

Playful Literacy

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A thesis on young children's play practices on digital tablets

Doctoral Thesis

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ABSTRACT

Young children play with digital tablets and have fun indulging in digital worlds, while discovering and problem-solving with a variety of narratives and interfaces encountered on these digital playgrounds. A set of tablet play characteristics, such as multimodal applications (apps) combined with tablets' physical and digital affordances shape children's digital play. This thesis presents how young children's current practices when playing with tablets inform digital experiences in Denmark and Japan. Through an interdisciplinary lens and a grounded theory approach, I have identified and mapped these practices, which compose the taxonomy of tablet play. My contribution lies in identifying and proposing a series of theoretical concepts that complement recent theories related to play and digital literacy studies.

The data collected through observations informed some noteworthy aspects, including how children's hands gain and perform an embodied knowledge of digital spaces. This embodied knowledge develops through digital play interactions, defining what I propose as *digital penmanship*. Complementary to the penmanship, several symbols and a range of modes of use shape a rich multimodal semiotic vocabulary in children's digital play experiences. These early digital experiences set the rules for the playgrounds and assert digital tablets as twenty-first-century toys, shaping young children's playful literacy.

RESUME

Når små børn leger med digitale tablets fordyber de sig i digitale verdener. Her udforsker de og finder løsninger på problemer via den vifte af fortællinger og interfaces, som de møder på disse digitale legepladser. Børnenes digitale leg formes af en række karakteristika ved tablets, såsom deres multimodale applikationer (apps) og de fysiske og digitale handlemuligheder, som de tilbyder børnene. Denne afhandling påviser, hvordan små børns aktuelle legende praksisser i forhold til tablets i Danmark og Japan præger deres digitale erfaringer. Gennem en tværfaglig optik og en grounded theory-tilgang har jeg identificeret og kortlagt disse praksisser, der udgør en taksonomi tablet-baseret leg. Mit bidrag består i at identificere og fremsætte et antal teoretiske begreber, som kan supplere de aktuelle teorier inden for forskning i leg og digitale færdigheder.

Gennem observationer er data blevet indsamlet, som belyser en række væsentlige aspekter, heriblandt den kropsliggjorte viden om digitale rumligheder, som børnene opnår og udfolder via deres hænder. Denne kropslige viden udvikles gennem digital legbaseret interaktion, som skaber dét, jeg kalder digitale skrivefærdigheder. Adskillige symboler og en vifte af anvendelsesmodi giver sammen med skrivefærdighederne anledning til et rigt og multimodalt semiotisk vokabularium, som opstår i børnenes erfaringer af digital leg. Disse tidlige digitale erfaringer sætter rammerne for legen og for legepladserne, og digitale tablets fremstår i høj grad som det legetøj, der former små børns legende færdigheder i det enogtyvende århundrede.

'Where to travel' and 'what is worth seeing there' is nothing but a way of saying in plain English what is usually said under the pompous Greek name of 'method'

Latour (in Reassembling the Social)

PREFACE

You are about to begin a journey that explores how young children defy and discover digital universes (tablets) through their *magic wands* (hands). Since my research interest involves interdisciplinary fields, it also involves challenges. The largest is that no matter how much I write, I feel there will always be more fields and angles to cover. However, I could not consider addressing a study in any other way, as my background is interdisciplinary. I have a Bachelor's degree in psychology and a Master's degree in interactive telecommunications. My MSc focused not only on learning technological skills, such as programming and electronics, but also on approaching technology reflectively and critically. We were encouraged to think of technology as a verb, as suggested by the head of our programme at the time, Ms. Red Burns.

I remained on a learning path by working in different countries and organisations with a variety of foci (interaction and service design, teaching, programming, etc.), both within industry and academia. Consequently, during the three years of my PhD studies, my educational and professional background experience converged to form my topic of choice. At the same time, by applying an interdisciplinary lens to my process, I have had the wonderful opportunity to be able to work with fields that I find highly motivating, and that build on my personal experience of observing young children and their digital interactions. It was partly this experience that informed the *what* and *why* that fuelled this thesis.

Regarding reading this document, I would like you to approach this thesis as a piece of music. I explore a repertoire of studies by eminent researchers; their notes and perspectives harmonise and contrast with my own soloist

moments, which originated during my writing process. All *notes* lead back to the initial train of thought, however, adding vital layers to the final composition.

For this research, I travelled to Japan. It was an eye-opening experience that expanded my horizons and shook my convictions. Despite having studied Japanese earlier in my life and knowing aspects of Japanese culture through a variety of media, books, films, origami, etc., the opportunity to immerse myself in the culture, though only for three months, proved one of the most significant learning curves of my life. I was confronted with my language literacy versus my culture illiteracy. I entered Japan with one set of lenses and I came back with very different ones.

The experience I gained there proved highly valuable for this research. Not only from the perspective of the data collected, but also for prompting me to think of aspects that were not necessarily initially visible in digital practices. For example, the role of iconography and symbols in a culture that is then confronted with western designs. In other words, how would tablets look if their interfaces had been developed in Japan? Probably you would swipe vertically and browse right to left through pages. More tangible differences included those related to broader use of Roman rather than Japanese characters in young children's everyday life.

Japan proved to be the most playful and efficient country I have ever encountered. I would therefore like this thesis to reflect an element of the same playfulness by bringing you a different set of perspectives when reading about this journey of mine. I hope you enjoy your 'travels'.

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I very much feel my achievements have been reached and supported by the wonderful people around my life... As if possible I would like to thank each and every person who brought me here with a text of its own. So, in order of life appearance, I thank you by trying to use a few words or sentences to sum it up.

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*...play is where children discover ideas, experiences, and concepts and think about them
and their consequences. This is where literacy and learning really begin.*

Dyson, 2009

*There is a complex connection between social and technological trends. It is virtually
impossible to unravel except by hindsight.*

Red Burns, 1998

INTRODUCTION

One hundred years ago, the Belle Époque had faded. During the *beautiful era*, which had started thirty years before, at the turn of the twentieth-century, daily routines had been transformed by newly developed inventions and technologies. The industrial revolution, which occurred in the same period, paved the way for a number of inventions such as the telegraph, the telephone, automobiles, the first computing machine and even the first commercial airline. As automobiles affected city landscapes and geographies, telegraphs and phones allowed for instant communication never seen before. Time perceptions changed and social contexts shifted. Beyond these, the popularisation of two other mobile machines bringing the possibility of self-expression and customisation flourished in the streets in the form of clothes and letters: the sewing machine and the typewriter (Gleick, 2011).

Sewing machines inspired the creation of magazines featuring clothes with accompanying templates and patterns, and created an entirely new market. Suddenly, there were sewing machine toys; children could now make dresses for their own dolls and create a vast range of objects from fabrics. By playing with smaller versions of the machine, children acquainted themselves with the modes and ways of the toy, which could later allow them to engage with the full-scale versions. In order to sew well, one had to be acquainted with different types of materials, and learn about measuring, fittings and cutting with scissors. So, parallel to the release of sewing machines, magazines and courses were launched teaching both the skills but also facilitating the learning through the use of templates, which

could be used repeatedly. People also had to get to know these related products. There were contexts, an order and narratives all informing the process of creating a final product, whatever that may be. When sewing, the dressmaker would learn both the narratives and the machine, embodying the modes, speeds and quirkiness of the product making. The child, while playing with the toy versions of the machine, sought to achieve the same while having fun.

The typewriter (also known as the calligraph) also shared some of the same learning processes as those associated with sewing machines. Typewriters allowed for the standardisation of professional writing, allowing anyone who was literate to engage in writing without needing to decode various handwritings. The calligraph allowed for uniform writing, for clear calligraphy¹. There were typing courses, and in order to type a document, the typist had to become familiar with the machine and acquire a sense of unity where the fingers knew where to go without conscious perception. Good typists are capable of acquiring a sense of unity with their typewriter, shaping the skill of typing into an embodied knowledge. And yes, there were also toy typewriters. The toy counterparts of these objects promoted the ideas of having fun and playing, while also engaging in learning skills associated with a tool.

In order to become a dressmaker and gain calligraphy skills, one had to engage in a type of penmanship, where the writing is equivalent to producing a neat result through acquiring the skill of engaging with the materials and the machines. Both machine-related skills required practice and training in order for the hand to produce a visually pleasing and clear product. There were several tools, and with each and every tool, the hand had to become *one with the tool* to deliver the desired outcome. Merleau-Ponty (2002), when discussing the phenomenon of habit as something that cannot be rationalised, exemplified a notion of an acquired skill through

¹ Calligraphy originates from Greek (Kallos, Kalli = good, beauty; Graphein, Graphos = write, person who writes)

the act of typing on a typewriter as creating ‘knowledge in the hands’ (2002, p. 144).

This notion of penmanship continues to evolve, together with machines and their technologies. Looking back, I consider sewing machines as the equivalent of 3D printing from the turn of the twentieth-century, and typewriters as ‘printers that print while you type’². None have lost their charm, nor have they been forgotten. A century later, instead of calligraphs, we have digital tablets, which communicate, engage and can send commands to several outlets. Tablets work offline and online and have entered the twenty-first-century toy landscape. This device turned toy itself poses a number of possibilities – and questions.

In recent debates, discussion has focused on the positive and negative aspects of media use (Buckingham & Strandgaard Jensen, 2012). Tablets, as a six-year-old technology, have joined this controversial field and have been the target of headlines in a number of newspaper and news sites in Denmark in recent years (‘Guide: Sådan værner du dit barn af med at spille iPad,’ n.d., ‘Om iPadiskolen,’ n.d., ‘Spil på iPad kan bremse børns udvikling,’ n.d., ‘Tjek lige iPad’en,’ n.d.)³. More recently, some research initiatives have emerged focusing on mapping when and how media and the internet are used by families with young children, which includes tablets (Holloway, Green, & Livingstone, 2013; Ólafsson et al, 2013; Sefton-Green et al, 2016).

Thus far, scant attention has been given to tablets from a play perspective in order to map the types of activities that are taking place while young children engage with these devices. For example, whether

2 A Brazilian newspaper chronicle writer used this expression a few years ago to explain a typewriter to his young daughter. Unfortunately I could not trace the article, but the writer was Luis Fernando Veríssimo for O Globo newspaper from Rio de Janeiro.

3 ‘Guide: How to get your child to stop playing on the iPad’, ‘About iPads in school’, ‘Playing on iPads can affect children’s development’, ‘Just check the iPad’ (own translation of the article titles).

playing with tablets promotes the development of several competences, such as learning a wide range of narratives and symbols; or looking at the roles of the hands and how they shape and become an integrated part of digital play. From the angle of play and tablets, I set out on this research with the following scope:

- To assess digital literacies through young children's current play practices with tablets in two⁴ distinct countries.

More specifically, during this research, I focused on studying how tablet play among preschoolers helps redefine recent concepts of digital literacy practices (Sefton-Green et al., 2016) in Denmark and Japan. Members of the young generation in both countries understand and conceptualise the physical world based on a range of skills, including those learned through their interaction with technology. Play is culturally shaped (Fleer, 2014; Sicart, 2014) and in the age group between 4 and 6 years of age (hereafter referred to as young children), play is the main mode of engagement with tablets, thus my overarching lens. As contemporary digital devices carry almost identical visual interfaces, investigating how play practices are manifested across countries with distinct cultures sheds light on transnational aspects of children's engagement with media (Drotner & Livingstone, 2008; Marsh, 2010).

Play can be a tangible or an abstract experience, a mode of being (Sicart, 2014). It is witnessed as the visible interaction and participation when playing with objects and peers as well as in the make-believe and thinking that goes on in children's (and adults') minds, which is impossible to access visually. Play could be seen as the central element in the development of human culture, or 'how far culture itself bears the character of play' (Huizinga, 1949, preface, unnumbered page).

⁴ I initially wished to study three countries. However, due to the extensive data and limited time to finish the thesis, I streamlined the process to include only two countries. These countries proved to be diverse yet sufficiently similar to set a base of valuable and valid data.

The role of play in children's interactions with and approaches to technology is undeniable, and affords new digital literacies, as children play across media (Gilster, 1997; Lankshear & Knobel, 2008; Leu et al, 2004; Spencer, 1986). Tablets, as an example of the current pervasive media, are the artefacts many children, parents and educators are turning to when investigating and debating young children's digital practices (Arita, Seo, & Aldriedge, 2014; Chaudron, 2015; Couse & Chen, 2010; Merchant, 2015b; Neumann, 2015).

In addition, if children are to use digital tablets or similar tools at school ('Tablet and e-learning Initiatives Around the World | Tablets For Schools,' n.d.), preschools should prepare their pupils for the expected future interactions to avoid a gap or a wide discrepancy between *master* users and *novice* users. Just as young children learn to recognise letters and numbers and practise motor and dexterity skills, learning and practising tablet-related (or digital-related) skills should be as integrated as all the other skills. Throughout my observations, there was a perceptible degree of discrepancy among the children's use and knowledge of tablets. Tablets, like pencils, require practice. This discrepancy indicates a form of 'digital divide' (Buckingham, 2005; Chinn & Fairlie, 2006; Scardamalia, 2003). In this context, the 'digital divide' does not necessarily fit its earlier definition as the gap between the technology rich and technology poor. Instead it can be reconceptualised and expanded to cover the gap between the *technology enthusiastic* families versus *technology apprehensive* families, which does not necessarily match economic patterns in the context of the observed target groups. Even though the learning curve associated with tablets might be steep and happen in a short period of time, the ways families perceive technology may also affect how a child relates to and uses a digital object.

I chose a grounded theory approach (Charmaz, 2014) in order to avoid blurring my research with pre-formed perceptions regarding children and technology. In grounded theory, the study starts with the empirical data collection instead of with the formation of hypotheses. The coding and data analysis provide the initial material to be matched with existing theories. I find this method more in tune with the field of my research,

as I wished to avoid setting out on an investigation with one set of perspectives. Instead, as the method suggests, I wanted the data to guide which perspective should be used when studying children and technologies. This choice, together with the richness of the data, led me to expand the theoretical scope, bringing together theories from diverse scholarly fields.

Consequently, although this PhD thesis follows a traditional structure, with the literature review following the introduction and context chapters, it is valuable to know that the theory was assessed and revised after the first round of data collection. Therefore, if this thesis would have the reader follow the actual process used in this study, the methodological chapter would come first, followed by the literature review and the final analysis and discussion. However, I have chosen a classic structure since I believe my data analysis and discussion become clearer if readers are already aware of the theoretical key points I chose to engage. Although I set out without an initial literature review, I acknowledge that my background and previous experiences coloured my coding and analysis process that led to the literature review.

I have also taken the liberty of applying a slightly unconventional page layout. The quotes spread throughout this thesis both inspire and challenge my own work. I have matched them to the chapters and topics being discussed as side notes, sometimes informative, sometimes funny, and sometimes critical. I have also added some further descriptions of specific terms with the purpose of having my work enter a dialogue with scholars from different fields.

This introduction composes the first chapter of this thesis and sets the scene for my research process.

The second chapter covers contextual aspects of play together with descriptions of preschool institutions in Denmark and Japan. I also introduce a hand movement typology. This typology emerged from the data analysis, but as some of the terms are used in the method chapter, I chose to present it earlier to help the reading process. A short glossary of terms follows the typology to facilitate reading the following chapters.

The third chapter presents the literature review, where I introduce core theories to substantiate the topics of digital literacy and play, plus a brief introduction to the topic of experience. The literature was reviewed after the pilot study data was analysed. Throughout my analysis, I repeatedly reverted to relevant theories in order to leverage my analysis and discussion. The literature review was reread and updated until a couple of months before the conclusion of this thesis to accommodate some recently published related texts.

The fourth chapter introduces my methodological approach and my research design. I explain my choice of grounded theory and how my research process followed this approach. In addition, I use excerpts of data to illustrate how the empirical data was collected and coded. The findings and final coding follow the examples framing the subsequent analysis and discussion.

The fifth chapter presents my analysis and discussion intertwined with my proposed tablet play taxonomy. I explain how I clustered the theoretical codes that emerged in my analytical process into five final categories. The analysis and discussion of my empirical data expose the thinking behind my process leading to my theoretical contribution.

The sixth chapter draws on the analysis and discussion. I summarise some of the aspects presented in my analysis and discussion, shaping my theoretical contribution to the field of childhood and play studies.

The seventh and final chapter is my conclusion. Instead of restating what has been presented throughout this thesis, I conclude by offering an all-round perspective of the existing play practices in society and how children are setting the stage for our playful world.

Thus, normal seeing is, in a very real sense, a form of extended, highly flexible touch.

W. J. T. Mitchell (In Elkins, Visual Literacy)

*The better you were able to imagine what you wanted to imagine, the farther you could
flee from reality.*

Haruki Murakami, The Wind-Up Bird Chronicle

*Philip K. Dick could have been Japanese. He seemed to know a lot about how the world
is never what it looks like. That's pretty much Japan through and through.*

Christopher Barzak, The Love We Share Without Knowing

*There is no geometry here; or rather there is a secret, infinitely non-Euclidian and subtle
geometry, a secret harmony that the mind seizes before the intelligence.*

Alan Macfarlane, Japan Through the Looking Glass

RESEARCH CONTEXT

In this context chapter, I explain the reason for carrying out the observations in two countries, Denmark and Japan. I then contextualise the terms used to describe play in the Danish and Japanese languages and offer a brief context of childcare institutions in both countries. After these cultural perspectives, I introduce a set of terms for shaping a typology of the hand movements involved when interacting with the tablet. Finally, I propose a short glossary that, together with the typology, aids the reader's progress through the chapters that follow.

Denmark and Japan

'If you are studying the generality of a finding across nations (the country as the context of the study), selecting countries so as to maximise diversity along the dimension in question should allow you to explore the scope or universality of a phenomenon' (Ólafsson et al., 2013, p. 22).

'...There is an urgent need to map children's engagement with cultural texts, such as media texts, in a global context' (Marsh, 2010, p. 12).

These two quotes introduce valuable grounds for including two countries as the sources of data for my research: observing the generality of young children's play practices with current technologies, such as tablets, in distinct contexts. Mobile technologies, such as tablets and smartphones from brands such as Samsung and Apple, have become ubiquitous in several countries. However, are current play practices with digital devices

defining similar norms despite diverse cultural contexts? Technologies such as tablets are ‘always flavoured by the local as instantiated in routines, relationships and day-to-day operations, as well as by the beliefs, understandings and experiences of participants’ (Merchant, 2015a, p. 6). Although I agree with this perception by Merchant (2015a), in my research I am not seeking to map the differences between Danish and Japanese children; instead, I set out to determine what types of play practices become universalised through tablet media. Play is a mediator of the interaction between child and device. Moreover, mapping digital play in transnational contexts facilitates thinking about future developments in both design and educational fields. I also wished to investigate whether there was a universal *play vocabulary* when dealing with touch-sensitive devices, as they carry the same interfaces across cultures.

The first country was the base country of the research, Denmark. The second country was selected on the basis of several initial points. First, it should not be a country where the similarities between cultures were too obvious (with this criterion, several northern European countries were excluded). Second, the educational systems, mainly related to young childcare, should be equivalent to those encountered in Denmark (children do not learn to read or write until six or seven years of age), and this aspect helped me eliminate another set of countries, such as England and Spain. A third point concerned language access. It should be a country where I could interact with the children in their language. Both Japan and Brazil fulfilled these conditions; however, Brazil presented another variable, which is the wide social-economical differences between classes.

