms into interaction with play machines that mimic living entities and are no longer bound by the boxy, monochrome appearances of anonymous technical equipment — they are given names, faces, and movement to accentuate their growing closeness to living entities, and at the same time, are genuinely *toyified*.⁵⁴

Personal devices enable individualized media practices (Turkle 2011). Look closely; the image in the end of this thesis shows me with my digital camera — a graceful, white device I have nicknamed “Stormtrooper.” A similar development I see with smartphones, laptops, tablets, and so on is that people seek to hide and erase their “machine-ness” by softening and covering them up with padded cases and colors.⁵⁵ As a toy researcher, I find it funny that in Sweden, mobile phones have been referred to by calling them *nalle* — teddy bears. No matter how shiny and futuristic our mobile communication devices appear, there seems to be a strong tendency to make them more soft and friendly (approachable and perhaps, anthropomorphizable) to the eyes and to touch.

The content delivered and channeled through play machines also deserves a few words: Many games are about overcoming goals and competing against one’s own skills or others. Contests still thrive in ever-increasing abundance, particularly nowadays in video and computer games (Sutton-Smith 2017, 156). Earlier observations point to findings that games influence current play to the extent that players start to, consciously or without realizing, apply game-like goals even to their open-ended play. This pattern of behavior also connects to theories of play in which the evolution of play in human beings starts from exploration at the infant age and proceeds to more rule-bound forms as we mature. But as we have seen in the thesis, play is not exclusively about playing digital games or sustaining the gameful mindset. Contrary to common belief, play of the 21st century is not only about competitive (digital) gameplay but also about (sometimes, seemingly chaotic or even anarchistic) creativity expressed in association with play of the imagination and play with objects, known in Caillois’ (1961) theory as *paidia*, the opposite of *ludus*.

Rather than competition and goal-driven motivations to engage with game worlds, play is also about free roaming in sandbox-style environments and experimental states of mind familiar in Caillois’ *paidia* — the open-ended, creative, and chaotic. Following Back et al. (2017), creative play is the primary play activity supported by

54 For the processes of toyification, see Thibault and Heljakka (2019).

55 In the Hybridex Project, Tyni et al. (2016, 54) discovered “slip-in” plush toys available that come alive when a smart device is placed inside them. Dossey (2016, 81) has similarly observed how teddybears and smartphones have “converged and hybridized.” He sees this development of ‘plushophilia’ (or “the devoted appreciation of and love for stuffed animals or plushies”) as a consequence of the isolation that digital devices sometimes seem to produce: “Teddies provide comfort and unconditional emotional support to kids, a replacement for the emotional warmth smartphones fail to deliver.”

sandbox games, including physical toys, such as actual sandboxes and LEGO (Wolf 2014). Creative play also seems to be a fundamental motivation for engagement with the play machines.

What needs further attention is not only how we play but *why* we play. Therefore — although not having asked this question in the studies *per se*, this thesis aims to discuss the underlying motivations of interacting with play machines — the technological tools and instruments of play examined in the featured studies.

Sutton-Smith has stated how the modern movement toward play is an item of primarily individual subjectivity rather than an item of group life (Sutton-Smith 2017, 234). Had the renowned scholar lived to this day, he would probably have changed this thought — first, due to the ever-growing use of mobile and social media, and second because of the digital leap play had evidently taken during the ongoing pandemic.

The technological landscape changes and advances rapidly. Play is more individual and personal thanks to the personal devices used. Still, it is precisely because of these devices that play is simultaneously increasingly social through sharing: “Play is naturally cooperative” (Goldstein 2012, 15). Digitalization of play also means more connectedness: Undoubtedly, the emergence of the social web has made sharing experiences more perceivable than ever. But what does this mean for the evolution and significance of play in the contemporary world?

Play is no longer (entirely) ephemeral; it is about interaction with documented, delivered, encountered, and produced content. Finally, it is shared as mobile devices and social media enable instances of play to take visual, auditive, and audiovisual forms and, in this way, to show people’s engagement in play.

Spectating and consuming the play of others represents one form of play. Besides consummatory acts, play is always curious and creative in one way or another — play moves our minds through our imagination and creativity. I have detected the mimetic potential and quality of play — shared play invites more play, e.g., in the photoplay illustrated in the studies focusing on adult play and toy tourism.

Although play has persistently been associated with leisure, entertainment, and (perhaps) escapism, especially in the 20th century, it is time to acknowledge how there is no room for regression in play but instead to embrace the fact that play is a robust and global unifier, as demonstrated in the case of the teddy challenge as a form of pandemic toy play.

The COVID-19 pandemic marks a watershed for the evolution of cultural phenomena. If the period between 1990–2010 is understood in terms of ludification (Raessens 2006) and the ludic era, perhaps 2010 onwards is best described as a time when the paidification of culture has thrived. From 2020 onwards, we live in a post-pandemic world that entails a more serious relationship to play and an interest in turning attention to the seriousness of toys and play. Then again, play has always carried a severity to it, being fundamentally crucial for our growth and well-being. While this is the case, the “ethos of fun” often connected with play is somewhat

problematic when considering the meanings and value of play to the human world and societies.