Japan, like Denmark, has a more stable and unified social-economic system, and, in that sense, is closer to Denmark though with a clear cultural distinction regarding language and play. In addition, Japanese culture is described as a technology-oriented culture (McGray, 2002, cited in Ito, 2006); therefore, it is valuable to assess how this orientation is lived and apprehended in this culture considering the pervasiveness of Western-designed gadgets, such as the iPad. Considering the early adoption of mobile phones (Ketai) and the I-mode in Japan, which is a system

that in 1999 already offered many of the services attributed to current smartphones (Mizuko Ito, Matsuda, & Okabe, 2006), Japanese culture has also embraced various forms of entertainment, including games as a regular part of their culture (Kusahara, 2003). Playing or having fun is witnessed in Japanese daily life through a wide range of visible accounts and performances, from dress codes, icons and characters displayed on signs, traffic information and packaging, to a variety of toys carried on bags, and commuters playing on their phones (Mizuko Ito, Okabe, & Tsuji, 2012). These performances compose some of the multimodal aspects of current communication practices pervasive in Japan and inform the cultural urban context of Japanese children (Yamada-Rice, 2013). Similarly, digital tablets offer multimodal ways of communicating and rich iconography.

In Denmark, as a western country, various forms of play have been mostly linked to pastimes and children's activities for many years. In more recent years, play perception has shifted with both the videogame market, catering for late teenagers and young adults, and smartphones, with which a range of users of all ages can engage while on the go.

Although Danish and Japanese societies can differ in a number of aspects, there are aspects of play and games that have exceeded borders and become universal, such as chess and rock, paper, scissors. As people cross borders for work and life, pieces of their culture are carried with them, and several games and traditions have become adopted and incorporated in diverse ways. However, it is also true that some of these adaptations are adjusted to their new culture and change in the way they are interpreted, with small local adaptations tending to appear (Merchant, 2015a). From songs and cards, to role-playing games, several commonalities and differences are encountered in various countries including the ones from this research.

What about tablet play? Based on my observations, there are several digital games and icons that are popular in both Denmark and Japan. These games and icons, together with several other media, are equivalent in both countries, in the form of TV shows, toys, characters, etc. These

media are context dependent, and as such are absorbed and appropriated in these societies. In the case of tablet play, the digital interface of the device, combined with the apps and the ways of playing, are the same, with almost no local cultural adaptation. The tablet interfaces in Japan are the same as those in Denmark and follow a Western layout structure, with a left to right orientation, and while the apps can speak different languages, the digital scenarios and activities offered on the devices' digital stores are almost identical. Children from both countries knew many of the same characters and applications installed on the devices used in the research. Consequently, the styles of play are expected to be of a similar character, with the types of interactions being dictated by the device and app designs. In order to better ground as well as challenge current and future perspectives of children's digital play practices, it is valuable to consider how technology-related skills are developed and incorporated into these countries and their cultural contexts.

Lege and asobu

In different languages and cultures, the term for play is defined and described in modes and forms, offering many subtleties in its meanings and uses.

In Danish, there are two main words used to define play: *lege* and *spil*. *Lege* refers to something that small children do, for example, they play house, play with dolls, play with dogs, etc. *Lege* is also used to describe a form of make-believe: she is playing as if pretending she is the queen; he is playing as if pretending he is a plane. This type of play should be differentiated from the act of playing a part in a play for the theatre, as actors *spiller* rather than *leger* (otherwise it would not be actual acting or *spille*, but pretending to try to act). So most activities by children are defined as *lege*, meaning nothing truly serious, but something fun, open and casual. When the verb is used for adults, it means an innocent attempt at an action, something of a light character or sometimes if something is done with extreme easiness and ability, e.g. *Hun bager en kage som en leg*; Baking a cake is

child's play for her. Such nuances of a term create a unique perception of the action of *lege*, giving it an array of scenarios and expectations. The verb *at lege* does not need to be complemented by a substantive, the action can be a complete action in itself, so one can say *han/hun leger* (he/she plays).

The term *spille*, which also translates into English as play, already indicates another very distinct meaning. The term originates from the German *spil*, meaning game (in Proto-Germanic it also meant *dance* and *exercise*). The Latin equivalent, *jocor* was to make a joke, to think of something as fun, which resembles more the *lege* definition than that of *spille*. While *lege* has no set of rules bound to the perception of the word, the word *spil* already brings on its core meaning, a frame or structure. So in Danish one does not say *spille med dukker* (play with dolls) as playing with a doll has no set of recognised rules, instead the ways individual children play with their dolls might differ, so *leger med dukker* is the expression used. *Spille* needs a complement for its full meaning, one always says *spille something or with something* (plays something), such as (play) chess, as this is an identified game with a known set of rules. The term is also applied to games of chance and sports, such as *spille Lotto* (play the lottery), *spille fodbold* (play football), etc.

So from these terms, one can easily define the type of action pursued with various objects, including digital devices. Therefore, if the sentence *lege (med) iPad* is used, the purpose or the type of interaction being performed is not defined i.e. it is not a serious activity, meaning the child may be watching videos, playing on various apps, taking pictures, etc. All of these would fall into the *lege* category. However, when using the term *spille*, the sentence would be: *spiller Angry Birds*, meaning playing *Angry Birds*, a specific game with a specific set of rules. *Spille* can also be used for instruments, such as *hun spiller klaver* (she plays the piano) and acting *hun spiller Juliet* (she plays Juliet). In sum, *spille* indicates play bound by a set of rules. In my observations, Danish children used the term *spille* when

referring to tablet play⁵.

In the Japanese language, there are specific verbs for specific activities and this also applies to play. Instead of two words, the range of words for distinct play activities is much larger. For the sake of the focus of this study, I limit the definitions to better relate to my current discussion; the three words selected are *asobu* (遊ぶ), *suru* (する) and *yaru* (やる).

The first word, *asobu*, is a general word connoting play not limited to games or rules, i.e. *asobu* is used for any form of free play⁶, entertainment or amusement. *Asobu* carries the sense of a non-intentional and an enjoyed activity and can be translated as the Danish definition of *lege*.

The remaining two words, *suru* (する) and *yaru* (やる), are very broad and related as verbs. Both share the meaning of ‘to do’, so it implicitly indicates an action depending on the word/substantive that precedes it – the antecedent word will define what the action is. In the case of videogames, the Japanese terms *suru* or *yaru* are primarily used. Comparatively, the terms *suru* and *yaru* are even broader than *spille*. However, like both the Danish and Japanese terms, they are tied to a structured action, thus *suru* and *yaru* can translate as *spille* when related to play-like activities, such as games. In the Japanese observations, all three words were used when talking about play and tablets, although *asobu* and *suru* prevailed.

Together with a wider range of actions and actors (Latour, 2005), oral language composes the sociocultural contexts of tablet use. Children participate in these contexts and flows between practices and artefacts while building their play (Medina & Wohlwen, 2014). Defining an activity

5 Nowadays, it is also common to hear *han ser iPad*, meaning ‘he is watching iPad’ when referring to a child watching cartoons, films or YouTube on a device.

6 *Asobu* can be used in all these sentences ‘the children are playing’ or ‘they are hanging out’ (where ‘they’ can mean anyone of any age) or ‘Noa and Charlie are fooling around’ (in a sexual connotation).

is a way of framing the interaction. A brief analysis of the play terms of choice based on the observations indicates that whereas in Denmark, playing with tablets is more commonly described as structured play (*spille*), in Japan the description appears to be looser, with *asobu* or free play being used to referring to the iPad in general when used by children, while *suru* and *yaru* were used more when describing playing with specific applications and games⁷.

Another actor helping to build the larger context of young children's lives and play practices are the day care institutions. Children spend long hours in these places, where they engage with people who do not belong to the child's direct circles of family or relatives. Instead, children gain a rich social environment with other children of similar age and professionals who engage in helping the child to develop and grow. The descriptions of the Danish and Japanese care institutions that follow further depict my subjects' social educational context.

Børnehave and hoikuen

It is important to clarify the profiles of the institutions that collaborated in my study. Although both use the term kindergarten when speaking English, their structure and goals fit more closely with those of a preschool in the English definition, where pedagogues focus on motor skills and social abilities, with a lot of play and loose structures instead of primarily focusing on preparing children for school through teaching them the alphabet. In Denmark, it is not uncommon that children only learn the alphabet and learn to write at the age of 6 or 7 when they formally enter the school system in grade zero, which corresponds with the English kindergarten. In both the Danish and Japanese institutions, children learn colours, shapes, numbers and sometimes, when interested, they also learn

⁷ This was not my direct focus, and further research is required to gain deeper knowledge regarding the vocabulary.

to write their own names, though this is not necessarily a requirement.

Denmark

Børnehavn, which translates in syntax to Kindergarten (børn=kinder=children, have=garten=garden) is a day care service offered to children from age three until the child starts attending school, which, in Denmark, can vary between 5 or 7 years of age. The reason for the age difference is determined not only by the child's birth date, e.g. children who turn 6 early in the year enter school at 6 years, and others who have birthdays in the second semester enter school at 5. Moreover, in the case of the ages between 6 and 7 years of age, the variation is sometimes due to some kind of pedagogical assessment conducted by the *børnehavn* pedagogues. Some children are encouraged to delay their school entry by a year if they turn 6 after late November or if they are deemed not ready for school. This school readiness consideration is the main reason that the age range in my study varies from 4-7 and not 4-6, as there was one child who participated in the pilot study who had just turned seven and was going to attend school that year (2014). When children enter school, they can attend grade 0, which would correspond to a kindergarten class in English terms. Danish *børnehavn* focuses primarily on helping young children to develop their language, social and motor skills, offer contact with nature and play, with every institution having an outside area with a small type of playground (the sizes differ depending on the location). Some *børnehaver* are even 'forest *børnehaver*' or others which are *mixed*, which means that they offer trips to the forest for some groups during certain weeks of the year. In these cases, children have to meet at a local place in the city and a *børnehavn* bus drives them to a location out of the city, which normally offers large green areas and plenty of outside activities in all types of weather conditions. In Danish preschools (as well as schools), children wear their own clothes and there are no uniforms. Every child has a personal mini-closet containing an extra change of clothing in case of mishaps.

Japan

In Japan, there are two types of day care institutions for young children, *yochien* and *hoikuen*⁸.

Yochien (幼稚園 *yóchien*), predominantly follows educational aims and houses children aged 3 and up. *Hoikuen* institutions are predominantly concerned with providing care for young children in general, and can take children from as young as a few months old until 6 years of age. Both types can be found as private or public institutions. In both kinds of institutions, social, motor and development skills are in focus, with *yochien* also devoting attention to preparing children for schools, with a stronger emphasis on learning the alphabet. The institutions have an outside space where children can play, and it is not uncommon for the children to have uniforms. This space differs from institution to institution, with some offering a larger outside space than others. Despite this difference, it is not uncommon, as in the Danish institutions, for *hoikuen* to call themselves kindergartens (and not preschools) although they potentially function just as the *børnehaver* in Denmark. Both the Japanese institutions that collaborated with the research were *hoikuen* in order to match the structure of the Danish institution.

Generally speaking, the two institutions visited expressed concern regarding the physical and mental development of the children, with a focus on both physical activities as well as scope for exercising motor skills via drawing, painting and collages. Music and outside activities were also part of their weekly schedules.

Considering these were only two institutions, it is not possible to generalise regarding institutions in Japan. However, both of them also prioritised not only communication skills, but international knowledge with opportunities for children to learn or at least be exposed to a foreign

8 Parents decide which institutions their children attend.

language from very early on, with a more bilingual upbringing encouraged through teaching songs, colours and shapes in English⁹.

Denmark and Japan

Despite the geographical distances between Japan and Denmark, everyday life in the preschools seemed similar, with children being offered a range of activities in which to engage. Some included the whole group, while others divided into smaller groups. All institutions are open long hours, from 7am until 5pm in Denmark, until 7 or 8pm in Japan. In both countries, the core of the activities ends at around 2pm, with the rest of the day being filled by playing outside in the playground or indoors. In both Denmark and Japan, parents have to pay for their children to attend these institutions. In both countries, the number of adults per child was similar, and the groups were also divided into around 22-24 children based on age. In the case of the Danish institution, children were aged from 3-7 years, though there were groups of younger children aged mainly 3-4 years and fewer older children. The group that I joined included mainly older children i.e. children aged 4-6, though one child was 7. This way of organising children according to age was also witnessed in both Japanese institutions, where children were divided into groups, some with children aged 2-3 and others with children aged 4-6 years.

For the sake of consistency, and to avoid any confusion, throughout this thesis I use the term preschool to refer to the *bornehave* and the two *hoikuen* where I carried out my observations.

The context of the hands

During the transcription period, another aspect of the data emerged: the role of hands in communicating as the centrepiece or the magic

⁹ This bilingual aspect is further explained in later paragraphs.

wand that brings the screen alive. As when describing what children were doing on the interface, I needed a clear description of the actions they were performing. These ways of interacting with the device informed an initial typology of hands' actions. This typology can be of use to both those observing children's screen interaction and readers in the following chapters when sections of the data transcription are presented. A small glossary follows the hand typology as it provides as an additional aid during subsequent chapters.

The observed variety of actions aligned with differences in hand movements and intentions led me to classify the touch inputs observed into a preliminary hand typology, which I summarise in the following¹⁰:

1. Hovering:
 - a. Action: moving the hands or just one finger above the interface;
 - b. Suggested intention: Still in doubt and exploring the possibilities, making a choice, deciding what to do.
2. Tapping:
 - a. Action: fast touch with one finger (or by chance with an arm or another hand);
 - b. Suggested intention: to play, the child had made a choice regarding an app, or a symbol and decided to interact with it.
3. Swiping:
 - a. Action: while touching, moving one finger across a small area of the screen;
 - b. Suggested intention: to enter the device, to browse on the device, to flick through pages in a book, to go forward inside an app.

¹⁰ This typology was introduced earlier in the article: Froes, I. Tosca, S. Hands Between the Worlds. In the Routledge Companion to Digital Ethnography. Forthcoming). <https://www.routledge.com/The-Routledge-Companion-to-Digital-Ethnography/Hjorth-Horst-Galloway-Bell/p/book/9781138940918>

4. Dragging (holding):
 - a. Action: tap and, without letting go of the contact interface, move the finger/hand across the screen;
 - b. Suggested intention: to move a character or icon around the interface, to move apps across the screens/areas of the device.
5. Continuous tapping:
 - a. Action: a series of short consecutively taps;
 - b. Suggested intention: to try to get an icon to respond (even in cases when it is not necessarily interactive), insistence.
6. Force tapping:
 - a. Action: tapping with pressure (can be related to using force when drawing on paper);
 - b. Suggested intention: to try to force an icon to respond, persistence.
7. Long tapping:
 - a. Action: tapping for a bit longer than a short tap (observed when either trying to choose something for the second time or trying a non-interactive symbol);
 - b. Suggested intention: Also persistence, as if the device had not obeyed.
8. Tilting:
 - a. Action: moving the device sideways, vertically or horizontally;
 - b. Suggested intention: to control icons or characters within an app. E.g. to pour liquids, to drive, to make things fall, etc.
9. Divergent dragging:
 - a. Action: moving two fingers in opposite directions;
 - b. Suggested intention: to see things *closer*, zoom in.
10. Convergent dragging:
 - a. Action: moving two fingers towards each other;

- b. Suggested intention: to bring it back to its original size, zoom out. To try holding an object.

11. Simultaneous holding:

- a. Action: tapping and holding simultaneously with two fingers;
- b. Suggested intention: to move the orientation of the space in the case of 3D environments.

12. Reach:

- a. Action: pointing closely as in tapping or *touching* an icon;
- b. Suggested intention: showing something, sometimes using words that indicate physical distance despite device proximity.

Some of these terms, such as tapping and swiping, already belong to an everyday vocabulary when referring to touchscreen interfaces. However, even though some of them are associated with digital devices, they are not necessarily defined beyond their precise physical actions¹¹. The typology proposed here defines some of the actions a bit further, and matches them to intentions of use. For example, while playing a game where one needs to

¹¹ Crescenzi, Jewitt and Price (2014) have presented a set of touch-based codes in their research with nursery school children, aged 1.5-3 years, while doing finger painting activities on iPads and paper. Merchant (2015) similarly presents a set of touch interactions in research with young children, aged 14-22 months, when using story apps on an iPad together with an adult. Despite identifying a couple of similar touch behaviours, our research foci differ in both the age group as well as the type of analysis. For example, although the authors identify some of the same hand movements, such as *tapping*, they do not associate that behaviour with any type of specific intention. Nevertheless, the studies are related as all three explore young children interacting with digital technologies.

Crescenzi, L., Jewitt, C., & Price, S. 2014. The role of touch in preschool children's learning using iPad versus paper interaction. *Australian Journal of Language & Literacy*, 37(2), 86-95. Accessed on 13 February 2016, <http://eres.library.manoa.hawaii.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=96256128&site=ehost-live>.

Merchant, Guy. 2015. 'Keep Taking the Tablets : iPads, Story Apps and Early Literacy'. *Australian Journal of Language and Literacy* 38(1), 3-11. Accessed on 26 March 2016, <http://shura.shu.ac.uk/9100/>.

drag a boat across the screen to save a drowning sailor, the dragging action was accompanied by the child saying ‘you have to take him there’. The actions identified in the analysis and classified in the typology helped frame the hand language vocabulary, which seems to have been learned through interacting with tablet devices.

Glossary

The concise glossary below specifies the meanings of the terms I use most frequently in the specific context of this thesis.

- **Activities:** The actual tasks that are offered from within an app. For example, the Lego Duplo Food app includes different activities as part of a narrative. As the player selects the play button, he/she can choose what food to sell before setting up the sales outlet ready to receive customers by opening doors, windows. The third activity involves receiving and putting the food away. The fourth activity is to prepare the customers’ orders. Many apps also offer different scenarios and other types of activities, such as puzzles, putting objects in specific places, matching colours, etc. Other apps offer a number of games to be played, and by playing those games, the players earn points that allow them to buy different items in the main activity, as in Talking Tom.
- **Apps:** Digital applications common to mobile technologies, such as phones and tablets. I also use the term to refer to the applications that were installed in the devices.
- **Book Creator:** An application (app) whereby users can draw, take pictures, record sounds, etc. to create a multimodal digital book. The app also allows for importing pictures and videos from the camera roll. The app was developed by Red Jumper Limited, <http://bookcreator.com/>.
- **Competence:** the ability to do something (well).

- Children, young children or preschoolers: The children who participated in my observations, my research subjects.
- Games: Structured play. An activity where there is a somewhat defined path with a specific goal.
- Narrative: a story, description or account of events, experiences; a way of explaining or understanding events or ‘a representation of a particular situation or process in such a way as to reflect or conform to an overarching set of aims or values’. In other words, the term goes beyond the literary definition, where a narrative is identified as a story or the style of how a story is told¹².
- Penmanship: the activity to learn to write clearly and beautifully. Also, means the skill to do so.
- Preschool(s): the institutions where I carried out my observations.
- Skill: an ability to do an activity or job well, especially because you have practised it. (Cambridge Dictionary)
- Tablets/digital devices/digital tablets: A device that can be personalised by users through the purchase and download of applications online. The device can be used both online and offline. Popular brands are Apple iPads and Samsung Tablet Notes.

Chapter overview

The typology and glossary, combined with the knowledge about play and play terms in Denmark and Japan, set the stage for the next chapters. This short overview aims to inform and contextualise the spaces where

12 Oxford Living Dictionaries, <https://en.oxforddictionaries.com/definition/narrative>

I carried out my observations. In addition, some of the aspects I have described in this chapter, such as the hand typology and the play terms, return later in both my method and analysis and discussion chapters. My literature review chapter immediately follows to further contextualise my field of research and inform my analysis and discussion, which culminate in my theoretical contribution.

Our relationship to the world of information is changing, because the hard-and-fast definitions of world and information have begun to collide, and the boundaries between them – which separate reality from imagination and idea from realization – have become even more tenuous. In the era our children ... inhabit, world is information.

Even as toys grow more flexible, more reflective of our increasing capabilities to the environment to suit ourselves entirely, they become a sort of magical laboratory for the exploration of possibilities entirely beyond our abilities.

Mark Pesce

We drive into the future using only our rear-view mirror.

Marshall McLuhan

LITERATURE REVIEW

Due to the ubiquity of portable devices, such as tablets, together with the ongoing development of new interfaces of interaction (wearable, non-touch interfaces, etc.), it is relevant to reassess children's digital literacies currently witnessed in society (Merchant, 2015a). The reason for choosing to converge theories on play, literacies and experience in one study emerged during the pilot observations. Initially, I envisioned assessing themes related to those described in digital literacy and literacies theories (Eshet-AlKalai, 2004; Gillen, Barton, Kress, & Garnett, 2010; Gilster, 1997; Lankshear & Knobel, 2008; Marsh, 2004, 2005a, 2014; Martin, 2008; Sefton-Green et al., 2016; Weber & Dixon, 2010), and throughout the pilot observations, I was able to also identify current practices of digital play (S Kline, Dyer-Witheyford, & Peuter, 2003; Marsh, Plowman, Yamada-Rice, Bishop, & Scott, 2016; Plowman & Stephen, 2014; Verenikina & Kervin, 2011) and witness aspects related to digital experience (McCarthy & Wright, 2004a) in children's play practices with tablets.

Considering that the children observed were of a young age, it might be expected that their primary focus when using digital devices was playing and having fun – as they themselves described it during the sessions. Nevertheless, while children played, they also created stories and characters, interacted with symbols, icons and brands in a variety of forms, discovered how to play, what to do and how to do it while learning – all these aspects were intertwined in their tablet play. Therefore, I had to take a step back in my process and question:

- What literacy is within the field of playing, (what types of learning

are taking place?);

- What being *play literate* is (how to master the requirements in order to navigate an array of options and digital game narratives?);
- What being *digital literate in playing as a young child* is nowadays (how do recent definitions of young children's digital literacy encompass aspects of tablet play?).

Thus, I have drawn on the concept of literacies and have analysed children's practices with tablets through the lens of digital literacies and play theories, while having the freedom to adapt the definitions according to the empirical data collected.

This chapter primarily introduces theories on digital literacy and play, and is divided into three main sections: Digital literacies, Play, and Digital literacy and Play. Besides these sections, a final section is dedicated to briefly introducing theories on knowledge and experience related to social practices, which have also informed this research.

The first section covers digital literacies and reviews of existing theoretical approaches to both digital and media literacy (Livingstone 2003; Ito, M. et al. 2013; Livingstone 2008a; Buckingham 2007; Buckingham 2006, Livingstone 2004). Theories on digital literacy span a sufficiently wide spectrum. They are briefly introduced and discussed in the following pages, complemented by theories on children and literacies. These theories covering children and digital literacies are of high relevance to my own research and bring key questions that more efficiently guide my contribution to the field. Consequently, although I acknowledge a number of theories covering studies on literacies, I have chosen to limit my scope to digital and media literacy theories, giving preference to concentrating on scholars who focus primarily on children. The focus of literacy-related studies (Buckingham, 2006; Erstad & Amdam, 2013; Jones & Hafner, 2012; Lankshear & Knobel, 2008; Marsh, 2004, 2005b; Rowsell & Pahl, 2015) has evolved from basic literacy skills, such as reading and writing,

towards more complex definitions, such as those covering distinct media and technological aspects such as ‘digital literacy’ and ‘digital literacies’ (Eshet-AlKalai, 2004; Gillen, Barton, Kress, & Garnett, 2010; Gilster, 1997; Lankshear & Knobel, 2008; Marsh, 2004, 2005a, 2014; Martin, 2008; Sefton-Green et al., 2016; Weber & Dixon, 2010), ‘emergent literacies’ (Spencer, 1986), ‘media literacy’ and ‘information literacy’ (Gillen et al., 2010; Leu et al., 2004; K. T. Levinsen, 2007).

The second section covers play theories, and introduces specific aspects of play from within historical and sociological studies (Caillois & Barash, 1961; Henricks, 2006; Huizinga, 1949; Sutton-Smith, 1986, 2001) together with related play aspects from within education and psychology studies (Bodrova & Leong, 2015; Dockett & Flear, 1999; Flear, 2014; L. S. Vygotsky, 2004; Piaget, 1951; Vygotsky, 1966). These aspects are complemented with research related to digital aspects of play and playfulness experienced in social and cultural practices (Barnett, 1990; Ejsing-Duun & Skovbjerg, 2015; Stephen Kline, Dyer-Witthford, & De Peuter, 2003; Pesce, 2000; Plowman & Stephen, 2014; Plowman, Stephen, & McPake, 2009; Salen & Zimmerman, 2005; Sicart, 2014; Verenikina & Kervin, 2011).

The third section covers digital literacy studies and play, joining the two previous sections by defining current studies and theories at the intersection of both fields. These fields have been combined before by a number of authors (Abrams, 2015; Gee, 2003; Jones & Hafner, 2012; Marsh, 2005a, 2010, 2014; Marsh & Bishop, 2013) who have studied overlapping characteristics that join literacy and play, media and play, literacy, play and consumption, etc.

The fourth section of this chapter highlights notions of knowledge and experience from the fields of phenomenology, anthropology, and science and technology studies (STS). These notions, such as Merleau-Ponty’s habit (2002), Ingold’s embodied knowledge (2009, 2013) and Latour’s actor-network theory (2005), guided me to reconcile my research with aspects of tablet play that went beyond the app designs and purposes of the device.

Consequently, these theories are briefly mentioned in this chapter although they do not represent the core focus of this research.

Following these four sections, I present a summary of the key theoretical concepts that are introduced throughout this chapter. These concepts serve as a plateau for further elaborations based on my findings, which are presented in my analysis and discussion chapters.

Digital literacies

Digital literacy is a broadly discussed term/concept. When Gilster (1997) first suggested this expression in his book of the same name, digital literacy was related to computer-mediated information. He defined it as ‘the ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers’ (ibid, 1). He discussed how reading always required interpretation or the capability to grasp what the combination of joined letters meant. As the definition of literacy evolved from basically learning the alphabet towards a critical and rhetorical competence, the digital literacy definition has also engaged in the same type of evolution.

With the growth of technologies mediating the Internet, together with its modes of use in the past 20 years, Gilster’s definition has been challenged and complemented by other scholars (Buckingham, 2006; Chang, Nunez, Roberts, Sengeh, & Breazeal, 2013; Couse & Chen, 2010; Leu et al., 2004; Liestøl, 2007; Shuler & Ed, 2009). Lankshear and Knobel (2008) who have acknowledged what they call the ‘plethora of conceptions of digital literacy’, presenting a wide scope of the digital literacy topic and suggesting instead the plural form of the expression – digital literacies. I entitled this section ‘Digital literacies’ because I feel the expression better informs the breadth of literacy studies described here.

In current social practices, including those involving young children, and with the ongoing development and adoption rate of emerging technologies, digital literacy can then be seen as a ‘framework for integrating various

other literacies' (Martin 2006 in Bawden, 2008, 5). Martin (2008) presents 'literacies of the digital' encompassing: Computer, IT and ICT literacy; Technological literacy; Information literacy; Media literacy; Visual literacy; and Communication literacy. These literacies emerged due to the need to address technology-related competences, which evolved through a range of developments involving technologies and cultures. However, they are intertwined in social practices and intersect and complement each other. These literacy areas focus primarily on adults as their target group, and scholars have relatively recently acknowledged a gap in digital literacy studies focusing on children (Marsh, 2005a).

Parallel to digital literacy studies, a number of scholars have concentrated their efforts on the developments of emergent media and literacies (Buckingham, 1993, 2006, 2007a; Drotner & Livingstone, 2008; Holloway et al., 2013; S. Livingstone, 2003; Livingstone, 2008a, 2009). Definitions of information literacy and media literacy have emerged almost concomitantly and complement each other, as suggested by Livingstone et al.:

'While media literacy and information literacy have developed as separate traditions, they share many of the same values. In general, the "media literacy" tradition stresses the understanding, comprehension, critique and creation of media materials, whereas the "information literacy" tradition stresses the identification, location, evaluation and use of media materials. Metaphorically, we might say that "media literacy" sees media as a lens through which to view the world and express oneself, while "information literacy" sees information as a tool with which to act on the world' (Livingstone, Van Couvering, & Thumin, 2005, p. 12).

Media literacy has been described as the capacity to not only use media devices but also to be able to assess and understand the breadth of media's cultural aspects and impacts (Buckingham, 2006). In Buckingham's view (2006), media literacy is the outcome of media education. He defines the purpose of media education as the development of a broad competence

in relation to the widest range of media, and suggests that digital media should be regarded as more than just teaching aids or tools for learning. He points out that early definitions of digital literacy confined the field within an instrumental context, instead of broadening its scope to that already suggested within media literacy studies (Buckingham, 2006). The four components he identified as the core base for being media literate were: representation, language, production and audience (ibid.).

a. Representation: being able to critically assess and evaluate content, both the motivation behind the production as well as the reliability of the information.

b. Language: being able to critically assess the semantics of the language used, and this aspect would vary according to the medium; in the case of digital literacy, it would include being able to question how information is designed and presented.

c. Production: being able to critically assess the role of the communication. Buckingham (2006) exemplifies this component with the role of commercial aspects present in information consumption.

d. Audience: being able to critically assess one's role in receiving (and I would add, also in producing) information.

Following this framework, another recent attempt to aid childhood scholars researching digital literacies was the adaptation of Green's model of literacy (Green, 1988 in Sefton-Green et al., 2016), which consists of three dimensions: operational, cultural and critical. These dimensions relate to aspects of media literacy studies and when arranged in parallel, they intersect. While media literacy scholars consider the aspect of critical assessment to be the core of any media use or production, in the adapted model of digital literacy critical is presented as one of the three dimensions. The cultural and operational dimensions cover the social practices and required competences when interacting with digital devices. However, these dimensions are intertwined and occur concomitantly, which closely agrees with the media literacy framework (Buckingham, 2006). I

present both frameworks from Buckingham and Sefton-Green et al., in Table 1 to demonstrate their points of intersection.

Table 1: Media literacy framework (Buckingham, 2006) x digital literacy's dimensions (Sefton-Green et al., 2016).

	Representation	Language	Production	Audience
Operational	Critically assess and evaluate content, both the motivation behind the production, as well as the reliability of the information	Ability to read, write and 'make meaning in diverse media, utilising a range of modes'	Critically assess the role of the communication	
Cultural		Critically assess the semantics of the language used. This assessment would vary according to the medium. In the case of digital literacy, it would include being able to question how information is designed and presented		Contextualised practices emerging from 'engaging in digital literacy practices'
Critical	Critically assess and evaluate content, both the motivation behind the production as well as the reliability of the information			Critically assess one's role in receiving information

These aspects are also present in current definitions of other types of literacies; the constant fount of emerging technologies challenges existing concepts and creates new spaces to be filled. The plural aspect of

the literacy term suggests its ongoing reconceptualising following social changes, cultural demands and developments. Besides digital literacies (Gillen et al., 2010; Jones & Hafner, 2012; Lankshear & Knobel, 2008), other terms such as multiliteracies (Cope & Kalantzis, 2000) have also been proposed within New Literacies Studies (NLS). NLS acknowledged the breadth of literate practices (Sefton-Green et al., 2016) and primarily suggested 'literacy as a social practice' (Street, 2003); literacy as a learning that is intertwined in all actions, everything from interacting with people, objects and environments to a 'sociocultural phenomenon' (Gee, 2015, p. 35). NLS has looked at both educational practices and literacy changes through emerging technologies. Initially, these studies focused primarily on educational purposes and developments, even though they acknowledged the wide range of modes where these developments could occur. For example, aspects of literacies were already combined with wider media contact and perceptions in pedagogical theories, as acknowledged by Spencer (1986) in her article entitled Emergent literacies discussing children's literacy competences before entering the school system:

'The continuous incidental interaction of children and adults in a world of increasing semantic complexity, intercultural contact, common experience of media, and the possibilities of almost immediate communication systems ... have to be acknowledged as events in emergent literacies' (Spencer, 1986, p. 445).

Moreover, Gunter Kress (Gillen et al. 2010), who has focused primarily on literacy related to reading and writing skills, discusses how texts have multimodal aspects, currently presenting a mesh of textual, visual, auditory, etc. information. These aspects are combined with how texts are displayed, such as the design and the form (screen-based) through which they are presented. During my research observations, these multimodal aspects containing sound, visuals, texts and symbols, which are inherent of tablet interfaces, were experienced within the cultural contexts of the preschools of each country.

Games and digital play have also gained attention amongst literacy

scholars. For example, both aspects have been considered a way of acquiring and developing reading and writing skills (Christie & Roskos, 2013; Gee, 2003; Kathleen Roskos & Christie, 2001; Sonnenschein, Baker, Serpell, & Schmidt, 2000). Play is then seen as a medium where some aspects of reading and writing competences emerge before children start attending schools. Interestingly, play and literacy received a lot of attention in the last thirty years of the twentieth-century in the fields of learning and early literacy; however research in this particular field has somewhat diminished over the past 16 years (Christie & Roskos, 2015). Instead, there has been growth in game studies and play, however, not necessarily related to literacy or particularly focused on young children. My focus on tablet play practices addresses this gap by focusing on the literacy or the learning that is related to young children's play experiences with these devices.

Games, as well as other types of media, such as TV, film, comics, cartoons, magazines, all converge in tablet devices. The convergence of media through mobile phones (and I suggest also tablets) has been affecting how mobile users, including children, attain and perceive literacies (Lankshear & Knobel, 2008; Leu et al., 2004). Literacy scholars (Dyson, 1997; Dyson & Genishi, 2009; Weber & Dixon, 2010) suggest that media encounters compose the 'common story material' (Dyson, 1997, p. 7) of childhood and 'constitute a form of literacy' (Weber & Dixon, 2010, p. 33) that needs to be acknowledged by adults and educators. As consoles have evolved and digital play has become accessible through all kinds of personal devices, from computers and key chains to phones and tablets, digital literacy studies have gained yet another subsection, one involving very young children. Interestingly, these young children are not yet necessarily able to read and write (in the simpler definition of these words) but are very much engaged in play.

In sum, all of these literacies studies converge towards one common ground, that of access, use, creation and critical assessment of information. To distinguish one from the other, we have to consider both the traditions of specific fields, together with the speed with which applications and information sources develop with and through scientific advances, with

technology being the most prominent in recent discourses. Being literate involves more than reading and writing. It requires that one is competent in contextual abstraction in order to understand the intrinsic meaning of the message. Accordingly, it is not uncommon to have the concept of literacy linked to fields spanning many disciplines. As digital aspects become increasingly intertwined in everyday living, digital literacies' competences (Gillen et al., 2010; Lankshear & Knobel, 2008) broaden their spectrum, incorporating more and more fields. Consequently, the discussion about literacies and their competences is bound to continue and evolve together with cultural and technological progress. As suggested in my introduction, every historical period brings its own technological advances and repercussions, i.e. type with typewriters, or touch with tablets. The artefacts change and the craft or the penmanship develops, adapts and evolves accordingly.

Digital competences are not the same as digital literacy, although they are a pre-requirement for digital literacy (Martin, 2008). If digital competence is compared to an early definition of literacy, i.e. the ability to read and write mentioned above, the competence can be exemplified as the ability to recognise symbols such as letters, together with knowing that in order to recreate those symbols on a surface, any person requires a tool (finger, pencil, brush, pen, ink, etc.), and to develop penmanship. Therefore, digital competence can be described as the capability of recognising and disposing of digital resources as tools. Martin (2008) argues that 'digital competences' are the set of skills required for 'digital usage' and 'digital transformation'. He combines the three elements of competences, usage and transformation in one concept by defining digital literacy as:

'The awareness, attitude and ability of individuals to appropriately use digital tools and facilities to identify, access, manage, integrate, evaluate, analyse and synthesise digital resources, construct new knowledge, create media expressions, and communicate with others, in the context of specific life situations, in order to enable constructive social action; and to reflect upon this process' (2008, p. 167).

In order to use digital tools, one's hands – as the tools that execute the interaction – must become acquainted and learn modes of interactions with diverse movements and gestures. These hand actions and reactions are mostly taken for granted, attached to the use of the widely spread term intuitive interfaces (Clarke & Svanaes, 2014; Connell, Lauricella, & Wartella, 2015). However observing children's hands guided me not only towards acknowledging the hands as the main active communication tool when children interact with tablet devices, but also led me to question key points regarding this ability, which involves the concept of penmanship in the digital age, identifying it and defining why it is important; and the concept of intuitive interfaces, if such a characteristic exists or if it is just a misperception. Thus, I acknowledge that both concepts require revision assisted by definitions of digital literacy practices, which shift and adapt depending on the target group being studied.

For example, in childhood studies, Sefton-Green et al (2016) have proposed a more condensed definition of digital literacy as 'a social practice that involves reading, writing and multimodal meaning-making through the use of a range of digital technologies' (ibid, p. 15). This definition agrees with that of Martin (2008), but it simplifies it to a core. For example, where Martin's definition uses 'in the context of specific life situations, in order to enable constructive social action', Sefton-Green et al use 'social practices'. This updated definition also synthesises the aspects of 'use digital tools and facilities to identify, access, manage, integrate, evaluate, analyse and synthesise digital resources, construct new knowledge, create media expressions' into 'multimodal meaning-making through the use'.

When referring to digital literacy later in this monograph, I use primarily the most recent definition proposed by Sefton-Green et al. as, like mine, their research focuses on young children. Nevertheless, as I later suggest an adjacent aspect within digital literacy studies, I believe it is vital to acknowledge the convergent and divergent aspects of previous suggested digital literacy (ies) definitions since besides expanding and grounding digital literacy studies, they also indicate existing gaps in the field. I do not

necessarily agree that condensing the term will resolve the discussions. However, it does give an adaptable framework for the assessment of literacy in distinct fields.