“At its most elemental, play always promises fun” (Eberle 2014, 214). Play is about spontaneous enjoyment, but more increasingly about enjoyment through commitment and devotion that lasts than through momentary fun. The idea of play merely as a promoter of fun activities seems dated, insufficient, and therefore untrue. But the promise play holds is an important idea, especially during challenging times in human history. In this way, Ibister (2016b) sees games as having the potential to “transform our social interactions.” She writes:

Rather than immobilizing and devaluating their body or isolating players from other people, games in the future have the potential to embrace and enhance the role of the body and movement in play. They may recouple the physical and emotional, gracefully augment and transform our social interactions, and support our performance on who we are, or who we want to be. (Ibister 2016b, 107)

During the pandemic, play provided possibilities for escapism but more substantially directed behavior into survival mode and contributed to affective behaviors. Therefore, restrictions on physical mobility have increased digital mobility and re-enforced the digital leap of the early 2020s.

When Sutton-Smith wrote his last work, published post-mortem by The Strong National Museum of Play, he observed how adult play finally became recognized. Nevertheless, he also pointed out how its discussion has largely been couched in the individualistic terms of the modern economic world rather than in the collective representations of, for example, ancient sporting practices (Sutton-Smith 2017, 233). The study addressing pandemic play of intergenerational players functions as evidence for the return of communal play and, consequently, a conceptual approach to this phenomenon, for which I have chosen to use the term *ludounity*.

In play, we have the license to explore ourselves and our society (Silverstone 1999, 64; cf. in van Leeuwen & Westwood 2008). In contemporary times and perhaps more than ever in the 21st century, it is possible to see how “[p]lay is part of everyday life, just as it is separate from it”; boundaries between play and seriousness are more permeable and less distinct these days (Silverstone 1999, 60; cf. in Kücklich 2004).

Play mirrors societal contradictions (Eichberg 2015), and not only technology but also social and spatial aspects influence the play activity (Márquez-Segura et al. 2013). Herbert Ginti said, “We did not get where we are as a species because we are especially greater competitors but because we are especially great cooperators” (cf. in Sutton-Smith 2017, 193).

While the teddy challenge may present a particular moment in time when play was desperately needed to contribute to our well-being because of the grim first phase of the global pandemic, in the future, perhaps and hopefully, ludounity will take forms other than displaying toys in window-screens. Nevertheless, the challenge

turned our attention to how play sustains emphatic care and hope and supports faith but does so especially when a health crisis dictates the demand for physical and social distancing. To be playful in challenging times is to express one's *sisu* (something akin to *guts*) with grace, not gritted teeth, as I have learned from positive psychologist Emilia Lahti. I have come to call this *playful resilience* — the ability to see possibility in the unbearable, to creatively think of ways to carve oneself out of the labyrinth life throws our way and into the light of more understanding, empathy, and even compassion.

To play with others is to increase togetherness and decrease alienation. For some, it may come as a surprise how powerful the agency provided by play is. We can discover more about the possibilities of play as interaction through digital technologies.

As a concluding example, the pandemic play article highlighted the fact that players are resourceful when using digital technology in reference to play. The (remote) play of the community at an exceptional time and drawing on both material and digital culture has been described as expressing the creativity and positive interaction of players of different ages, thus increasing playful resilience.

Here is an answer to a question you did not ask (yet): What is the relevance of the synthesized findings of the studies undertaken in this thesis?

First, a synthesis of the findings communicates ideas on the implications and applications of the thesis. The summary of findings provides food for thought for academics interested in possible directions of current play. Second, for early education experts, it is illuminating to understand the possibilities that play and the play machines provide for education, in this case, early education: For educators, this means subtle suggestions on integrating digital media into pedagogical practice.

Belpaeme et al. (2018) note that introducing novel technologies into learning situations also means that some changes in educational practice are needed. Teachers and parents need to become more knowledgeable about digital toys (Johnson & Christie 2009, 288) as they, besides a capacity to entertain and cater to possibilities of open-ended play during leisure, offer technology-based support (Jones & Deeming 2008) to learning. Child engagement with computers and digital toys can be a solid positive complement to other forms of play (Johnson & Christie 2009, 288).

Third, for designers, it is essential to remember what Kudrowitz and Follett (2014, 252) stated: “Make the toy about the play, not about the technology” by considering that play detests optimization. Therefore, it is beneficial to consider possibilities for open-ended play.

To achieve this, Boon et al. (2020, n.p.) have a valuable suggestion: “Designers can leave things open for interpretation, leave room for multiple courses of action, make things unstable or erratic, provide many variables, allow things to be manipulated or rearranged, and avoid pre-defined goals and rules.”

Fourth, and ultimately, there are ideas for the wider public to consider — and finally admit that interaction with digital and connected technologies — really — is about play.

Centrally, a key takeaway of this thesis's findings is that digitality influences, enables, or enriches many forms of play. Technology invites, attracts, and stimulates play. Invitations to play must be subtle, welcoming, and, if persuasively constructed — elegantly designed, encouraging the player to have a certain freedom to explore the materials, systems, and environments. In one way, devices concretize engagement with the imagination, resulting in hybrid play — play of the mind combined with the possibilities offered by digital technologies.