In sum, digital literacy can be broadly described as any digital-dependent event affording and encompassing some type of interaction leading to some type of learning. However, such broad definition is not helpful, as it does not necessarily acknowledge all the nuances encountered in these interactions, hence all the sub-divisions on the theme. Consequently, laying out digital literacy studies in one grid helps towards identifying existing gaps in these fields. For example, although games literacy is present, there is no aspect of young children's play clearly defined in it, although it could be assumed that this play aspect is present within the 'social practices' described by NLS.

Visual literacy is an intrinsic part of interacting with digital devices, considering their content-dependent visual information. Communicating through digital interfaces with objects and other people is also a relevant aspect when interacting with tablets. Most of these types of literacies are blended and intertwine the use of digital devices, particularly in the case of young children, who dedicate their attention to these devices while having fun. Thus, when observing young children, play becomes the focus. Play is the way these children engage with the world around them and with digital technologies, which are embedded in current social practices.

Play

Play shares the wide cross-disciplinary reach of literacy studies. It has been theorised and discussed within distinct fields, both from historical and sociological perspectives, to psychological and educational contexts. Theories focusing on play in children's development and learning (Buckingham, 2006; D. W. Winnicott, 2005; Seymour Papert, 1993a; Piaget, 1951; Vygotsky, 1978) as well as play theories of symbolic and make-believe play (Caillois & Barash, 1961; Henricks, 2006; Huizinga, 1949) have looked at play across a wide spectrum as well as its unique role in the life

of humans.

Henricks (2006) revisited sociological theories of authors such as Durkheim, Marx, Simmel and Goffman, confronting the play space in society by critically assessing the theories in contrast with aspects of play previously defined by Huizinga and Callois. Henricks presents play as ‘the laboratory of possible’ (ibid, p.1), and also argues ‘no discipline has moved this topic (play) to the centre of its theoretical or research tradition’ (ibid, p.3).

Piaget (1962) and Vygotsky (1966, 1978) touched upon the importance of play for children’s mental developments and stages, and how those processes help children’s learning. For Piaget, children’s cognitive abilities were developed through playful experimentation; something that should clearly be reassessed nowadays in the way children play with digital devices. In this research, I am particularly interested in the aspects of play that occur with the help of digital devices, such as tablets. A type of play that creates vocabularies and knowledge at various levels, both physical and cognitive, though emerges from unintended learning activities.

In both psychology and educational studies, the role of play has been attached to aspects related to child development and learning; and thus analysed and theorised in somewhat instrumental ways (Kuschner, 2015; Marsh, 2010). Possibly due to the pervasiveness of this scholarly tradition, play studies have also tended to focus on child development. Play was then seen as a tool for adapting to the adult world. Learning and play were interlaced as a way to develop and engage children in acquiring a range of skills required for entering schools, including those related to basic literacy.

Psychological theories, such as those by Piaget and Vygotsky created awareness of how play could flourish in preschools, kindergartens and school settings, and highly influenced pedagogical practices in the twentieth-century. Within psychology and education, specifically in the area of cognitive development, Piaget (1951) and Vygotsky (Bodrova & Leong, 2015; Vygotsky, 1966) looked at play through a similar lens, that of play and learning, but with somewhat distinct points of view.

Piaget (1999) focused on play serving the role of preparing children for adulthood, identifying stages where children would master specific skills and capabilities required in their future lives. Vygotsky (1966) looked more specifically at how child development was dependent on social interaction, focusing on how role-playing (and not so much other types of play) was an important social aspect of achieving social and cognitive maturity.

Both Vygotskian and Piagetian theories have been revisited, embraced and criticised in recent years, with re-elaborations being most prominent within the fields of child education and psychology. Leontiev (Bodrova & Leong, 2015) contributed to Vygotskian theories by adding that play was the main and leading activity of children in their preschool age and suggesting that play provided ideal conditions for children's mental development. Fleer (2014) builds on both Vygotsky and Leontiev's theories by adding current cultural-historical perceptions of play, including those related to digital devices and experiences. She points out how children's psychological development of play first explores the functionality of objects, which will then be given meaning through their social interaction. In her words, 'objects embody socially produced meaning' (2014, p. 16). Fleer also suggests children's imaginary will go beyond the socially constructed meaning of the object through the development of play (ibid.).

Play can be a tangible or an abstract experience, and according to Huizinga (1949), it is a non-serious and free activity that absorbs the player intensely. Vygotsky (2004) discussed the topics of creativity and imagination, suggesting that children combine their experiences to create something new while playing. More recent authors have described play as 'a portable tool for being ... a way of expression, a way of engaging with the world' (Sicart, 2014). In play, young children find themselves at the crossroads between the physical world and their imagination (Ackermann, 2013; Fleer, 2014). Sutton-Smith has pointed out how play has been associated with child development, and how the idea of play as progress has focused on progress rather than enjoyment (Plowman & Stephen, 2014; Sutton-Smith, 2001).

Progress is intertwined in play as a progression of thoughts combined with actions and objects that entangle themselves in a continuum. In the case of young children, play composes the concept of everyday living and routine, which will be disassembled as children grow older and learn to distinguish between play and non-play activities, play and non-play objects. Vygotsky suggested that young children's play, which he saw as human development, emerged from social exchange and was 'a complex interplay' between natural development 'and the cultural development created by the interaction of a growing individual with other people' (Bodrova & Leong, 2015, p. 2). A similar 'complex interplay' exists in cultural development and involves interacting with things, where this inter-aspect of play refers to objects to play with. These objects might not be toys, however, they become one within the context of the interaction, in the inter-play between child and object, as witnessed in my observations. This 'object turned toy' perception aligns with Sicart (2014), who suggests that play is not 'tied to objects', but instead emerges from the 'complex interrelations with and between things that form daily life' (2014, p. 2). In the context of my research, tablets are some of these things that shape many young Danish and Japanese children's lives.

Toys or props, following Vygotsky's role-playing descriptions, also fulfil a symbolic purpose and through playing with an object, children master their symbolic ability, which paves the way for imagination and creativity. Toys are described as culturally bound, fulfilling a role in the play ecology and bridging reality and fictional worlds (Ackermann, 2013; Fleer, 2014; Marsh, 2010; Sicart, 2014). This perception is supported and expanded by Sutton-Smith's suggestion that 'toys are an agency for the imagination', and that children 'control the toys rather than the other way around' (1986, 205). Besides these imaginative aspects attached to toys, when in play, any object, whether a toy in itself or an 'object turned toy' in the activity, might foster emotional connections and attachments (Fleer, 2014; K Roskos & Christie, 2011), therefore becoming a toy. Overlapping these points in relation to my own research, questions regarding the control aspect emerge within tablet play, because although children have some agency regarding when and what to play, the device itself is physically constrained. So I

ponder how this aspect limits or expands children's digital play in current scenarios. Another valuable aspect is looking at the interplay leading to transforming these digital devices from an object into a toy.

Play and playfulness

In the later part of the twentieth-century, Seymour and Harel (1991) built upon Piaget's work, combining the ideas of play and tinkering as a framework for learning, suggesting the term constructionism or as it became widely known as 'learning by making' or 'learn by doing'. Moreover, it is not to be forgotten that a similar idea had been proposed in philosophy. Dewey, as early as in 1916 argued that we learn through experience (Dewey, 1916).

In the case of digital play, this tinkering idea re-emerges among a range of studies, as devices are seen as learning tools by parents and educational institutions¹³, though they are not always directly linked to the role of fun or playfulness that the applications might also afford (Norman, 1988). In order to better frame digital play, it is relevant to distinguish play from playfulness. While play is identified as an activity (Caillois & Barash, 1961; Huizinga, 1949), playfulness does not necessarily imply the same, as playfulness exists in its own mode and accord and is sometimes constrained to a brief moment or an attitude that does not necessarily evolve into an activity (Barnett, 1990). Some play scholars have kept these two distinctions intertwined in the play description. Henricks points out:

'Play can be a moment of quiet reflection or an occasion for public hilarity... playing with bats and balls seems somehow different from the play of the mind or the practical joke or the pun or the flirtatious glance...' (Henricks, 2006, p. 182)

¹³ According to responses from informal interviews and conversations with parents and children's pedagogues from the participating institutions.

Sicart defines playfulness as: ‘a way of engaging with particular contexts and objects that is similar to play but respects the purposes and goals of that object or context’ (Sicart, 2014, p. 21). Any object that participates in the play event is imbued with references and associations, which might characterise it as a toy (or ‘prop’ in the words of Vygotsky). So among young children, I suggest that it is the aspect of playfulness that allows for the transformation of a tablet from a digital object into a digital toy; although the device is not designed specifically for children and can be used for many purposes, the ‘purposes and goals’ of children’s tablets might just be that of playing¹⁴.

Expanding the playful use of mobile technologies to their current role in children’s lives, Jensen and Karoff (2008) have suggested that ‘children today cannot do without toys, media or other equipment when they play – alone or with other children’. I would argue that tablets have followed this trend in the countries where the data was collected and they have become a toy in the digital play landscape (S Kline et al., 2003; Marsh, 2010; Plowman & Stephen, 2014; Plowman et al., 2009; Verenikina & Kervin, 2011).

Digital devices and their applications afford many play and playful aspects¹⁵. They provide content and access for the brief playful act, but the act is dependent on the child’s own approach (Marsh et al., 2015; Marsh et al., 2016). That being said, some apps do promote playfulness by inviting a child’s fun universe into their play. The apps vary from full play activities, such as actual app games with a defined structure, to other loose actions when using other types of applications, such as using the glass of

14 I will return to this aspect in my discussion, as a range of curious, and somewhat subversive actions, were witnessed during tablet play with young children. This was described in the forthcoming publication Froes, I., Tosca, S. Playful subversions: small children and tablet use. *European Journal of Communication Studies*. (forthcoming).

15 However, it is valuable to clarify that there are digital objects designed for children as digital toys, such as Nintendo Gameboy; and there are digital devices that are not necessarily designed for children, which have become toys or portals for play when in use, as in the case of mobile phones and tablets.

the device as a mirror, recording funny sounds, and playing with letters in input fields. Another good example is the camera app, where children make funny faces, take pictures of these faces and laugh a lot when looking at the pictures. So even though this application does not necessarily fit the description of a funny app, the reflection and the possibility to capture the funny faces and expressions, promote playful moments and responses. Both play activities, apps designed for children and playful approaches, such as making faces at the camera, have fun as their common ground.

However, I would like to supplement the idea of a tablet as a toy by pointing out how digital toys differ from regular physical toys in several ways. One of the first noticeable aspects refers to how apps are currently chosen and downloaded, mostly by parents, older siblings or educators and not necessarily only by the children themselves (Marsh et al., 2015). Physical toys are not necessarily chosen only for their ‘teaching’ aspects, with both children and brands playing a role together with *cute* and *fun* aspects, which are equally important. In the case of apps, parents and pedagogues from the preschools in my study mentioned ‘learning’ as the main purpose for downloading the apps. This finding also agrees with the Marsh et al. (2015) study where parents specified learning as the highest quality when choosing an app, but at the same time were not keen on spending much on these apps. Brands were also mentioned, mostly relating to their educational purposes or background, as in the case of Lego or the local TV channel app.

A second aspect refers to the type of play, as the character and use of physical toys might vary according to each child’s imagination and will. For example, a Lego piece can become food when playing ‘family’ with other dolls, or a teddy bear can have a range of personalities depending on the child’s mood. In the case of tablets, these aspects are limited as the apps pre-define the main characteristics of the play and the characters’ personalities. Besides, they do not necessarily interact with each other, therefore remaining silos in themselves. For example, if you dress up a doll in one app, you cannot necessarily use that dressed up doll in another app or game, with the exception of taking screenshots and using them

in videos, paint or photo type applications. Tablets offer a range of opportunities from within each application, yet they do not necessarily allow for a change of property, as seen with physical objects (although the object itself can be used as part of playing house).

A third aspect through which tablets, as digital toys, differ from physical toys relates to notions of digital spaces, or how children's experiences with digital devices shape unique notions and uses of these spaces. This topic, as it belongs to a larger scholar field, requires further elaboration and is presented briefly in the following *digital spaces* subsection.

Regarding digital play, tablets, as emergent digital toys, are paving a relevant way towards not only future toys but towards digital technologies as a whole. Based on my observations during the research, I could identify a couple of affordances (Norman, 1988) that are inherent to tablets (and smartphones) and can present some early answers to previous questions on the role of the tablet as a digital toy. These affordances constitute a body of digital experience, which is composing current literacies of the digital and these will be presented in the discussion chapter.

Digital spaces

Digital spaces (or as otherwise described, virtual spaces) have been discussed and presented by a number of scholars studying technologies, games and human perception (Ackermann, 2013; Chipman, Fails, Druin, & Guha, 2011; de Souza e Silva & Frith, 2010; Gaines, 2006; Turkle, 1984, 1995; Weber & Dixon, 2010). I will briefly present recent studies addressing digital spaces that take into consideration current digital artefacts such as tablets.

Digital spaces in the context of this research do not necessarily refer exclusively to the imaginary projection of oneself into a non-tangible dimension (de Souza e Silva & Frith, 2010; Turkle, 1984, 1995). I am looking at digital spaces as non-tangible, created areas within tablets and their applications, such as creating 'pages', 'sections' and 'folders' to

accommodate apps. Although some of these spaces inherit their metaphors from their older relatives (desktop and laptop computers' interfaces), these constructions are mostly unknown to young children, who are learning this semiotic vocabulary through tablet play. Organisation, distribution, location, notions of distant locations that are finger reachable are some of these space perceptions present in digital platforms. Children are becoming acquainted with these digital spaces while at the same time creating distinct notions about these spatial affordances. A physical example paralleling a digital space experience would be being able to create extra rooms in a physical house as needed – having no physical limitations to prevent that from occurring.

Gaines (2006), while discussing Kostogriz, presents a 'literacy of multiple perspectives', where spaces where we live and learn are negotiated between objects and cultures, creating a thirdspace, 'where the meaning of a sign is negotiable'. He adds that 'all media establish a space for re-contextualising the meanings of things that have different meanings in other contexts.' (Gaines 2006, 176). This thirdspace, in the context of children's digital play on tablets, could be exemplified by the negotiated notion that children acquire through interacting with digital icons and feeling their presence extend to spaces and narratives on tablets and apps (shaping their own 'digital culture'). This acquired perception is complemented by the tablet affordance of *infinite* storage of games and activities that allow and invite users (in this case, children) to cross-borders, occupy and customise their digital space (Ackermann, 2013). Consequently, the thirdspace in children's digital play is shaped by each child's own negotiated perception of physical and digital symbols and contexts that compose the whole of the play experience.

Another noteworthy theme related to digital space deals with collective and individual imagining when related to digital experiences (Fleer, 2014, p. 82). This theme refers to shared properties of role-playing, i.e. when children play 'the floor is poisonous' (the Danish version of Hot Lava), meaning they have to jump from one place to another without touching the floor. This shared and agreed perception of playground rules is also

present when a group of children play together on a digital device. The digital space sets the scene and the boundaries of the shared role-playing, and this space becomes the *over there* while the device is being held close to the children's bodies.

Digital toys and digital play bring stimulating aspects when discussing digital literacy. These toys promote looking at children's play in order to inform current changes in the digital literacy scenario, informing how playing with digital toys might challenge current perceptions of digital literacy. In the following section, I present recent studies that address the field of play and digital literacy combined in order to further debate some of the valuable aspects of these fields in relation to my research.

Digital literacies and play

Play and digital literacies have *played* together before. One example comes from scholars in the field of computer science and game studies (Abrams & Gerber, 2014; Gee, 2003; S Papert & Harel, 1991; Seymour Papert, 1993b; Salen & Zimmerman, 2005; Zagal, 2010) who have long advocated playing to learn. Games and literacy in particular have gained a shared amount of research focus in recent years (Salen and Zimmerman 2005; Gee 2003; Weber and Dixon 2010; Ito et al. 2013). Some of the studies concerning games and literacy research have been put into practice, culminating in middle and high schools as well as summer camps that make use of game-based learning to educate children (Ejsing-Duun & Skovbjerg, 2015; Mimi Ito, n.d.; K. Levinsen et al., 2014; "Quest to Learn (Q2L) – Middle School and High School," n.d.). Technology is then an integral part of the learning process in these educational cases¹⁶. Digital platforms do permeate the contemporary lives of young children – as shown in my

¹⁶ In the case of the Minecraft summer camp ('Minecraft,' n.d.), the Minecraft application has been the chosen tool for learning. A relevant aspect to be highlighted regarding Minecraft is that it is not necessarily a game, as you would not call Lego bricks a game. Minecraft has been described as an interactive space where players have a digital canvas for creating worlds with pixels (Thompson, 2016).

research – and as such, inform a set of acquired skills related to interacting with digital interfaces. Consequently, although my research does not focus on pre-defined aspects of formal education system learning such as game-based learning cases, theories related to media literacy, multiliteracies and digital literacies described earlier are of relevance for my discussion, as they help identify and define some of the skills being acquired when children play with digital interfaces.

Digital interfaces are built on a collection of visual elements. How (their size, shape, etc.) and where (background, foreground, corners, edges, central, etc.) these elements appear on screens and dictate how they are to be used. When playing with tablet interfaces, children decode and create associations for the icons and signs available, as well as engaging in notions of time and space on the devices. These experiences can be described as polysemous, as they are multifaceted interactions, where one icon suggests a response, but how the user acknowledges and interprets the icon will lead to distinct ways of interacting with both the application and device. I propose that with very young children, such as those in my target group, digital literacies are acquired and developed through play. Through my observations, questions emerged concerning what characterises the semiotic domain of tablet play, and how children construct meaning from the apps' signs and symbols. As tablets become familiar, so do popular apps, and they help to contextualise the (game) play. So the more acquainted one becomes with a tablet's properties and semiotic domains, the easier the following interaction will be.

In addition to this familiar aspect that contextualises the play, the confluence of media, or the transmedia intertextuality (Kinder, 1993; Marsh, 2014; Marshall, 2002), populates children's play in contemporary society. Nowadays, children's lives have an online dimension, both directly and indirectly (Livingstone, 2014b) and it is no longer possible to distinguish between online and offline domains as they are intertwined in children's play (Marsh, 2014). When dealing with tablets, this transmedia intertextuality is of vital importance. Children's use and modes of play with tablets are simultaneously online-dependent and offline-possible,

considering that downloads, updates and networked apps rely on being online. However, playing on the device with various apps or even some of its physical affordances, such as the reflection, can occur in offline mode. Marsh (2014) also points out how current modes of play and media use create a semiotic knowledge that influences how children understand and conceptualise their everyday lives. Medina and Wohlwend (2014) align with Marsh (2014), acknowledging play as embodied and collaborative literacies:

‘Children’s social imaginations in contemporary times are embedded in fluid but also disjointed and fragmented cultural practices with multimodal textual resources that are not static or tethered to one particular place yet carry attached histories and ideologies that become traces of multiple localities... Reading, writing and cultural production happen at the intersection of participation in complex worlds and discourses that cannot be ignored when visualising literacy pedagogies that matter to/for children’ (ibid., 5).

Complementing this description of how children’s social imaginations are currently formed, Marsh (2014) has presented the notion of a ‘narrativized semiotic system’, based on studies investigating young children’s participation in virtual worlds. These worlds are characterised as 3D environments where a child can become a member, where their avatars can play games, make and meet physical friends online (as in a social network), join events, etc¹⁷. This semiotic system notion also helps delineate how children apprehend digital information and how it builds on social and cultural experiences. Marsh (ibid.) indicates that these digital and physical encounters with toys and artefacts that belong to both online and offline play inform a range of aspects in their play:

‘Children move across these spaces in fluid ways and genres of offline play (such as socio-dramatic play, fantasy play and games with rules) can

17 Both of my own children had Club Penguin accounts and often met and played with their school and kindergarten (børnehave) friends online.

be discerned in their play in virtual worlds, just as themes and characters from virtual world play appear in offline play contexts. Second, these virtual spaces are part of the narrativized semiotic system that is embedded in children's use of media texts and children draw on their understandings and experiences with narratives across a range of media in their online play' (Marsh 2014, p. 411).

These narrativized experiences that cross online and offline domains generate perceptions that are then intertwined in children's competences, digital or not, such as those related to the perceptions of digital spaces and the types of play allowed or constrained by digital characteristics (Marsh et al., 2016).

Digital characteristics frame the tablet as a toy with wide digital capabilities but with specific narratives, constraints and rules such as those encountered in digital games. It is then valid to make a parallel of the competences and modes of tablet play observed, linked to studies looking at videogames competences and literacy.

Game literacy has been described within game studies, but has focused primarily on videogames without necessarily engaging in the whole spectrum of play. Gee (2003) suggests that a videogame-literate individual is able to decode; understand the meanings in respect to a semiotic domain, and produce meanings in respect to a semiotic domain. Despite these structures emerging from game studies, they also agree with descriptions of digital literacy and digital literacies presented earlier in this chapter. I would like to revisit them and suggest that similar defining structures could be applied in relation to tablet play. It could therefore be argued that in order for a child to engage and master (digital) tablet play, the child should be able to:

- decode (or be able to interact with touch interfaces, physical and digital buttons);
- understand a tablet semiotic domain (iconography, narratives, modes);

- apply or transfer the tablet semiotic domain into other contexts.

By comparing these competences with those listed in the definition of digital literacy suggested by Sefton-Green et al (2016) – ‘a social practice that involves reading, writing and multimodal meaning-making through the use of a range of digital technologies’ – I suggest that in my target group, the activity might be a social one, while reading and writing the alphabet are not necessarily taking place. However ‘meaning-making through the use’ is a major aspect of the play, which also includes social and cultural dimensions. This meaning-making is what I describe as decoding, because it starts from the first contact with a digital device, from finding out how to physically interact with it, to identifying and becoming acquainted with the interface in order to interact with the tablet semiotic domain. This decoding phase is followed by understanding the domain, and being able to learn distinct narratives that can be applied in digital or physical interactions and contexts.

This wide range of narratives experienced through tablet play with apps and their characters is also present in children’s continuous exposure to digital technologies in their lives, and through common social practices and objects that carry digital characterisations. Children’s encounters with digital devices happen concomitantly with encounters with other objects carrying symbols and images from digital contexts, characters from apps such as physical toys or patterns on clothing, such as the ones carrying characters and objects from Club Penguin or Angry Birds. So when allowed to interact with digital interfaces, these interfaces are not foreign but instead carry *recognised* images (symbols).

These encounters with known images – how children’s recognition of symbols and media permeate their online and offline social practices – touch on the concept of hyper-intertextuality (Fox, 2001; Régard, 2015)¹⁸.

¹⁸ Although these authors discuss hyper-intertextuality in distinct contexts, such as pop media and historical texts, I feel their definitions can apply to children’s digital play contexts.

Hyper-intertextuality is defined by how information and symbols flow in diffracting ways, regrouping and reshaping through different media formats, from cereal boxes to icons on screens. In each instance, a current narrative feeds from a previous encounter while at the same time feeding into the following encounter in whichever media the narrative may occur. In the case of young children's digital play practice, the decoding or meaning-making is hyper-intertextual, thus social and contextual. Hence my alignment with Sefton-Green et al.'s definition of digital literacy as social practices, although in the case of play in this young target group, I suggest adjusting the definition to include hyper-intertextual 'social practices'. This also aligns with Merchant's (2015a) recent research with toddlers and tablets, where he acknowledges that:

'working with mobile technology is part of a translocal assemblage in which ideas, practices and material resources from diverse sources coalesce as a space for meaning making' (2015a, p. 18).

The popular belief that children are masters of interaction may well be due to the everyday and contextualised hyper-intertextual characteristic of tablet play, where children acquire information about the use and existing narratives from several outputs and social exchanges¹⁹. In reality, we might just be observing a natural exploration of a toy, which happens to be digital, but that has become familiar to the child from social practices and cultural exposure, and this recognition of context might promote the required engagement for digital exploration. Decoding or meaning-making are the pillars of tablet play and digital exploration. During play, children explore. During learning, children problem-solve. So how does (digital) play/exploration relate to problem-solving?

Problem-solving is described as innate to children (Thornton, 1995). Thornton points out that from a very early age, children are attracted to

¹⁹ I believe children are masters of exploration, but as my empirical data showed, the interaction and the decoding are all learned and apprehended. I discuss this further in the discussion chapter.

solving problems, as she exemplifies:

‘... even babies in their cribs enjoy solving problems (how do you get a rattle to make a sound?), which shows just how fundamental the process of solving problems is to our human makeup – and to childhood’ (Thornton, 1995, p. 2).

She adds to this perception by indicating that solving problems is an intrinsic part of childhood and learning. She points out that children enjoy solving problems and that:

‘...problem-solving skills grow out of the ordinary process of understanding the world around us, of discovering and using information and of reacting to and interpreting the feedback provided by our activities’ (Thornton, 1995, pp. 4–5).

Additionally, Dewey (1938) suggested that play helps children encounter problems to be solved. Some of these ‘problems’ involve decoding or meaning-making, thus problem solving is a natural characteristic of children’s play, which possibly stands out even more during children’s tablet play. From decoding the *secret codes* of interaction related to movements, physical and digital buttons, avatars, icons, etc., children are faced with multiple problems to be solved (I prefer calling them puzzles as the word problem sometimes has a negative connotation, which is not justified here). I discuss these perceptions further, based on the empirical data, in the analysis and discussion chapters.

The following chapters address aspects related to the topics presented here in the light of the analysis of data collected. I should also mention that beyond these considerations, some other perspectives were raised as the research progressed. These further perspectives challenged and complemented many of the topics exposed in these sections and I will return to these topics in my analysis and discussion. I think it is pertinent to note that I do not intend to propose yet another digital literacy definition. Instead, by looking at young children’s use of tablets through a multidisciplinary lens, I align with the definition of digital literacy proposed

by Sefton-Green et al. (Sefton-Green et al., 2016), while reserving the freedom to adapt it towards play practices supported by the empirical data collected.

A note about knowledge and experience

As digital play happens aided by the use of hands for the most part, not acknowledging the role of hands in this interaction would cripple my analysis and the work I have put into this research. Therefore, it would not be fair to discuss play and literacies studies and not present, even if in a very condensed form, some thoughts on knowledge and experience that emerge from actors' exchanges or social practices (Latour, 2005). The reason for bringing these theories into this review of play and literacies literature is due to the breadth of the material contained in my data set.

In order to address the experience relating to the hand, I am being quite selective and choosing to engage with only few of the scholars who have impacted on studies related to perception, experience and technologies. Despite coming from different disciplines, they intersect in some aspects of their discourse, i.e. those referring to the knowledge acquisition phenomenon and the role of a range of 'actors' building the final experience.

First, from phenomenology, Merleau-Ponty (2002) suggested that habit was born within a specific environment and acquired through imitation, and its perceptions, developed by the feedback, are received from that environment. However, he did not necessarily consider habit in itself to be knowledge. Instead, he suggested, among other descriptions, the example of habit as 'knowledge in the hands' (2002, p. 144). Being able to execute something without necessarily being able to thoroughly describe or rationalise it. He exemplified this behaviour through typing on a typewriter, where the fingers knew the way, 'a knowledge bred through familiarity which does not give us a position in objective space' (Merleau-Ponty 2002: 166). But what does this knowledge mean in relation to digital play and digital literacy? As young children acquaint themselves with digital

devices, we could describe their learned dexterity and digital perceptions as knowledge in their hands, a type of hand literacy or, as I propose later in the analysis, *digital penmanship*.

From the field of anthropology and adding to the notion of knowledge in the hands, Ingold (1994, 2009, 2013) explores the knowledge embodied within the hands in his work debating studies of art and technologies. He points out that creations emerge and feed on the encounter between the medium and the practitioner, affording the knowledge in what he describes as the ‘weaving’. In his words, some disciplines are characterised by ‘thinking through making’ (2013: xi). This idea agrees well with Schön’s (1987), Dewey’s (1916) and Brinkmann & Tanggaard’s (2010) perception of learning through experience, together with the ‘learning by doing’ approach mentioned earlier in this chapter. As children play with and through digital devices, they engage in digital experiences and, I suggest, also learn with them. The digital artefact both introduces and shapes the interactions that occur and provides the material for the engagement. The digital as the artefact, is manipulated; it shapes movements while also adapting to them. This intertwined digital and physical process condenses into one product, the user (weaver) experience (Dourish, 2016; Ingold, 2009; Pink, Ardévol, & Lanzeni, 2016). However, these interactions also depend on a range of other actors, which should also be taken into consideration in order to assess the full body of the experience.

Consequently, the actor-network theory (ANT)²⁰ (Latour, 2005; Law, 1992), or as suggested the ‘sociology of associations’ (Latour, 2005, p. 9), which have emerged from the field of science and technology studies

20 When presenting ANT, Law (Law, 1992) proposes that

‘... “knowledge” may be seen as a product or an effect of a network of heterogeneous materials.

I put “knowledge” in inverted commas because it always takes material forms. It comes as talk, or conference presentations. Or it appears in papers, preprints or patents. Or again, it appears in the form of skills embodied in scientists and technicians (Latour and Woolgar, 1979). “Knowledge”, then, is embodied in a variety of material forms’ (Law, 1992).

(STS), is also relevant when discussing play and digital literacy. According to ANT, knowledge (or science) 'is a process of heterogeneous engineering in which bits and pieces from the social, the technical, the conceptual and the textual are fitted together, and so converted (or translated) into a set of equally heterogeneous scientific products' (Law 1992, 381, original emphasis). Play undeniably occurs in the encounter of a number of actors, and all of them promote and shape the outcome of the event and the actual experience. In relation to ANT, play takes 'place in an ecology of things, people, and processes, all of which are related in multiple and varying ways through time' (Sicart, 2014, p. 114). This perception aligns very well with the approach of multiliteracies studies and bridging them appears to be a natural route in my research process.

Chapter overview

In order to study and discuss play and digital literacy focused on young children and tablet play, it is impossible to disregard the interconnections present during these observed encounters. It is actually the acknowledgement of this complexity that led to a range of considerations during the analysis of the data that subsequently informed the outcome of my study. Also, in order to answer those initial questions regarding what literacy is within the field of play, what it means to be play-literate, and what being digital-literate in playing as a young child is nowadays, I find some concepts contribute more to my study than others.

Considering that the literature review was compiled after the data was collected, it is valuable to highlight some of the key points that shaped my research. Among the key aspects presented in this chapter, I would like to highlight those serving as further grounds for my analysis and discussion chapter that follows.

Due to the vast breadth of literature valuable to my study, I chose to acknowledge its multiplicity, however subsequently only engage further with some of the theories previously introduced. Current definitions of digital literacy already thoroughly cover the wide range of characteristics

that shape literacies concepts, however, these concepts do not clearly address the adoption of emerging technologies by young children. Sefton-Green et al.'s (2016) recent definition deals with a similar target group and thus is the definition with which I am aligning my research. However, based on the observations made throughout the study and that are presented in the following chapter, a couple of questions I have raised during this process both agree with and complement Sefton-Green et al.'s current definition of digital literacy. For example, acknowledging the role of play as the mediator of the interaction raises a number of questions to be debated, such as the role of the experience and the physical interaction informing young children's digital literacy practices; the breadth of characteristics defining what is to be digital-literate as a young child; and which current aspects of digital literacy definitions are witnessed during young children's playful interactions with tablets.

These perspectives also engage with theories covering aspects of play, such as Sicart's (2014) and Barnett's (1990) definitions of play and playfulness. Beyond the playful definitions presented earlier in this chapter, I also explore the idea that: 'Playfulness glues together an ecology of playthings, situations, behaviours, and people, extending play toward an attitude for being in the world' (Sicart, 2014, p. 25). Tablets and apps are currently part of the ecology of children's digital and play experiences. These experiences are the final product composed of a number of actors involved, aligning with the ANT approach. Therefore, it is vital for my research to assess and evaluate how aspects of play have been building and shaping children's digital literacy practices. The role of play in shaping young children's tablet experiences informs what kinds of competences are acquired and developed through the play, and how aspects of play help define and motivate children's interactions with these devices.

In the following chapters, I introduce the method chosen, which in itself presented a number of challenges. In order to cross-analyse the sets of data, I needed to identify a set of key categories in children-tablet play interactions, such as context and narratives, as well as acknowledge my research limitations.

Furthermore, the choice of using tablets in order to observe digital play and literacies causes in itself some debate, as the device's interface and descriptions fall into inaccurate perceptions of technology (such as intuitive interfaces and children knowing how to use these devices intuitively). Combined with that, as an object, it was not designed for children. Notwithstanding these contending aspects, following the analysis, I suggest some answers to the questions I have raised so far, and add a number of other inquiries to be pursued in potential future research.

The advantage of a travel book approach over a 'discourse on method' is that it cannot be confused with the territory on which it simply overlays. A guide can be put to use as well as forgotten, placed in a backpack, stained with grease and coffee, scribbled all over, its pages torn apart to light a fire under a barbeque. In brief, it offers suggestions rather than imposing itself on the reader.

Latour (in Reassembling the Social, 2005)

He believed that it was for the man of letters to record these epiphanies with extreme care, seeing that they themselves are the most delicate and evanescent of moments.

James Joyce (in A portrait of the artist as a young man, 1916)

METHODOLOGY

In this chapter, I present all the empirical phases of my study. As mentioned in the introduction, the data collection preceded the literature review. This process ensured that the coding would not be linked to a specific theoretical field. Instead, the coding opened the range of theories that needed to be taken into consideration during the rounds of discussion.

This chapter is divided into two main sections; method presentation; and my coding process. The first section starts with a presentation of the methodological approach chosen, including subsections on the study's initial setup and how the research structure was designed. The second section covers the data-coding process and the presentation of the final set of codes. The chapter ends with a final summary of the main theoretical codes that are further elaborated in the analysis and discussion chapter.

Grounded theory

The original intention with this PhD research was to explore young children's play practices with tablets. I chose a qualitative approach and direct observations to more efficiently map these practices and chose a method that would better accommodate my choices regarding which approaches to employ. I chose grounded theory (Charmaz, 2014; Creswell et al., 2009; Glaser & Strauss, 1999; Robert Thornberg, 2012) as it does not require an initial review of a set field, but instead suggests that the empirical data should inform the questions leading to theories that are relevant to the research.

‘A grounded theory emphasis on comparative methods leads ethnographers 1) to compare data with data systematically from the beginning of the research, not after all the data is collected, 2) to compare data with emerging categories, and 3) to demonstrate relations between concepts and categories’ (Charmaz, 2014, p. 41).

Consequently, the study was initiated by setting up a pilot study. In this first phase, the observations focused on children engaging in unstructured free play with tablets, and the results of this study informed the rest of the data collection. The purpose of the pilot study was then to help define the scope of the research and to avoid misconceptions of how young children currently use tablet devices.

The timeline for the research was then laid out in the following plan, presented on Table 2:

Table 2: Research timeline

	Pilot	Coding & analysis	Literature review & writing	Data collection			
				Phase 1	Phase 2	Coding & analysis	Literature review & writing
	Unstructured play (free play)			Unstructured play (free play)	Structured Play (pre-defined activity on tablets & drawing on paper)		
DK	April-May 2014	June-Sep 2014	Oct 2014-Jan 2015	(pilot data)	February 2015	June 2015 -Aug 2016	Jan- Dec 2016
JP				May 2015 (Hoikuen 1)	May 2015 (Hoikuen 2)		

The first round of coding and data analysis, plus an initial literature review, followed the pilot study. Subsequently, the actual data was collected in Denmark and in Japan. The data collection involved three institutions (one in Denmark and two in Japan) located in metropolitan areas of both countries. The pilot study goal had been to frame the field and define specific observation categories. It had been based on unstructured free play, meaning children could engage with the device and the apps according to their own choices. This method was then reproduced as the first phase of the study. In this first phase, which focused on unstructured play, children were invited individually to a room at the institution, where, together with a table and chairs, there was a camera setup and the devices were placed on the table.

The main study also included a second phase that focused on structured play with a predefined activity. In this phase, children were together in one of the classrooms but divided into groups, where they could engage with the devices or draw with colour pencils and crayons in different areas of the room. In this second phase, some of the activities occurred in parallel, with some children playing on tablets, while others drew. This dual setup meant that the observation was *divided*, as I had to go back and forth at specific times. As the rooms were not that large, this setup was not overly problematic, but obviously meant that a few points might have been missed. When this second phase took place in Japan, two student assistants were present and helped both with the language as well as with the recording, as we could have two cameras available instead of one, which proved to be helpful during the analysis. A total of 84 children were observed, 41 in Denmark and 43 in Japan.

This chapter initially presents considerations taken regarding the study setup, followed by a description of the study design.

Setting up the study

Before investigating the practices of young children playing on tablets in two countries, a couple of methodological challenges needed to be

addressed prior to the observations. With the purpose of limiting too much discrepancy among devices and environments that could compromise the data analysis, it was important to limit the number of variables.

Devices: Devices customised for the observations, together with knowing which applications were installed, promoted some consistency. The devices used for the research would also present the children with an unfamiliar layout and possibly unknown applications. Trying unknown apps on someone else's device would possibly put the children in an *out of their comfort zone*, which may help assess some of children's digital literacy skills.

Location: although many studies involving children reinforce the importance of the home environment (Ogan et al. 2012; Chaudron 2015), and by being at home one could see how the devices are placed and used within an everyday routine context, unique physical and family settings (siblings, parental layouts, etc.) could interfere with the observations. Therefore, I opted for doing the observations at educational institutions, where the environment could be more neutral and controlled. Lastly, the choice of being with the children while they played on the devices was also relevant, as any unseen or unexpected mode of use could be further investigated. It also gave the opportunity to see and hear children's own ways of playing and describing their play while I took ethnographical notes.

Camera setup: As this study is concerned with children's digital play, the decision to focus on children's hands and their use of the device was deliberate and aided the observations and the data collection in important ways. The camera focused on the context in and around the hands to learn how the hand performs and embodies engagements with digital devices (Pink, Horst, et al., 2015; Pink, Sinanan, Hjorth, & Horst, 2015). Digital ethnography scholars have invited researchers to rethink ways of capturing data related to the digital domain, considering the tactile aspect performed by the hand when interacting with digital technologies.