“What can be done to preserve one's humanity and sanity in an increasingly digital world?” Michelle Weil and Larry Rosen asked in the late 1990s (1997, 358). Alongside the much-promoted, balanced, and healthy diet between analog and digital forms of recreational leisure and work, one way to preserve one's sanity is to engage with digital technology through play.

In essence, play has long driven humans toward technology — and vice versa. In the 21st century, play has gained a steady foothold as part of interaction with smart and connected devices and social media. Through play, technologies become part of the lives of very young children not only in the domestic sphere but also increasingly as part of early childhood education, where the technologically driven educational space is being reinforced by the newest interaction and communication technologies, including those tools with the particular set of affordances intended to invite players of different ages to engage with them. Children's digital media habits are under constant discussion. Clearly, there is a need for balance in children's activities with the play machines, “as well as a balance between the real world (3D) toys and the new digital ones” (Yelland 1999, 220). Adults have a supporting role in this:

Parents have often expressed the concern that if they let their children play with computers and other new technologies this will take away from their 'real' world experiences. It is up to them to ensure that this does not occur. (Yelland 2011, 11)

A balancing act is required not only from parents but from everyone engaged with play in the name of leisure and learning with technology. Indeed, play as a life-long and life-wide phenomenon proposes exciting questions about how play will move us in the future regarding technology, one of them being the toy play habits across the lifespan.

Players across age groups demonstrate a high level of engagement with devices, namely touchscreen and mobile technologies, but even natural interfaces that revolutionize ideas about togetherness experienced with and through machines. Intergenerational play means joint media engagement through play. The moment when co-viewing (see, e.g., Takeuchi & Stevens 2011) becomes co-playing, turning consummatory acts into interactive dialogues marks a shift in engagement with the play machines. This reciprocal, fruitful, and productive relationship alters the minds and bodies of the players as technologies become freed from their standard forms of devices.

The *digital leap* has become an everyday standard — as long as digitality is not embedded in our physically mobile and mentally affective bodies, we must take that leap every day to stay connected with the networked world.

Movement challenges monotony; as shown in this thesis, movement is integral to play. Bjorklund et al. (1998) suggest that future research on physical play should examine types of physical play. de Vries (2021, 247) claims that “physical play as a unique and separate experience throughout the human lifespan has not been defined.” Perhaps additional and more fine-tuned definitions of physical play are needed as we fully grasp the idea of the mobilizing tendency of digitalizing and connected play and the movement enabled by play patterns associated with hybrid play.

What playing with (the play) machines has brought to our lives are concerns about decreased well-being due to poor ergonomics, passivity, restrictions on proper and meaningful time with physically adjacent friends and family members, threats to our privacy, the fear of a crippled imagination too much guided and controlled by media content, and so on. However, as this thesis demonstrates, due to the automation of tedious and labor-intensive tasks, more time and space to use digital technology for other, far more intriguing and motivating engagements are becoming possible through play. For what else could digital cameras, Internet-connected things, smartphones, social media, and companion robots have offered us but more time to ease up for playing — exploring, tinkering, and socially sharing experiences mediated with and through the software and hardware of play machines, offering more possibilities in capturing, molding and experimenting with digital content, making it more entertaining, more open for reactions, responses, re-playing in the course, and presenting us with opportunities for rewarding interactions even with non-human companions.

Based on information distilled from the studies presented in this thesis, digital technology does not detach us from the world, but when combined with other elements such as human interaction, physical entities, and environments, it connects us in ways that allow mobilization of the body and mind and, as a result, activate emotional responses. The affective turn points to an intensification of interest in ‘emotions, feelings, and affect (and their differences)’ as objects of scholarly inquiry (Cvetkovich 2012, 133). The affective turn coincides with other turns, such as the visual, material, and playful turns: Affection, care, and companionship are recognized virtues of a post-pandemic world.

Emotional responses are a vital ingredient in human communication and player experiences. Therefore, they are of great interest for the area of interaction design with a particular interest in the possibilities of playfulness. Prosocial behavior, also of interest in this thesis, is a significant area of human behavior, especially from the perspective of early education — the perspective of the “know-how” of SEL competencies developed in play is more interesting than the flow and immersion

often associated with play. Facilitating the growth of SEL-related skills gained in playful learning with robotic pets may promote the development of kindness. In fact, empathy, in particular, has already gained attention from the designers and industries of play, where social companion robots are created for players of different ages, and other toys (and games) are designed to support empathy development and pro-social skills.

As the thesis illustrates, play is valuable, and I am adamant that play with technologies be seen as valuable. The “taming” and domesticating of technology happens to a certain extent through play. Play can also be perceived as a distinct relationship to technology. Play is progressive — it is about dealing with the unknown, what we do not yet know about, and the progressive and productive nature of play can be observed by studying digital culture that happens through actions of play. In other words, digital play is *productive* as well as about intrinsic motivation and process.⁵⁶

Marshall (2004, 25) noted that in “new media cultures, people are involved in the production of the text and images that become part of the reception and pleasure.” When play is motivated by external factors such as playful learning or semi-occupational activities like playbor, it must be designed subtly, for play can never be an obligation. In these ways, I refer to the persuasion strategies of different tools, environments, and techniques for play, with which the interaction should always be voluntary.