'Visualisations on the touch screen are not just seen but they are part of both what the hand incrementally learns and knows, part of how the hand knows and are inextricable from our sensory perception of the

wider environments we are in' (Pink et al. 2015: 5).

Institutions: A couple of children's preschools were contacted. The employees of one of them were very keen on participating as they already owned tablet devices and were considering how to involve them in their daily activities with the children in the preschool. The pilot study took place in spring 2014, followed by the coding and analysis of the data. For the pilot study, 19 children were observed individually at their care institution. A room with a table and chairs was set up with a camera above the children that focused down on the tablet play instead of children's faces or full torsos. Two devices were available, and the children were invited to use both. The observations lasted around twenty minutes each, with a few children using even less of that time and some trying to extend it. All the video material captured during the sessions was watched several times and fully transcribed. The transcription work was shared with a Japanese translator. I did all the Danish transcription, while the Japanese translator did all the Japanese transcription to make sure no important details were lost.

The observations took place in the spring semester of 2014 and 2015 in three preschool institutions; one Danish preschool (børnehave), which already uses interactive devices in their daily activities, and two Japanese preschools (hoikuen), which have no type of interactive device available for the pupils or teachers. It should be noted that the institutions in both countries comply with the English description of a preschool. In other words, a place where children aged 3-6 are helped through developing motor and social skills together with learning the basics of language and numbers through playful activities (children enter school between the ages of 5 and 7 in both countries). Upon the institutions' agreement to collaborate, a letter was sent to all parents of children age four and older who attended the institutions, requesting permission for the child to take part in the study and observations, besides also inquiring if the child was acquainted with tablets or similar devices. All the children belonged to middle-class families and lived in metropolitan centres of their respective countries, more specifically in the regions of Copenhagen, Tokyo and

Fukuoka. In total, over 100 parents answered, with five sets of parents refusing to let their children participate, as they did not want their children to use tablets during preschool hours. The children, who were also asked if they would like to take part in the study both before and on the day of the visit, replied positively on both occasions. Only one child in Denmark, whose parents had also agreed with him taking part in the study, had never used such devices before. In total, 84 children were observed.

The institution's pedagogues collaborated by providing a room where the observations could take place, and by facilitating contact with the children who took part in the research. Neither parents nor pedagogues were present during the sessions. The devices of choice were an iPad Mini and a Samsung Galaxy Note 10.1 (both released in 2014) with the latest running software installed. For the purpose of the research, a total of 60 apps were chosen and downloaded based on the age category, their descriptions, and popularity ranking on the Android and Apple store (Google play and App store). The types of apps varied from the *puzzle*, *game*, *entertainment*, *educational*, and *family* categories, which were highly rated (4-5 stars) however with download rates lower than 500,000 downloads at the time of the download (February 2014). Apps with download rates of lower than 500,000 were selected as a way to try to witness a child's first encounter with unknown apps and assess ways in which the children deal with these encounters. This decision aimed to assess how children choose the apps, together with observing how they discover what to do and how to play with them. If the children were very experienced with using similar devices, encountering unknown applications would show how or if they apply previous knowledge from known applications to foreign ones.

Research design

Pre-pilot sessions: To prepare the pilot study, I had two twenty-minute sessions with a four-year-old child and six-year-old child, individually. These sessions were informally organised in my home, and the children participating were contacted via my personal network. These two sessions

helped me design the questions to be asked during the observations and to be aware of the positioning of the device when observing. Both sessions took place in March 2014.

Pilot study: The pilot study lasted over 4 days with 17 children between the dates of 10 April – 23 May, 2014 in the capital region of Denmark. For the first part of the study, the children, who attended the preschool and had been previously contacted, were called one by one to a room located outside their own group room in the building. The rooms were set up with a video camera overlooking the tablets from a top-down perspective, not focusing on the children's faces, but on their hands as they used the devices following tactile digital ethnography principles (Pink, Sinanan, et al., 2015). There was no Internet access in the location. Both devices had mainly children's applications installed; however, as none of them were initially visible on the first active screen, the children were required to look for them. The children were asked a few questions regarding how they felt about the devices; if they owned one; frequency of use; what they did on it and modes of use (if alone, with siblings, parents or friends). They were then invited to engage with the devices, one at a time. The devices were turned off and without a password, so the children had to turn them on to use them and then they had to find and choose the applications they wanted to use. Each child had a total of 20 minutes to use both devices. After around ten minutes and according to what they were doing, they were asked if they would like to change devices. After the pilot study had been completed, a series of informal talks with the institution's pedagogues and some of the parents took place. Although talking to pedagogues and parents had not been initially planned, it seemed a valuable addition to better contextualise the children's environment. These informal conversations and interviews also helped me to understand how tablets are perceived by the adults' surrounding the subjects.

The pilot study proved valuable and presented a rich set of data, which was key for framing the scope of the research. The initial coding of the data took place in the autumn of 2014 after all the pilot transcriptions were complete and read through multiple times. With the initial coding process

complete, the relationship among the initial codes was identified, which generated the focused codes, providing the final data for the theoretical coding (Charmaz, 2014). Main themes emerging from the theoretical codes served as guidelines for planning and structuring the second round of observations. They also informed topics that led to an initial literature review and to first drafts of writing that helped me elaborate further on the subsequent analysis. Following the grounded theory approach, early writing is encouraged, as it demands more than reporting. Instead, it initiates the analytic process to be pursued via rewrites throughout the study (ibid.). These topics are presented later in this chapter in the *Data coding* and *Theoretical codes* sections.

After coding the pilot study data, I divided the first round of theoretical codes into topic sections. These sections informed the first draft of the taxonomy of tablet play (Froes, 2015), which is further discussed in the analysis and discussion chapter. The hypotheses (see Table 3) were used as guides towards the second round of data collection and not as fixed points to be tested. The hypotheses, which are presented in the following, merely helped to funnel the observations towards more framed experiences.

Table 3: Hypotheses

Area	Deals with	Hypotheses
Tablet vocabulary	Play terms and distinction between activities	When playing with tablets, preschoolers construct a unique tablet vocabulary and frame the type of play designed for digital objects due to the characteristic of mediated and delimited play
Mediation (parents, siblings)	Mediated play and interaction	
Physical x Digital meanings (visible but not available)	Constraints and possibilities within digital interfaces. How are multimodalities identified in the digital realm?	

Area	Deals with	Hypotheses
Tablet literacy	Learned interaction and tablet <i>codes</i>	Tablets require learning (are not intuitive) and practice concomitantly/ parallel with pencil and paper because the existing <i>tablet knowledge</i> among preschoolers is too heterogeneous and can reinforce discrepancies
	Physical: performance, dexterity, literate and cross-platform knowledge	
Iconography	Icons x symbols x design: meanings and purposes (semiotics)	
Same toy, different rules	Many narratives and modes of play	Tablets afford versatile and un-designed play. However, they are a strong medium for branded play
Branded choices + branded play	App options and choices related to child and consumption	
Flexibility	Variety of tools within	
No other toy informs the same type of interaction	Physical interactions with tablets define how to play (swipe, press, turn, etc.)	Problem-solving engagement with tablets in preschoolers affords distinct modes of interaction because the problems are interpreted and assessed individually (based on individual experiences) and they do not frustrate the child in case of failure (not following the designed interaction)
Problem-solving magnet	Every interaction as a problem to solve or relate. (What does early problem-solving in digital contexts develop?)	
Play versus goal (blind interaction/role of fun)	Little or no expectations of play outcomes keep the play going	
Familiarity	Mine versus yours	Digital involvement in preschoolers is culturally bound due to local knowledge and device perception from within the social circles navigated by the child
Privacy		
Storytelling (I x he/ she/they)	Role-playing and point of reference	

Based on the initial framework of these hypotheses, I set out to explore how play was performed in groups. The activities, which are described later in this paragraph, were chosen to help further develop the aspects of problem-solving, vocabulary and digital involvement in groups, plus reveal how peer learning and collaboration were manifested in digital play practices.

Second round of data collection: The second round of the study was

conducted over the course of 10 days of data collection (two to four days in each institution) between 1 February and 29 May 2015 in both Denmark and Japan (see Table 4). While in the first phase of data collection, the children were left to choose whether they preferred to interact/play on the tablet, in the second phase they were asked to use a specific app and to draw on paper. The method for collecting data on the second phase was designed to explore some of the hypotheses and initial theoretical propositions raised after the pilot study.

Table 4: Pilot and Data Collection Plan

	Pilot	Data Collection		Total
Phases		Phase 1	Phase 2	
Type Of Activity	free play	free play	pre-defined activity on tablet & drawing on paper	
Denmark	april-may 2014	(april-may 2014) – used the pilot data	february 2015	
Children	19 (including the pre-pilot session)	(19)	22	41
Japan		may 2015 (hoikuen 1)	may 2015 (hoikuen 2)	
Children		12	31	43

Children were asked to use the device in groups, and two activities were planned to take place. The first activity was to see a short demonstration in order to learn how to use an app ('Book Creator for iPad - create ebooks and pdfs, publish to iBooks on the App Store on iTunes,' n.d.) and then create a digital book using the same app. Book Creator is an app that allows for drawing, writing, picture taking, video and sound recording. This app was chosen for two reasons. It would both allow the assessment of how children remember using the functions and symbols of an application for a pre-chosen activity, and it would allow for observing how children combine different modes of play and interaction (drawing, picture taking, recording)

in one tablet activity. The second activity required them to draw on a piece of paper *playing on a tablet*. Drawing on paper *playing on a tablet* was intended to reveal how children represent and explain their own tablet narratives and experiences. The first and second phases were carried out in Japan between April and June 2015. In Denmark, the second phase was carried out in February 2015, as the pilot data, which had the identical setup as the first phase of data collection, proved sufficient and could be reused and reanalysed.

In Denmark, the same institution that collaborated with the project during the pilot study was interested in continuing to participate. However, as this time I would be observing and doing tablet activities with children belonging to only one preschool group (for the pilot I had children from various groups in the preschool), which comprised of 22 children between 4–6 years old, we had to send another letter to all their parents requesting consent regarding participation, photos and video recording. The parents had no objections regarding participation, however, some parents required specific constraints regarding video and photo capturing (which were strictly followed during the research period).

During four mornings in February 2015, from 8:30 until 11:30 a.m. each time, I was present during the activities carried out by the group's pedagogues. Each group has three pedagogues and one assistant pedagogue (normally a pedagogue student doing part of his/her educational training). Some activities involve the whole group of children, and for other activities, the children were divided into smaller groups. For example, on the days I was present, one group of children was playing board games, other children were playing with beads, making decorations, another group was playing with animal toys and yet another group was playing dressing up and role-playing. The tablet activity was added as one of the possible offers, and, just like the other activities, whoever wanted to join the tablet activity was welcome. On the first two mornings of the visit, two groups of children were presented and introduced to Book Creator separately. They were asked to draw or tell a story using the app. These functions were shown to the children as soon as the groups were formed.

Due to space constraints and the limitation of having only two devices, the groups had four or six children at a time and, as a group, children had a total of 30 minutes to use the devices. While one or two had the device, the others could follow by watching and making suggestions. There were a couple of intentions with this activity, first to explore how the multimodal possibility of the app, allowing for video, sound recording, drawing, etc., would be explored (if explored) by the children; second, if and how play would emerge during a pre-defined task.

On the other two mornings and still in groups (this time not necessarily the same groups as in the first two visits) children could use the tablet as they wished for 10-15 minutes and then had to draw on paper after playing with tablets. This time the idea was to gather how tablet play and digital play narratives emerged in an analogue format. Also, considering the initial findings from the pilot study, I was interested in observing which types of icons or symbols from tablets would emerge in paper drawings.

Both phases in Denmark took place in the same institution. However, the children who participated in the individual observations were not necessarily the same as those who took part in the group observations. The two phases were almost a year apart, with not necessarily the same children being observed due to their age (some children had turned six or seven and had left to start school) and children attending different groups in the institution. This timeframe, combined with the fact that I worked with only one class in the Danish preschool on the second phase of the research, provided the possibility of children trying unknown devices in both phases.

I wanted to keep this same unknown device characteristic in my fieldwork in Japan, and as I had limited time to visit, I opted for contacting two distinct institutions. The individual observations took place (first phase) at one preschool, while the Book Creator activity and drawing on paper (second phase) were carried out at another preschool. Both Japanese preschools had similar profiles to those of the Danish ones (as defined in a previous chapter). These preschools focus on motor skills, social thriving, etc. rather than focusing on school-oriented learning, such as learning

the alphabet. This aspect was carefully chosen, as I did not want to skew the data analysis by adding such a disruptive variable (children who have learned the alphabet and can read might still act the same with the devices, however, it would be difficult to compare their actions if the reading variable was added).

In Japan, after an ethical consent agreement had been sent and approved by the ethical committee at the hosting university, I was permitted to contact local institutions. The procedure was very much the same as in Denmark, with initial contact with the institutions' directors and, subsequently, a letter sent to inform about the research, requesting consent from the parents, and asking if the children had used similar devices (tablets or smartphones) before.

Preschool A

Copenhagen capital area (Fig. 3). Preschool A is a combined institution that receives children between 8 months and 6 years of age. Toddlers from 0-2 years of age stay in one building, which is separate from the building that houses children aged 3-6 years. The building housing older children has four groups, each with 20-22 pupils. Children arrive between 7-9am and are picked up between 4-5pm. Each group has two to three teachers, and children bring their own food from home, so there is no kitchen staff. They also have external staff who teach children special activities such as rhythmic, painting, etc. The day starts with all the children together singing, followed by organised activities such as drawing, going on an outing to a park or garden, or free play, where children either play with a range of toys and games in their designated group room or play in the playground area outside of the building.

For the pilot and individual observations, a room containing a table and chairs was set up with a camera facing down focused on the children's hands. Three observation sessions took place between 11 April and 29 May 2014, and I was alone in the room with the children, although occasionally, some of the staff members entered the room to collect tools. A total of 17

children participated.

For the group observations (second phase), I chose a couple of quieter corners in the designated group room, while the other children who attend this group were involved in other activities. Four group observations of two hours each took place between 3 February and 22 February 2015. This group has a total of 22 children and is the *old* group, with all children ranging from 4-6 years old. For these observations, the children were divided into groups of 5-6 at a time, and were shown how to use a specific app, Book Creator. They were subsequently asked to engage with it as they wished (drawing, taking pictures, recording, etc.). After using the devices, the same children were asked to draw while playing on tablets.

Preschool B

Tokyo area (Fig. 4). This private institution receives children who are between 1-5 years old in two groups – a young group of children aged 1-3 years and an older group with children aged 4-5 years. For reasons of consistency in the research, I observed young children who were in the older group. The institution is open from 7am until 8pm. However, most children arrived between 8-9 am and were picked up between 5-6pm.

The class had two main ‘sensei’ (teacher), who were there permanently, two people who were responsible for the food (each class of children had its own kitchen and kitchen staff) and a couple of other employees who were responsible for teaching English and rhythmic activities through different activities. On the observation days I saw only the English activities, which were held in the morning for one hour, during which time children sang and played while learning basic communication in English (no reading or writing, only oral skills). The staff were all of Japanese descent and apart from the English terms, everything else was in Japanese.

For the individual observations (first phase), repeating those carried out during the pilot study in Denmark, I visited the first institution four times between 18 and 25 May 2015, always accompanied by a local Japanese MSc

student, who belonged to the research group I had joined while staying at Keio Media Design Graduate School (KMD). The Japanese student helped me when children did not understand my accent in Japanese and sometimes when they said something I could not grasp. As we mainly observed children's use of the devices and asked only a few questions at the start, this setup did not seem to affect the study. In this institution, the room setup was very similar to that of the Danish one, with a room in the building furnished with a table and a couple of chairs where I could set up a camera facing down, focusing on children's hands on the device.

Twelve children were observed on their own, and in one case, two children wanted to participate together, which we allowed and carried on the observations in the same way as the others.

All the children observed were Japanese and only one child had a foreign mother.

Preschool C

Fukuoka area (Fig. 5). A large institution with children aged from 2 to 5 years of age. The groups of children also had two 'sensei' per group, and children who were four and five years old were also in the same group. This preschool also offers English classes as well as a variety of other activities. Its location was spacious and it also offered other types of activities after the regular hours, such as Karate. In this institution, they have had videoconferencing events with other preschools around the world aimed at promoting international consciousness among young children. As in the other institution, the children are also divided into groups according to their age and they also learn basic English words for these events. All the children were Japanese.

In this institution, the group tasks of using Book Creator and drawing on paper were carried out. I had the help of two Japanese students for the observations, and we were located in a large classroom with tables and chairs plus all the materials required for drawing, making collages, etc. As

Methodology

in the Danish case, activities could happen concomitantly, in other words, while one group used tablets at one table, another group would be drawing at another table. We had two full days at this institution, starting early in the morning (8am) and leaving late in the afternoon (at around 5pm). In this way, we observed 31 children in total, although not all at the same time, but divided into groups of 4 or 6 children each, with 8 -11 children being



Figure 1: Preschool A, Copenhagen



Figure 2: Preschool B, Tokyo



Figure 3: Preschool C, Fukuoka

present in the room altogether (half with two tablets and the other half drawing on paper).

Due to having many children at the same time, I had the help of two Japanese students from my host university. I showed them some of the Danish data collection plus informed them what had to happen as a way of instructing them how the activities should be done. Both students had lived abroad for a long time and were very good at English. Therefore, in this institution, I became responsible only for overseeing their work and filming the events, while they carried out most of the activities. We had a two-camera setup – one for the tablet table, and another camera for the drawings.

Some considerations and limitations of the research design

While the one-to-one observations and informal conversations were quite calm, group interaction was more chaotic and though it was a slightly more difficult to follow their conversations closely on the spot, everything was videotaped. Nevertheless, it was a great opportunity to see how children collaborate and play with each other when in possession of tablets, besides allowing for play events such as role-playing and game-like events to emerge (children would not make faces or make sounds for

the device if alone, however as soon as another child was present, these actions entered their tablet play repertoire). The video data collected is very helpful, as it allowed me to capture these conversations for analysis after the events.

Overall, it became clear that the choices made earlier regarding devices, room setups and camera focus allowed for collection of a rich data set. In addition, the focus on the hands while using the device proved to be an invaluable choice, as it helped shape questions and guide the analysis towards unforeseen, but appreciated directions. For example, during part of my data analysis, I took my focus away from the tablet object and instead directed it at the hands. Focusing on the hands led me to further consider how the hands act as a communication tool while interacting with digital devices. While children play, they also communicate their thinking behind their action through hand movements. Hands extrapolate from being just an interaction tool between user and device; hands are the silent communication tool between the user and his/her peers. The method choices, together with some of the results presented here, contribute to the field of digital ethnography by bringing the value of hands into focus when studying digital media and children (Froes, I. Tosca, S. 2016). However, this same choice of focus sometimes proved itself challenging as children moved the devices and their bodies, sometimes covering the camera view.

My choice of carrying out the observations at the educational institutions instead of at home can be perceived as faulty because children are not in their own 'natural' environment. Consequently, it can be argued that I did not observe children using their own devices or devices they know and that my observation setup was too detached from children's actual practices. Besides the choice of location, in both countries, the children did not know me or the other research assistants, and they were called into a room with a video camera setup, which already differs from their own room at the institution. Some of the children showed a degree of shyness and did not seem *at home*. Notwithstanding these barriers, the children wanted to participate and were keen to try the devices.

Some children struggled with some basic interactions, such as swiping, sometimes requesting the researcher to intervene or help. Although helping the child was avoided as much as possible, it was accepted only when the child had been unsuccessful at least four times or when they went into *delete* mode and did not know how to rectify the situation.

With the first two children, a few notes were taken on a notebook while they interacted with the device. However they did not seem comfortable with that and instead, for all the following children, notes were taken immediately after the respective child had left the room.

On the second and third days of observations, in both Japan and Denmark, the children were more at ease. As they had seen me before, I was probably less of a stranger. This aspect facilitated communication and reduced the level of shyness for some of them.

The transcription work took place a few weeks after the last observation had taken place. This timing was chosen intentionally so as to give some distance from the notes and whatever preconceptions may have been formed during the observation days. It is also relevant to explain why this empirical phase is called data collection observations instead of interviews. Although questions were asked and to some extent a mini-interview was conducted, the whole purpose of the encounters was to see the devices in use by the children, so to observe what and how they interacted with tablets in general (hence the camera angle setup). The methodological approach followed suggests that it is relevant to become familiar with the participants' words and meanings (Charmaz, 2014), an important aspect for the success of this study. Consecutively, I observed a round of children playing in groups with the intention of assessing some group tablet interactions and how the *playing on a device* roles are defined within pairs and groups.

I filmed a total of 18 hours and 16 minutes of video with children in Denmark and Japan combined. Besides the observation video, I also collected video of two hours and 15 minutes of conversation with parents and pedagogues in Denmark, plus around two hours of informal and

unrecorded conversations with parents and pedagogues from Japan, where notes were taken after the conversations. These conversations could be described as loosely structured interviews, however as they were not in the initial research plan, and were not my focus, I still consider them conversations.

Data coding

In grounded theory, the data collected is organised through a coding process, which is the core thread linking the data collection and developing a theory to explain the data (Charmaz, 2014, p. 113). The data collection analysis guides both the literature review and fuels early writings that are revised throughout the process. These revised writings form the final set of theories that contribute to the field by expanding current theories and asking questions for future studies in related fields.

One of the key characteristics in grounded theory (Charmaz, 2014), together with the order of the study phases, is its coding process. The structure for this analysis leads towards a rich but condensed overview of large amounts of qualitative data. The coding process is divided into three areas: initial, focused and theoretical coding (*ibid.*), all described in the following:

Initial coding refers to coding data as actions, staying close to the action and choosing words that reflect it. As this initial coding is based on recorded observations, one incident is compared with another to identify similarities and discrepancies. E.g. uses force when touching the screen; tries to interact with locked items; interacts with arrow symbols to both play and navigate within an app.

Focused coding refers to weaving the initial codes into a more explicit phenomenon to ‘determine the adequacy and conceptual strength of your initial codes’ (Charmaz, 2014, p. 140). E.g. acquiring touch knowledge through interacting with the device; some images require decoding (lock symbol = not available), and children create their own game narrative by

using arrow symbols to continue playing instead of following the game order.

Theoretical coding ‘simply means applying a variety of analytic schemes to the data to enhance their abstraction’ (Glaser, 2005 in Charmaz, 2014). Theoretical codes also help to make the analysis coherent and comprehensible (Charmaz, 2014, p. 151). E.g. hand knowledge; semiotic, vocabulary; and play experience.

I used this coding structure for the initial analytical process of the pilot study data. Following the initial coding, I identified focused codes as tentative categories so as to further develop and explore these codes in the next round of iterations.

All the video material captured during the observation sessions was watched several times and fully transcribed – both what was said and the actual play (how children interacted with the devices). The initial coding took place after all the transcriptions were completed and reviewed multiple times. With the initial coding process completed, the relationship among the initial codes was identified, then the focused codes were generated, which provided the final data for the theoretical coding.

The theoretical coding subsequently informed the literature review, leading to the final analysis and discussion of the data. As much as an analysis process is set to be a structured and organised activity, making sense of the data, together with clustering and creating the categories and codes, tends to be a rather abstract and unstructured process. Although some of the actions observed appeared to be easily linked to one another, an additional set of clusters could appear depending on the discipline analysing the data. Due to my cross-disciplinary background, I could identify a range of values in the data set, since some data aspects could cater for interaction design, play, digital literacy and phenomenology fields. However, depending on how I clustered them, they would gain a distinct focus. This clustering process was a huge challenge, and the way I dealt with it was to follow a disciplined structure, while allowing the data to overlap into more than one set of codes.

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The data analysis process started with transcribing every single video by describing the actions that were occurring together with things children said during the session. Sometimes questions and my own comments emerged during this transcription process and were written down in the transcription next to the paragraph that provoked the thinking. E.g. ‘He has clearly played with tablets before as he asks for the password, however when encountering a blank area, instead of swiping sideways to find other apps, he just taps the applications visible in the lower bar.’

As points emerged, I captured screenshots from the videos and added them to the transcription to illustrate the description. After each transcription, I listed all the apps that had been used. At the end of each transcription, I would write the main actions, together with the utterances of the children, into a file. The collection of these passages formed the first set of codes.

After many hours of attentive video transcription, it is not uncommon to miss seeing repetitive actions that could feed into valuable questions. Consequently, I tried to carry out just three hours of transcription at a time to avoid this problem as much as possible. By having a couple of hours’ break in between, I was able to return to the data refreshed and aware of the material I was transcribing.

Throughout the process, I realised I also needed to code or define the hands movements, as they informed some of the communication and intentions during the play. Besides, as the hands do most of the interacting actions while children play with tablets, I also needed to define these actions in order to have some consistency in the analysis. This focus on the hands led to a

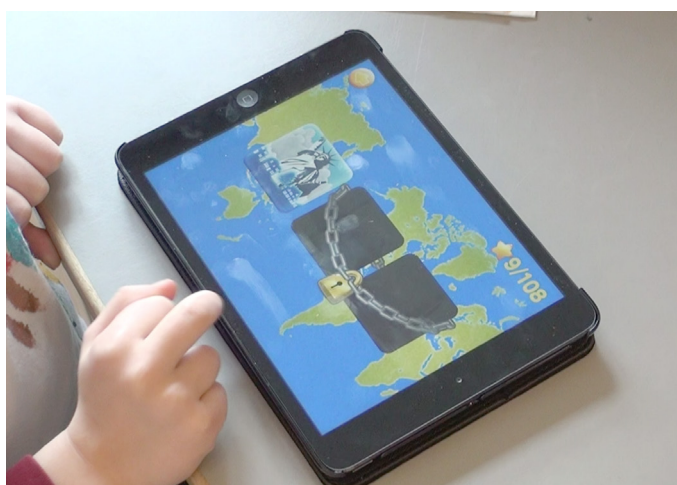


Figure 4: J encountering a locked item.

typology of hand interactions, which was presented in the *Research Context* chapter.

A slice of data

The following examples of the transcription and coding illustrate how I followed this coding process. These examples, one from Denmark and the other from Japan, are followed by a compacted version of the whole coding table.



Figure 5: J force-tapping on locked images.

Transcript examples:

First phase, Subject J: ‘He looks continuously at the screen while trying to see where to tap. He then tries the star on the right top corner followed by the lock symbol in the centre of the screen (Fig. 4). When tapping on the lock, it loads the next stages of the game that are not yet available (what signs and symbols are part of tablet semiotic vocabulary?).’

He keeps tapping on the locked images for some time (Fig. 5). As he does not appear to grasp what should happen, I have to instruct him to tap on *x* to close that window and also have to instruct him to choose the area that is *open* and say that he can choose that (icons/symbols informing a narrative?).’

Initial codes: trying to interact with non-interactive



Figure 6: H tapping on character while animation is running.

icons (locked images, stars); hand position in relation to activity, changes fingers, uses pressure on tap and repeats tapping on an icon when the device does not respond.

First phase, Subject H: He watches the video holding his hand above the device, waiting for interaction and even taps on the screen while the animation is still going (Fig. 6). (hand position indicating intention/expectation?)



Figure 7: H trying to interact with the loading bar.

As the truck starts to drive, he holds the device with both hands to control the truck through its physical position, brings the device down when the *action* stops. Tries to interact (swipe) with the loading bar (Fig.7) (signs and narratives).

Initial codes: Hand position in relation to the device (ready to act), taps on non-interactive icons, taps repeatedly on icons in order to get a response. He tries swiping on the loading bar (similar to the opening bar on the device's main screen).

Theoretical codes

Following this initial process, I compiled a table including all the initial codes. I then linked the correlated combined quotes from the codes into groups where I summarised the actual transcriptions into main topics that formed the focused codes. Following the examples above, points such as trying to interact with locked items or trying to interact with loading images led to focused codes such as: relation to iconography and images, and tablet symbolic knowledge. When combined with others focused codes,

these aspects informed two theoretical codes; semiotic knowledge and play expectations (see table 5 below).

The table of codes drafted after the pilot data analysis was revised and adjusted a number of times throughout my project to keep the data alive in the process. This process led to revisiting the codes and notes, building the final frame I have developed prior to writing this thesis. I present the final summary of coding and the set of theoretical codes in the following, as they are valuable input for the subsequent analysis chapter.

Table 5: Summary of coding process

INITIAL CODES	FOCUSED CODES	THEORETICAL CODES
Using different words for devices and types of play (lege, spille – asobu, suru) (apps (Appuri, アプリ, gemu ゲーム games) (computer, iPad – Samsung and iPad)	There is no common and defined language to refer to areas and symbols of the interface	Ways and words for describing/language
Confusion about specific functions of the same symbol in distinct contexts and applications (i.e. arrow to move to the left, arrow to go backwards, x to close a layer or to go back)	Diverse range of modes using various signs	Semiotic knowledge
Follow the <i>designed play</i> when they have played with older siblings or parents	Learn and teach interactions and narratives (P2P)	
Adults and older siblings affect how the apps are played and what things are called		
Tapping and trying locked items	Symbol knowledge	(Play) expectations
Tapping on <i>loading</i> images	Relationship to iconography and images	
Tapping on images that look like buttons (tablet = iPad)	Expect responses and have some symbol knowledge	
Differentiate devices (iPad x computer)	Mediated learning and mediated play (cultural aspects)	Cultural aspects
Games (DK) and apps (JP)		

INITIAL CODES	FOCUSED CODES	THEORETICAL CODES
Symbol incoherency	Interface acquaintance	Familiarity
Icons and symbols knowledge required for a smooth play experience		
One sign can mean many things, depending on the app		
Instead of moving forward to finish the game, they simply returned to the previous screen and continued playing	Play narratives	Play experience
Not following the app narrative allows for infinite play		
When asked to use an app, do not recognise it as play	Agency	
Some children struggle with basic interactions	* Heterogeneous knowledge	Hand knowledge
Struggling with basic interactions (swipe, finding applications)	Different levels of knowledge and dexterity regarding the medium	
Requires practice	Touch	
The interactions are learned	Not intuitive	Literacies
Going from one application to the other just by pressing the physical button, apps remain open in the background	Media literacy	Privacy
Apps keep running in the background		
The applications are silos in themselves, no interconnection	Constraints	Design
	Limitations of the design	
	Distinction from regular toys	
Different environments on the same platform	Multiple possibilities	Engagement
Knowledge of app library, many games and play possibilities	Many digital toys, large library	
Look for children's apps, when they swipe through, they do not stay long on areas with other apps such as Google, word, etc. They swipe back to the area where the children's apps are located	Learn iconography	Tablet semiotics
Recognition of apps for their target group (children's apps)		

INITIAL CODES	FOCUSED CODES	THEORETICAL CODES
Few children chose the apps on the front, safari, clock, calendar)	Exploring environment	Exploration
	Getting acquainted	
Children who had never played struggled at first but caught up within the session	Fast physical learning curve	Hand knowledge
Apps don't necessarily <i>interact with each other</i> , can't do a drawing in one and paste it into another. Not many import, export options. Only if you save it as an image and the app is designed to access the photos	Limited range of cross-interaction	Design limitations
	Different from computers, apps are not designed to necessarily cross-interact	
No problem going from one device to the other	Acceptance of screen as interactive interface	Semiotics + culture
	Go from one app to another	Acknowledge the variety within one device
Flexibility within a device		
'I'm there' ways of describing and participating in the interface	Perceptions of location, foreground and background	
Sound feedback expected	Children are used to apps with various output and input modes (movement, sound, video, etc)	Multimodality
* Make their own design rather than following the suggested app design	Disrupt narratives	Agency
* Deduce and create their own rules for the games ('I think this is about matching the red dots')	Create their own rules/ appropriation	
* Initially look for known apps, but don't mind trying apps they do not know.	They are curious to see which apps are on the device, one device with many options	Familiarity
	Comfort	
* Having fun while playing (creating combinations on <i>Bad Piggies</i> to see what happens to the car and to the pig, feeding king pig to hear sounds and see expressions)	Curious to discover, explore and invent how to play	Curiosity
Children were curious to explore and try new things		Exploration
Moving apps around (doodling)	Becoming acquainted with the digital environment	Hand knowledge

INITIAL CODES	FOCUSED CODES	THEORETICAL CODES
Having fun while playing/using the device is the main goal/reason for playing	Fun	Toy (object to play with)
Lego apps were favoured compared to other apps	Recognised/known symbols	Familiarity
Recognition of brands and known apps	Brand pervasiveness	Branding aspect
Although there are physical parallels with some of the iPad activities (puzzle, drawing, watching videos), the dexterity required to use a tablet is only learned on similar digital touch interfaces (smartphones or other tablets)	Similar games, but unique tactile interaction and feedback	Hand knowledge
Unique ways of physical/digital interaction		
Use both hands when using the device without necessarily always having a defined preference	Both hands can be equally valuable	
Hands are the primary communication tool when interacting	Communication, learning and playing through hands (intention, expectations)	
Use of force when device does not respond	Physical characteristics being applied in digital environments	
Change fingers if the device does not respond to the first finger	Logic	Problem-solving
Do not follow or wait for instructions, instead forward to actual active part, pause and <i>assess</i> the interface and start trying some of the symbols/icons	Exploring and deducing the digital environment	
Every new interface is a new problem to be solved (instead of just tapping everywhere, there is an <i>assessment</i> of the interface)		
Children-appropriate device features to create own games		Agency
Children do not seem to care if they win or lose	The goal is having fun	Fun
Playing = having fun, if an interface does not respond after a few trials, they might abandon this app and try another. However, often they go back to the <i>failed</i> app to try again.	Very little expectation regarding game outcome, fun is more important	

INITIAL CODES	FOCUSED CODES	THEORETICAL CODES
(Skilled children) know about different narratives and different types of games	Knowledge of game narratives and symbolic meanings in digital environment	Familiarity
Know who is the <i>bad guy</i> in firemen game (big fire ball)	(Tablet play literates) understand narratives and goals	Game literacy/media literacy
Seem to enjoy using the tablet (some children did not want to stop playing)	Having fun while playing	Engagement
Fun as the main motivator		
'it's fun'		
Winning is not a goal		
A small number of children did not use all the 20 minutes and wanted to go and play outside instead (2 of them had their own device at home)	Preferences	Agency
<i>I do this then nothing happens</i>	Discovering and understanding the game and the play demands logical thinking (<i>I do this then this happens</i>)	Problem-solving
<i>I do this then this happens, therefore I move forward</i>	Decoding game narratives	
<i>I do this then nothing happens, therefore I try something else)</i>		
When referring to the icon on an app they say 'I'	Self-referencing	Identity
Some children own a device, some use parents' or siblings' devices	Shared device	Familiarity, ownership
Watching TV programmes and playing the app (Ramasjan), Rasmus Klump cartoon and app, and talking to friends about some apps (Angry Birds).	Socialisation	
When playing together, create their own games and rules for the device	Personalisation and customisation of devices	
* When asking when they use it, they mentioned ('at home', 'all the time', while parent cooks, holidays, etc.)	Cultural exchange part of social bonding	Identity/digital narratives
'it's me' (while pointing at a character in the app)	Personal history/experience/emotional bonding	
'I have to take them there', 'I have to go there'	Personal history, personal narrative, (future nostalgia?)	
Use the hands to prevent or invite the others to play together	Relationship to device (control)	Ownership

INITIAL CODES	FOCUSED CODES	THEORETICAL CODES
* Apps are rarely closed, only left open in the background and another one is chosen	limited knowledge on background aspects of device use	Media literacy
Provide a lot of information back to apps – never close apps	Accessibility of data (by 3 rd parties), privacy	
No knowledge about <i>web</i> as a concept, nor about self exposure or <i>data</i> (due to age group)		
* Parents download apps and make purchases. However, children are not necessarily supervised while playing	Own experience, tablet companionship	Agency
	Little supervision on day-to-day playing	
	Mediation	
	Control	

As demonstrated in Table 5, some theoretical codes appear more than once. Therefore, one theoretical code can span different aspects of tablet play. Despite the *multi* aspect of some of these codes, in an attempt to further classify them, I have combined and summarised them in the following descriptions.

Overview of theoretical codes

- Language: this code deals with ways of describing the play or the device, explaining if it is a game or an app, calling different areas on the device different names, describing spaces such as here and there although both are on the tip of the finger. E.g. I have ‘spilled’, calling the areas or spaces as a page, window, app, game; also how children describe their play ‘I have to take him there’.
- Semiotic knowledge: this code relates to learning the meaning of symbols such locks, stars, arrows, etc., as well as trying to interact with images that have a meaning, but were non-interactive. E.g. children tried using locked items (items that were not available to be used, either as they need to be bought or earned through playing),

these items had a lock symbol on their side or they were faded out to indicate their non-available state.

- (Play & design) expectations: this code deals with how children engage with characters and images even when they are not interactive. E.g. children tapped on loading images, star icons and characters expecting them to respond, sometimes even tapping on them consecutively, showing that they expected these characters and symbols to be responsive.
- Cultural aspects: This code covers calling tablets iPads, calling all activities available on tablets games or just identifying them as something unique to digital interfaces, such as apps. E.g. in Denmark, it is common to use the term ‘spil’ (game) for all apps, while in Japan they use mostly the term ‘app’ for the applications on the device. Children followed this cultural aspect accordingly, using the widespread term used in their culture to describe the programs/games/applications available on tablets. Another example within this topic refers to how the type of play converges through the tablet medium.
- Familiarity: This code refers to being acquainted with the digital interface, looking for known apps or brands, recognising narratives, symbols and characters. E.g. children look for known apps and if they do not encounter a known one, then they try a new one; children mention they know the brand or the character while choosing certain apps.
- Play experience: This code refers to ways of playing that do not necessarily follow the designed narrative, so using back arrows just to go back into the game and repeat the play; also refers to aspects of agency as children apply their own tastes and logic to their playing (even if they go against the design of the activity/game). E.g. creating combinations based on their tastes, as in the Lego Food app. E.g. going back in the app instead of going forward and following the designed narrative.