In each of the studies presented in this thesis, digital technology shaped play in specific ways. The data show that digital technology use is of fundamental importance for each of the instances of play to have happened. To summarize, the shifts in play that have taken place can, according to the findings of the studies presented as part of this thesis, be synthesized into the following arguments: The cornerstones of digitalizing play are the use of digital devices and digital (social) media alongside physical toys or play environments. Digital play of this kind is always documentative and thus productive. Technologically enhanced play connects closely to imagination, creative storytelling, and social sharing. Digitalizing play tends to connect and unify generations, although the different skills of players may lead to separated realms of play. Digitalized and connected play is linked to fantasy worlds as much as it relates to real lives, player identities, and actual world happenings.

Finally, there are some key points to list regarding technological play based on the findings made in this thesis, which are addressed in the following:

56 Prior to digital technologies, toys and books have been understood as “tools of progress” (Kline 2004).

SOME KEY POINTS AS TAKEAWAYS OF THIS THESIS:

- Digital and connected play starts with the utilization of various technological affordances (interaction with screens/screenless technology that is either leisurely or educational).
- Digital and connected play involves devices for play (primary role as play machines on which playing is enabled through games and apps) as part of play machines.
- Digital and connected play emerges as an extension for play (secondary role as play machines on which playing is captured by photographing, videoing, audio-recording, and digitally manipulating personalized playthings or other forms of content — physical or digital).
- Digital and connected play is often documented play.
- Digital and connected play can be solitary, but it also involves using social media platforms that allow content sharing and, therefore, networked and social play.
- Digital and connected play evolves into connected play once connected (“smart”) devices, such as IoToys, are used.
- Digital and connected play also uses robotics, and the most recent tools in this area are robotic companion animals with natural user interfaces (NUI).

A SUMMARY OF ARGUMENTS:

- Digital technology acts as an *extension* of the player.
- Digital technology acts as a *play enabler*: It manifests through players’ creativity through affordances of hardware (devices) and software (apps).
- Digital technology, more than an additional element to play, is an *empowerer* and *enricher* of play: It makes play-related content distribution possible through networks (e.g., IoToys). The connectedness of the playthings means that they provide players with updated content, which can be entertainment, education, or a combination thereof.
- Digital technology functions as a *socializer* of play: It allows communication through social media platforms.
- Play with toys and digital technology (and technology toys) moves us toward our inner selves — and each other.

7.1 Future paths for research

“Life, it seems, always becomes more exciting when the hope of play exists.” (Sutton-Smith 2017, 241)

“Western society is beginning to take play more seriously as an important form of culture” (Sutton-Smith 1997, 125). Contrary to belief, play is not diminishing nor vanishing from the world, but mainly due to developments, it is transforming and taking new directions in the form of a digital leap. Technology invites and supports the cultures of play. At the same time, the timeless quality and appeal of play with physical materials, equipment, and environments live on.

While it is contended that this study makes a timely contribution to research on play, it is also necessary to turn the attention to possible future paths for research. Skolnick Weisberg et al. (2015, 9) claim that “play has value for the development of well-adjusted, creative individuals who will be prepared to solve challenging problems.” However, Garry Chick writes that “with respect to both child and adult play, emerging perspectives that unite evolution, culture, and the environment as complementary rather than competing explanatory variables appear to hold substantial promise for future research” (Chick 2015, 81). In the following final part of the thesis, I will sketch some possible pathways as ideas for future analyses of play, including three broad perspectives, namely players, playthings, and play(ful) environments and assemblages.⁵⁷

7.1.1 Players

Maxwell (2020, 7–8) claims that a digital footprint (the trail one leaves behind when one scours the internet) ties directly to our digital legacy. The footprint is not a thoroughly negative thing: “It can be a portfolio of your life” (Ibid.). While playing with digital and Internet-connected technologies, our play inevitably becomes recorded.

Social sharing is essential when considering the historically relevant nature of the documentation of play and, today, how distribution happens in the digital realm. Documentation of play, such as the results of photoplay or toy photography and related play knowledge, will likely, in the future, be considered traces of information leading to interpretations of the play culture of a particular time. In the future, we can trace down complete biographies of play activities, showing our play preferences in terms of play partners, playthings, and play spaces and the documentation we

57 As illustrated in Figure 2, what also presents possibilities for future research is to investigate play with technologies more within the areas of structured work and education, namely playful learning (of adults) and as part of productive play, i.e., playbor.

have voluntarily left behind during and as the acts of play. This speculative idea proposes suggestions for further research on digital and connected play and long-term investigations of movement within and across physical and virtual space, which leave behind our digital footprints as players, telling the tale of our playful legacy.

7.1.2 Playthings

Yelland (1999) cites Papert (1996, 188), who suggested that “our concern must be to ensure that what is good about play is at least preserved (and hopefully enhanced) as the concept of ‘toy’ inevitably changes.” However, neither play nor playthings as phenomena of the world are changing by themselves, but we change them. This constant and ongoing change that forms evolution is guided by the meanings and values attributed to play and the resources employed in play. As discussed in this thesis, playthings and play machines have affordances that steer play in many directions. As shown, the dimensions of toy and play experiences can, for example, be grasped through their physical, functional, fictional, and affective dimensions.

This thesis has taken an interest in the affordances of toys and play machines. While it has been essential to increase knowledge on the affordances of toys and how they influence play, following a proposition made by Sutton-Smith, I consider this a fruitful observation: “We must now also ask what the toy does *not* let you do” (Sutton-Smith 1992, 9). In other words, alongside investigations on toys’ afforded potential, critical accounts of the limitations of toys present an intriguing avenue for research, especially considering toy design.

Importantly, Ackermann (2005) notes how “digital per se is not synonymous with an artifact’s ability to be an enjoyable and rewarding relational partner.” On the contrary, what is known is that three-dimensional toys like the character toys as “toy friends” are liked for many reasons: their tactility, aesthetics, and weight, to name some of their physical qualities. I assume that tactile and tangible play will not vanish — the materiality and visuality of playthings will, in some ways, remain.

The vast category of toys will offer ample material for research for years to come. To begin with physical toys, Bird (2020) claims that children’s play with what she describes as *imaginative technologies* is underresearched. I interpret this as a possibility to study some more of the mass-produced *and* handmade miniatures made in 1:6 and 1:12 scale, appropriate for use with doll, figurine, and action figure play in combination with the play machines — digital cameras, smartphones, and the screens of social media; these are most likely even forms of media that do not yet exist, that complement play with physical toys to continue the research initiated in this thesis.

Another perspective of playthings and play machines concerns their current and future functions. Brennan (2018) cites (Galloway 2011) to describe how some forms of technology have already become redundant. “Children need to balance between

screenplay and actual play,” Johnson and Christie (2009, 288) noted years ago. This leads to another question: What if the squabbles on “screen time” limitations that many children face with their parents were rephrased as “playtime”? Would the result be more positive?

While tangible playthings are not under siege, the screens as we know them from actual playthings and the play machines will be replaced with more sophisticated technologies. Furthermore, what constitutes a screen now and what it will be like in the future may be very different: To exemplify a case of speculative toy fiction, the movie *Ron's Gone Wrong* depicts a malfunctioning IoT of the future — a B*Bot named Ron — where the complete toy *is* the screen.

“Our world grows increasingly saturated with sensors and alternate feedback systems beyond big screens” (Ibister 2016b, 96). Little by little, screens as we know them are shrinking and perhaps vanishing from the horizon of the landscape of play giving room to play machines in which the body and the screen become inseparable. This will probably have consequences for technology without screens, such as voice assistants and smart toys (Plowman & Stephen 2014, 16). Marsh and colleagues state that voice-activated devices and speaker assistants, such as Alexa, Google Home, and Siri (Marsh et al. 2020, 19), could be used more in technologically oriented play.

The promises and limits of robotic pets as interactive partners have been noted by Melson et al. (2009). Further, Westlund Kory et al. (2018) have addressed the need to deeply understand how children think about robots through time. Relevant paths for future research could be to continue exploring the affective side of interaction with robotic toys and social companions and ask: To what extent will the use of robotic pets replace relationships with live animals as play partners? And even more interestingly, will they genuinely serve us as friends in future relationships?

The public concerns over AI, such as the possibility of Artificial Intelligence developing consciousness (addressed in research as “singularity”; see, e.g., Giddings 2019), have been noted in recent literary work: In an interview with Kazuo Ishiguro, the Nobel prize winner and author, said: “At the moment artificial intelligence accomplishes to understand emotions, it can also manipulate them” (Ahola 2021, C2). Ishiguro’s novel *Klara and the Sun* (2021) speculates on the possibility of human-like Artificial Friends (AFs) being able to *continue* their owners’ (and players’?) lives in passing by learning and memorizing their personalities, movements, and behavioral patterns. In this chilling account of the utopian/dystopian views of artificial life embodied by robots, Ishiguro toys with the possibility of letting a robot not extend or replace a potentially dying child but *continue* their life through a replica of the child’s gestures, manners, and likings, carefully studied during the years of friend-like companionship with her.

The many possibilities for further research continue with the question pondering the role of the machine in future human play. Nonetheless, the human being is a physical entity who, according to some lines of thinking, is increasingly becoming a

cyborg — merging with intelligent technologies and robotic aids (Jaques 2015). Is it possible for the machine to make the human into a toy for its own play purposes?

“Cyber-toys,” as Ackermann (2005) names them, enable relationships outside of human presence. Will their evolution lead to post-human play, meaning play beyond the involvement of humans? At the verge of post-human play, a longing for naturalness and organicity as commonly understood sources of human authenticity are values at risk of becoming forever lost. The machine as an independent player is about mechanisms, systems, control, structure, metrics, competition, optimization, and achievement. However, play must be allowed to flow freely and voluntarily and cannot be about regression and enslavement dictated by the play machines. The human player still distances herself from the machine through trial, error, unpredictability, and mistakes. What follows is growth born out of serendipitous moments, encounters, and relations within the world, advancing us in ways not foreseen.

“Animated toys ‘grow’ with us, and within our culture, because *we* don’t cease to re-invent ourselves” (Ackermann 2005). Bartlett et al. (2004) have predicted that “people may develop strong attachments and even affectionate relationships with artificial information systems.” This requires advanced toy literacy skills, such as *AI literacy* (Druga et al. 2019).

Longevity as a facet of sustainability brings up another potentially relevant question for future research: Despite our relationships with the play machines and sophisticated toy friends, it is worth asking: How long until the novelty effect of technologically enhanced toys wears off — or does it ever? Longitudinal studies on digital toys would be needed to answer this question.

7.1.3 Play(ful) environments and assemblages⁵⁸

In traditional thought, physical environments have provided places of play for playful learning, leisure, and work. The terrains of play have widened in a physical sense due to player-facilitated practices around toyism and digitally, thanks to innovations around location-based games, such as geocaching. The playgrounds extend because of non-human toyism: For example, a *Yoda* toy of Star Wars fame has already traveled to space with humans (Heljakka & Rääkkönen 2021).

The realms of play will expand territorially and digitally, offering simulations and other immersive experiences, augmented reality experiences, and such. The advent of digital technologies that invite play to move into new environments presents vast possibilities for future scholarly work. In a news release dated 1988, Brian

58 Nigel Thrift (2003, 395) describes a shift from toys as “solitary objects” to toys as “assemblages” that are “linked elements of little fantasy worlds”; cf. in Berriman and Mascheroni 2019, who discuss the co-existence of media technologies.

Sutton-Smith envisioned the following. He said he can imagine that “in the future there may be electronic simulators, such as the World War II Link trainers, that allow children to engage in adventures without getting hurt” (Sutton-Smith 1988). Since Sutton-Smith’s prediction, simulators beyond entertainment are known to be widely employed across professions and in learning.

What comes next in technologically enhanced play within space — the auditive turn? While this thesis does not explore the soundscapes of contemporary play *per se*, it is possible that with audio-based services such as Alexa, Siri, ASMR videos, and audiobooks et cetera, auditive play experiences will thrive in future play environments connecting sound-based toys with new technologies.

Another area of interest for future play research is the virtual realm. Navigating the virtual space in present times is enabled by play machines associated VR technologies. Domains such as the metaverse highlight another complex phenomenon to study in the future. The metaverse and movement toward and in this futuristic but approaching play space present additional opportunities for research on play. “The ‘metaverse’ represents the next generation internet, promising richer, more immersive 3D experience and more seamless conversion of physical and digital realities” (Livingstone & Pothong 2023).

The emerging metaverse as a “3D Internet” is building up rapidly. As suggested by the Digital Futures Commission, it should be built by considering children’s imagination and offering inclusivity, diversity, agency, and an environment where safety and privacy issues are valued (Ibid.). If a mosaic of play studies were created focusing on the evolving landscape of play between 2020–2030, we would probably be more informed on what forms play takes in this yet-emerging environment.

Lastly, on a metaphysical level, what intrigues me beyond virtual space is play in the unknown terrains of human afterlife, such as speculative accounts on questions like “Are there toys in heaven?” This question remains for the speculative fiction of future play (and perhaps religious studies) to answer.

7.2 Finally...

“To play is to take on the world, to take it apart, and frequently build it anew,” says Thomas Henricks (2006, 185). The role of play in human progress needs to be acknowledged and appreciated much more than has been the case so far. Johan Huizinga (1938/1950, 195) asked in *Homo Ludens*: “To what extent does the civilization we live in still develop in play forms?” Play creates possibilities because “in play, we explore possible pathways into the future” (Henricks 2008, 174). This idea can now be extended to include digital and connected notions of play into the progressive possibilities play presents.

It is the human who engineered the machine to automatize, digitalize, and robotize — to make tasks fluent and connected and to surround and befriend us

with the help of the machine. In everyday life, the machine has come to be replaced with the notion of devices — a more domesticated approach to digital technology. Therefore, machines are now perhaps more easily understood as resources, tools that can be used to realize solutions and make dreams more tangible, digitally or materially. Devices as play machines are enabling, extending, and enriching our play. The affordances for play in the post-digital era move from the *non-connected* to the *connecting* and, ultimately, to the *connected*.

Besides technological “toys” such as digital cameras, smartphones, and other screen-based devices, it is also possible to see how these tools become a category of playthings of their own. For example, previous research shows how mobile devices — smartphones and tablets — are, by some parents, regarded as toys (Ihamäki & Heljakka 2018). Consequently, it is possible to perceive a *toyification of technology* (Thibault & Heljakka 2019) taking place, one not determined by engineers, but instead by players who incorporate such technology as extensions of their play and employ them as play machines.

What next turn will captivate the attention of those investigating play? Perhaps it is the already ongoing era of Artificial Intelligence.

Play is a stance toward technology that is dialogical in our negotiations about how much it is okay to give away our natural abilities to those enabled by machines. Digital play keeps the human occupied and mobile, but there is a need for balance between speed and slow motion, process, and productivity. Still, how play moves us is largely about human willingness to be mobilized mentally, emotionally, and physically. It was the human who made the machine. It is play that will keep the human in ourselves and our technologically mediated social interactions alive.

Positive play moves human beings closer to each other, no matter which device, digital platform, or environment they reside in. Play creates a sense of belonging in communities, global and local. Technology helps build connections; play connects us and makes us stay connected.

At the beginning of the 21st century, play is still very much an activity of humans and animals of other mammalian orders. Humans recognize play when they see it happening among themselves and in animal behavior, and they are conscious of their playing, even though many adults distance themselves from the term. But play should be more acknowledged and more highly valued. Parallel to love, health, and communality, play keeps us moving because it tends to connect us with our inner selves, other beings, and relevant environments.

The opposite of play is not boredom or depression (Sutton-Smith 1995) but misanthropy. Playing is invigorating, and it is surviving — by being human. When the human ceases to play (or is forced to do so), this will mark the end of humanity as we currently understand it. But will this be the end of play altogether? Not entirely, if accounts of speculative fiction are to be believed.

In Kazuo Ishiguro’s striking story on AFs (or Artificial Friends) presented in the novel *Klara and the Sun* (2021), machines are on the threshold of studying what it

means to be human to be able to *continue* them once they are gone, once they leave the existential condition we recognize as life. But will the play machines of the future start to play by themselves because of their boredom or anxiety, or for the fun of it, for that matter? This question will require attention beyond what the thesis in front of you can do. However, a burning need is to never stop posing questions like the one above. Perhaps it is the death of curiosity that would mean the end of play. Poetically, play casts light in a world filled with negativity, cynicism, intolerance, and rigidity. Play has an innocence to it that is very human. Burghardt (2005, 405) writes:

Play can be all of these: neither inherently useful nor useless, neither good nor evil. Play is — play endures — play may be something that creates a spark, lighting a candle where there was darkness.

When we have unraveled the mystery of play by arriving at a rigid definition of it, the movement of play will cease. In this unlikely event, we have arrived at a point where being human has lost meaning, and ultimately, we have turned to fully automated machines regarding our behavior. So far, there is still hope. We move forward because we can't go back. But play is the ultimate perpetuum mobile, an engine that keeps us mobile, flexible, and in motion. Play raises questions (Eichberg 2015) continuously.

“If play does prepare for the future, then it seems to do so most obviously by preparing the players to play more complexly in the future” (Sutton-Smith 1986, 104). Play moves as a mode of experience (Moore 2011), and movement means life. I could add the hope of play to move us more playfully in(to) the future.

In closing my arguments of how play moves us, I recall reading Brian Sutton-Smith's statement of the 21st century as a Century of Play. We are there now, Brian. Welcome to the paidic era. Serious and goal-driven as the play of the ludic turn might be, the era of the paidic turn, as described in this thesis, conceptualizes play more broadly and humanly. Because while the ludic most often is about putting the cyborg machine in us in motion, it is the paidic, childlike, creative, and anarchic play that makes us more human in our playful activities. It is the human who knows how to make any machine a partner in play. Still, essentially, it is the human who recognizes the role of the machine as an instrument for play, which can never replace the imaginative and emotional capacities of the human as the playing other. Play begins with that tiny sparkle in the eye, then makes us perspire while absorbing ourselves entirely in the playing, and maybe squeezes a glimmering teardrop out from the corner of our eye. Sometimes, play may give us goosebumps, even make the skin crawl, because of excitement, immersion, and the flow. Maybe it sets everything in motion and causes our organic bodies, imaginative minds, and human hearts to do everything simultaneously, even when assisted by the machine.

Play is infinite. Play is ∞ . That is how play moves us.
Let's hold on to that sparkle.



Figure 5. Portrait of the researcher by Studio 1851 / Tuomas Sinkkonen

List of Original Publications

Playing with the Camera

Heljakka, K. & Harviainen, J.T. (2019). From Displays and Dioramas to Doll Dramas: Adult World Building and World Playing with Toys, *American Journal of Play*, 11(3), 351–378.

Playing with Connected Toys

Heljakka, K., & Ihamäki, P. (2019). Persuasive toy friends and preschoolers: Playtesting IoToys. In Mascheroni, Giovanna, & Holloway, Donell (Eds.) *The Internet of toys: Practices, affordances and the political economy of children's smart play*. (pp. 159–178). New York: Palgrave Macmillan. https://doi.org/10.1007/978-3-030-10898-4_8

Playing with the Smartphone

Heljakka, K., & Ihamäki, P. (2020). Toy tourism. From Travel Bugs to characters with wanderlust. In Nicky van Es, Stijn Reijnders, Leonieke Bolderman & Abby Waysdorf (Eds.) *Locating Imagination. Popular Culture, Tourism & Belonging. Place, tourism and belonging*. (pp. 183–199). Oxon & New York: Routledge. <https://doi.org/10.4324/9781003045359-15>

Playing with Screens with/through Social media

Heljakka, K. (2021). Liberated through teddy bears: resistance, resourcefulness, and resilience in toy play during the COVID-19 pandemic. *International Journal of Play*, 10(4), 387–404. <https://doi.org/10.1080/21594937.2021.2005402>

Playing with Social Robots

Heljakka, K., Ihamäki, P. & Lamminen, A. (2020). Playing with the Opposite of Uncanny: Empathic Responses to Learning with a Companion-Technology Robot Dog vs. Real Dog. In *Proceedings of ACM CHI PLAY '20 EA*, November 2-4, 2020, Virtual Event, Canada Association for Computing Machinery. A262-266, 2020 ACM, New York, NY, USA, 262–266. <https://doi.org/10.1145/3383668.3419900>

Playing with Speculative Toy Fiction

Heljakka, K. I. (2022, November). Reading Ron Right: Speculative Toy Fiction, Friendship and Design of Future IoToys. In *Proceedings of the 25th International Academic Mindtrek Conference*, 16-18 November, Tampere, Finland (pp. 334–338). <https://doi.org/10.1145/3569219.3569386>

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APPENDIX I

(RESEARCH PERMISSION/PERMISSION TO PUBLISH FORM for preschool children's caretakers, translated from Finnish to English by the author)

Internet of Toys Study with preschoolers with preschool group XXXX at XXXX (Fall 2017)

Researchers: Katriina Heljakka, University of Turku and Pirita Ihämäki, Prizztech Oy

Information about our research:

This study investigates a) preschool-aged children's position towards and b) play with character toys (dolls, action figures, soft toys, etc.) that have digital connections (such as toy robots or other character toys). We are studying these toys associated with literacy, play, and learning. The study results will be published in academic publications, such as scientific journals, conference papers, and presentations.

More information about our research may be obtained from Katriina Heljakka at katriina.heljakka@utu.fi

RESEARCH PERMISSION

Name of preschool student _____

Caretaker's name(s) _____

Permission from the preschool student and caretaker to participate in research:

Able to participate _____

Not able to participate _____

PERMISSION TO PUBLISH

This request concerns the use of photographs or videos taken of your child as part of our research to be published in academic publications (such as research journals). We need the caretaker's permission to publish images of children under 18 years as part of our research, which may be shared in online contexts.

I give my permission to publish photographs/videos on which my child is present

I do not give my permission to publish photographs/videos in which my child is present

_____/_____/_____
Date/Month/Year

Caretaker's signature and name in block letters

APPENDIX II

(RESEARCH PERMISSION/PERMISSION TO PUBLISH FORM for preschool children's caretakers, translated from Finnish to English by the author)

Research permission for a study on dog-assisted activities on children's mutual empathy and prosocial behavior as part of the Rinnalla project.

The Preschool group X will have dog-assisted activities in the company of Milli once a week during XX times between February-April 2020. Eight (8) randomly drawn children from group X will participate in the dog-assisted activities [The Eight (8) other children included will work with a robot dog]. The children are subjected to authentic collecting of research data by observation, video-filming, photographing, and interviewing them. Parents and personnel join the research by filling out a questionnaire on prosocial skills at the beginning and end of the study. The children will document their work during the dog-assisted activities and produce material regarding pro-social skills (e.g., drawings), which will be stored as part of the research. The study may also include an interviewing of the parents. The personal data of children, parents, the preschool, group, or participating personnel will not be identifiable from the study. When children are interviewed, they are asked for their consent. The children will also be asked for their views about joining the study so that the voluntariness of their participation can be assured.

Milli, a Labrador of 2,5 years [at the time of research], has undergone socio-pedagogic training (25 credits). Milli is insured and has previously acted as a plenipotentiary member of a preschool group focusing on learning prosocial skills.

Name of the child: _____

My child can participate in Milli-related activities:

Yes No.

My child has a sensitivity/allergy which should be considered in the Milli-related activities; how:

- My child may be photographed as part of this study.
- My child's work (drawings, videos, etc.) may be documented and preserved as part of this study.
- My child may be filmed on video as part of this study.
- My child may be interviewed as part of this study.

We, as parents, are ready to answer a questionnaire at the beginning and the end of the research

Parent's signature: _____

Contact information: _____

Tel. _____ E-mail: _____

Thank you for the cooperation, Milli and Anu Lamminen*,

Tel. _____ E-mail: _____

* Research colleague and co-author Anu Lamminen was responsible for collecting permissions from the parents of children, who joined the dog-assisted study presented in Article V. At the time of conducting the research, she worked as part of the *Rinnalla* project.

The 21st century has been described as the Century of Play. The change in current play is particularly noticeable when looking at technological developments. This thesis deals with the technologization, digitalization, and connectedness of play between 2010–2020. The research explores forms of contemporary play, playthings, and players in a time when digitalization and connectedness have extended to various tools and realms of play – devices, toys, games, apps, and mediated playful environments. At the heart of the research are playthings and technologies conceptualized here as play machines, players using these tools within their communities and contexts, and, due to technological evolution, play research that increasingly, expands our knowledge about *How Play Moves Us* physically, cognitively, and emotionally.



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