- Hand knowledge: This code refers to ways of being physically acquainted with the interface of digital devices, knowing or not knowing how to use their hands to interact with the device, levels of pressure, types of movement, using both hands. E.g. trying different fingers if one finger *fails* to open the app, showing their intentions through how they position and move their hands around the device.
- Literacies: This code refers to the ways of learning, both physical and digital aspects of tablets combined with not only alphabet and numbers, but also to the wider range of modes of interaction, signs and symbols, narratives, characters and types of activities. E.g. both physical and digital interactions are learned through trial and error, from the physical use of a touch-sensitive screen to being able to fully explore the applications and possibilities within.
- Privacy: This code deals with the aspect that children hardly ever properly close the apps. Consequently the apps keep open in the background, gathering and sending information of the device use. E.g. children go from one app to another by pressing the physical home button.
- Design and design limitations: This code refers to the different design aspects that were popularised and characterise mobile digital interfaces, such as mobile phones and tablets: ways how applications are acquired; modes of exchange between applications (or lack of); narratives and symbols commonly used in digital applications and devices, notions of space on the device and background/foreground aspects. E.g. what is created in one app cannot necessarily be used in another app; apps continue to run in the background, as children do not necessarily close them.
- Engagement: This code deals with the possibilities of a device and the way children happily engage in exploring them; children find playing on digital interfaces fun. E.g. when asked why or what they liked about tablets, children replied 'it's fun'.

- **Tablet semiotics:** This code refers to children's symbolic knowledge when using the device. This code complements the semiotics code although it relates mostly to the device interface as a whole and not necessarily to symbols used in apps. E.g. children were quick to identify children's apps, hardly choosing others and, if this occurred, rapidly extricated themselves from the app as they recognised the interface did not seem like something 'to play with', as in the case of a browser or a calendar app.
- **Exploration:** This code deals with how children were keen on exploring the device areas, assessing what was available. They also explore activities within the apps. E.g. tapping on side tabs, swiping through all the areas to see what was available, planned tapping on a range of icons to see what happened.
- **Notions of space (digital):** This code refers to both the notion of existing areas/regions in the device as well as a way of describing and participating in the narratives. E.g. saying 'I've been there' for having tried an app before.
- **Multimodality:** This code refers to all the modes (sound, voice, touch, movement and visual) afforded by tablet devices with which children engage while playing. E.g. besides the obvious touch and visual information required to interact, children also engage with sounds and body movements when exploring and playing on the device.
- **Agency:** This code refers to ways of appropriating the design and specific aspects related to tablet play, where children superimpose their own tastes and narratives, dismissing the tablet's and the apps' own design and goals. E.g. creating their own rules for certain activities and playing by those, such as in the case of the ice cream in the Lego food app.
- **Curiosity:** This code refers to children being interested in investigating possibilities and options within diverse interfaces. E.g.

creating combinations on *Bad Piggies* to see what happens to the car and the pig.

- Toy: This code refers to how the device becomes a prop or a mediator of the play, either through the activities it carries or some of its physical and digital affordances, such as the reflection and the camera. E.g. playing with their own reflection and creating games with the camera functionality.
- Branding: This code refers to how devices are called by their brand and how brands are rapidly identified in the digital environments of apps (semiotics). E.g. children saying they were playing Lego, calling both tablets iPads.
- Problem solving: This code refers to the multimodal ways of interacting with the device by using logic and deduction. E.g. changing fingers if the device fails to respond to the first finger; assessing the interface before interacting with it; verbalising notions of the game narrative.
- Fun: This code deals with how children find playing on tablets fun and this aspect is a clear motivator of the interaction. E.g. when asked what they liked about tablets, or why they liked playing on tablets, the reply was 'it's fun!'
- Game literacy: This code refers to children being knowledgeable and reflective about app/game narratives. E.g. knowing goals and how the games are played, so being able to identify the character that needs to be destroyed or to know that the amount of stars shown at the end of the game indicates how one played (just won, did very well, etc.).
- Identity/digital narratives: This code refers to children identifying with the characters and how the identification promotes a distinct engagement with the interface (emotional bonding). This identification also reflected how children describe digital spaces

as being part of it. E.g. calling the character 'P' or pointing at characters saying 'it's me' or 'I have to take him there'.

- **Ownership:** This code relates to the identity code previously described. It refers to being able to customise a device, create spaces both digitally through dragging icons and also physically by ways of positioning their arms and hands, inviting others to join the play or preventing them from joining. E.g. hugging the device; positioning the device close to themselves or on a flat surface; dragging icons around to organise them in a certain way.
- **Media literacy:** This code refers to the further control over the media in general that is yet to be acquired. As much as children can create, challenge and consume media content, they are a young group and do not necessarily acknowledge how all of that happens. Consequently, their use is not necessarily critical of the backstage, though it can be critical of types of content. E.g. children take pictures and acknowledge if they are good pictures or if it is a good or not so good game/app.

Chapter overview

Coding the data provided me with a clearer overview of all the observations, while allowing me to see the data in patterns. But as I finished the first big round of the theoretical coding after both phases, it became clear that the code group was too vast to work with individually. Besides, many of the codes intersected. Furthermore, it also became evident that when the codes intersected, they gained distinct *weights*, helping shape more of a contribution to the field. Therefore, by following these intersections, they were further grouped into clusters that shaped the five categories leading the taxonomy.

With the taxonomy at hand, I identified a number of key points that other scholars had written about extensively, which guided my literature review. Throughout this process, a number of questions were raised,

Methodology

from ways in which children interact and engage with the device to ways in which children communicate and learn with and about digital devices through play.

In the following chapter, the theoretical codes are further presented, analysed and discussed from within the taxonomy and intertwined with the relevant theories. The further analysis and discussion guide my theoretical contribution that follows.

Play gives rise to stories. Stories become games; games become stories

Frank Rose (in Art of immersion, 2011)

ANALYSIS & DISCUSSION

In this follow-up analysis and discussion of the theoretical codes, I dwell on each code and the questions they inform in relation to the relevant theory. Some of these definitions have already been presented in the literature review chapter. However, they are re-formulated together with the empirical data in order to build the arguments in this chapter.

Why tablet play and not tablet use

Throughout the observations, data coding and analysis, the data geared towards a clear aspect: children's interactions with tablets are playful and children identify their use as playing. Even children who were trying tablet devices for the first time appeared to enjoy the activity while exploring and trying things, and when asked if and why they liked tablets, their responses were almost unanimously the same: 'It is fun!' The fun aspect composes one of the many play characteristics, and this aspect surfaced as early as during the pilot observations and re-occurred in both Denmark and Japan during the first and second phases of the data collection. Thus, I acknowledge play as the core experience in young children's practices with tablets.

Key aspects of play theories build a valuable spectrum of young children's encounters with digital technologies together with theories of digital literacy practices, STS and experience. Therefore, when summing up the analysis of these interactions into a taxonomy, which I understand as a way of organising things systematically into groups, I specifically call

it the taxonomy of tablet play and not of tablet use. I also allow myself the freedom to play with play-related terms, such as toys, calling the tablet a *toyblet* in the case of this age group. The reason for this wordplay is explained in the previous analysis, but in short, I identify tablets as playful multimodal toys. The proposed taxonomy describes the overall interactions that shape and define the types of play witnessed in digital contexts (Marsh & Bishop, 2013; Marsh et al., 2016; Plowman & Stephen, 2014).

As the coding process advanced and key patterns emerged, several aspects struck me as important. For example, observing the ways children interact (and learn to interact) with the tablet interfaces made me wonder how they become acquainted with game narratives and a wide-ranging iconography and its meanings; and how children explore the spaces available in the digital interface. These thoughts fed into several questions and perspectives relating to existing theories.

During the final coding stage, I identified topic clusters from the theoretical codes. This happened already after the pilot study analysis and, as mentioned earlier in this chapter, I grouped the previously presented theoretical codes (chapter 4) formulating an initial taxonomy of tablet play or the *toyblet taxonomy*. In this taxonomy, I have identified and defined the group of young children's interactions while playing with tablets. This taxonomy was then revised after the final rounds of data collection analysis and is presented in the following subsection. The reason for defining a *toyblet* taxonomy was to group aspects of tablet play that intersected with each other and to facilitate an overview of aspects encountered in young children's digital play practices.

Creating a taxonomy, which was an effort to synthesise the findings while not losing their breadth, also aided me in focusing on the three main theoretical fields presented earlier. Moreover, analysing the theoretical codes through the taxonomy categories exposes the overall process of organising and interlinking the findings into meaningful categories that define digital play practices. In the following sections, I present each of the taxonomy categories through the theoretical codes. In each category

section, I analyse and discuss the theoretical codes supported by some of the literature introduced in chapter 3. Additionally, I offer reflections on these codes and categories, building the argument towards my theoretical contribution.

Taxonomy of tablet play or toyblet taxonomy

The proposed taxonomy is composed of five key categories: vocabulary, design, play, interaction and attachment. The taxonomy is grounded on how the theoretical codes address the research questions raised in the literature review and each of the categories is explained and exemplified below. Besides addressing the research questions, the *toyblet* taxonomy expands them further into broader arenas. For example the categories of play, interaction and attachment intersect through distinct angles with the motivation and engagement codes. The tablet vocabulary and design categories are both central for defining current and future interactions with similar future devices. Clearly, competences and skills are being developed, such as problem-solving, dexterity and learning a range of symbols and their functionalities, but I suggest that the whole of the play experience with digital devices reaches beyond these competences.

Vocabulary

Vocabulary: refers to the verbal, physical and semiotic vocabulary being shaped and developed through tablet play.

Theoretical codes: Language, semiotic knowledge, literacies, identity/digital narratives, multimodality, cultural aspects, problem-solving.

The vocabulary category comprises seven theoretical codes. These codes intersect in a common thread in children's tablet play that relates to ways of speaking about and seeing the interactions and engaging with spaces and activities in the devices. These aspects form the vocabulary category and are further analysed in the following paragraphs.

As tablets are used, it becomes clear that there is a lack of term differentiation when young children refer to activities on the device. The findings show that from the children observed, the vast majority called all types of apps ‘games’ (*Spil* or *Gemu* ゲーム) and any activity, ‘playing apps’. The preferred verbs used were *spille*, in Denmark and *suru*, in Japan. It also became apparent during the observations in both countries that there was a lack of a defined term when indicating an activity, e.g. Does one swipe the screen to another ‘page’, ‘section’, ‘area’? When within apps, this choice of word was sometimes facilitated as the term ‘page’ fits very well in the case of a book-reading app, or the term ‘level’ in games. Also, terms such as ‘menu’, ‘back’ or ‘home’ were commonly applied, but as I did not further investigate this specific vocabulary, I cannot say if these words are used as synonyms or whether children perceive them differently. However, there is not a unified and commonly used term for these *spaces* or *areas* on tablet devices.

A second aspect belonging to the vocabulary category relates to what the interaction (or play) is called, and how it is described and framed by older siblings, parents and institution’s pedagogues. What children call the apps and how they describe them is inherited from parents, siblings, friends, TV shows, and shaped through social and cultural descriptions. Therefore, the way parents use terms such as *games* or *apps*, might frame how children verbalise their own tablet experience. When talking to pedagogues and parents, I witnessed similarities in the choice of words regarding activities on tablets. However, the talks and interviews I had with these adults were only intended to contextualise children’s environments. To find out how *top-down* mediation affects the emergence of an original vocabulary from the children’s side would require further investigation.

A third aspect of the tablet vocabulary category refers to distinct states and meanings within the digital universe, e.g. a definition of the visible *things* that are inaccessible. It is possible to make a quick comparison metaphor to physical retail, where objects in shops are visible and available for purchase. However, in the digital context of apps, children found themselves uncertain of the interaction, trying to tap and drag non-

interactive images and icons. By trying non-interactive icons, children start gaining knowledge of digital symbols informing their states, i.e. a lock next to the image or a faded colour means they are not available. These interactions slowly build the creation and development of a semiotic vocabulary, as children who appeared to be well acquainted with an app or with tablets, in general, were less likely to try interacting with locked items, loading images or non-interactive symbols.

When assigning empirical evidence to the codes of language, semiotics and multimodality, it became apparent that there was more than that which met the eye while children played with tablets. Children were in a process of discovery, experimentation and learning. However, these aspects do not necessarily inform whether children are able to read and write earlier or later (as this was not part of my study). Instead, the data revealed a range of competences being acquired and developed through these tablet interactions, feeding into the perceptions of what it means to be digitally literate as a young child.

I observed similar competences to those described by Marsh et al. (2015) in their UK research with children between 0-5 years of age, such as dragging items, using apps, swiping the screen, using creativity apps, taking pictures and turning on the device. Beyond these, I also identified ways children described their play and how they played. Consequently, as children became acquainted with the available app environment I had curated, they tried unknown apps and discovered or created their own app narrative while playing them.

Children sometimes asked how to play something while already playing it. Other times they verbalised what they thought the app was about by saying what they believed it required or they described to their peers what they were doing ('linking the red dots', 'moving the balls', 'taking him there'). This also aligns with Marsh et al. (ibid.) as they highlight in their report that one of their subjects, a parent, mentions how her child talks while playing, describing what she is doing on the app. This way of engaging with the device by talking while experimenting and playing gives

a small glimpse of how children use and develop their creativity, how they problem-solve and decipher the meanings of a number of images and their modes of interaction. For example, in the case of seeing an image of a tablet with an arrow inside indicating they have to tilt the device in order to pour the liquid into a jar, children tried *holding the container* (see Fig. 8), moving the container in the direction suggested, and eventually tried moving the actual tablet, finally deciphering that code. When it appeared subsequently, children immediately tilted the device, showing that they had learned the symbol and the interaction associated with it.

I propose that this form of play is also creating a multimodal body of knowledge (Marsh, 2010; Sefton-Green et al. 2016) that is constituted by physical competences combined with rich semiotic resources and practices. This also resonates with Schön (1987) and Ingold's 'thinking through making' (2013: xi). In this case, the making refers to engaging through physical actions with characters and spaces on the device, which are the material for 'weaving' or constructing the final product, the play experience.

The vocabulary also deals with how children relate to characters, settings and digital spaces when using the first person pronoun 'I' or using terms such as there and here while touching the screen and pointing at these locations.

Moreover, by describing

locations on the apps and what they are doing while playing using these personal and spatial terms, children show they have incorporated perceptions of digital spaces in their play and in their narratives. This way of describing and performing play agrees with those described by Winther-Lindqvist (2009), Ackermann (2013) and Fleer (2014) when discussing

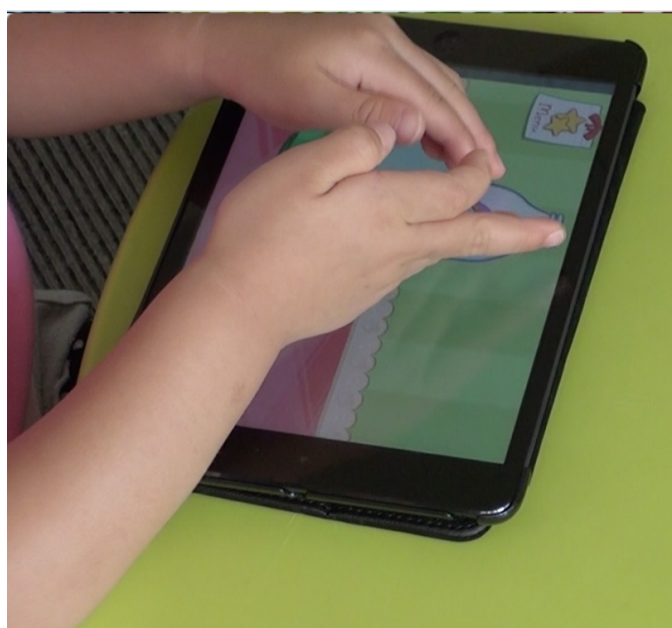


Figure 8: Holding the bottle to pour liquid in the bowl.

play as a multilateral activity where the real and imaginary overlap and are ‘simultaneously about pretence and about the literally real’ (Winther-Lindqvist, 2009, p. 63). However, in the case of digital play, the pretence or the digital environment guiding the play, as in the *Lego City* or *Talking Tom* apps, is digitally real. They are not imaginary spaces; children are interacting with existing digital spaces.

Children’s imagination expands these spaces by bridging them to their realities, such as saying ‘I have to take him there’ when referring to a rescue boat that needs to save a drowning character in the *Lego City* app; by attributing personality traits to the device – as when saying ‘I don’t like when it (the tablet) teases me’; or by self-referencing and identifying with the characters ‘it’s me’ when seeing a little girl approaching the booth in the *Lego Food* app. In these examples, children interact with the tablet in creative manners by engaging with app scenarios distancing themselves from the physical rules – saying ‘there’ to something you are touching, incorporating the perceptions of space offered by the app – while acknowledging their role in the game as the character *needs* the child to move him/her from here to there.

Attributing a personality to the device²¹ is also a way to build a relationship with the machine (this feeds into the attachment category presented later in this chapter). In this discourse, the machine becomes the other, or something with a will of its own. A similar perception can be found in Sherry Turkle’s (1984) early research on children and interactive toys, where children also attributed human behaviour to electronic toys. Children create and challenge the device’s *moods* by insisting and imposing what they want, hence the consecutive tapping and using pressure when the device does not obey. Another way of dealing with the ‘teaser’ is distancing themselves from the teasing by just leaving the app to go to play with another one, and returning later to try the same app again.

21 Saying that the device teases closely agrees with the aspects presented by Turkle (1984) in her study with young children, where children discussed a computer toy (Merlin) ‘cheating’.

In summary, through the choice of words and modes of play-related literacies, the vocabulary category covers a number of valuable aspects encountered in young children's tablet play language. Although the word vocabulary relates to spoken or vocal expressions, I find the term has grown beyond its definition and can be used in this described context to include a visual and touch vocabulary composing the *toyblet* taxonomy vocabulary category.

Design

Design: refers to physical and digital interface aspects encountered in tablets – aspects that dictate or inform how to interact with the device. It also covers some of the current design limitations in existing platforms.

Theoretical codes: agency, branding, tablet semiotics, (design) expectations, design limitations, privacy, exploration, notions of space (digital), toy, multimodalities and media literacies.

The design category is composed of 11 theoretical codes. These codes converge the physical and digital interface design characteristics of current tablet devices and the ways children appropriate these characteristics through their media use. The appropriation aspect within this category relates to ways in which children recognise, narrate and relate to their experiences with these types of technologies²² (McCarthy & Wright, 2004; Dourish, 2006; Papert & Harel, 1991; Pink et al., 2015). The appropriation aspect intersects the theoretical codes of branding, agency, semiotics, exploration and notions of spaces. The design category is also presented and discussed through media and digital literacy theories (Buckingham, 2006, 2007a; Livingstone, 2004; Sefton-Green et al., 2016), which in this context refer to existing (and yet to be learned) design-related competences when interacting with the devices. For example, how, through

²² In the context of this research, I should say that when talking about these experiences, children referred to both tablets (parents', siblings' and their own) and smartphones (their parents' or siblings').

trial and error, children learn to differentiate active and non-active icons and to create spaces by dragging icons to the side of the device. These competences shape and are shaped through the types and qualities of the interactions with tablets. Although these design-related literacies are not the outcome of a formal media education in children's preschools, these literacies are still obtained out of cultural, social and individual processes while engaging (playing) with these devices. Furthermore, in this design category, I acknowledge current limitations of tablet interfaces and suggest how these interfaces could evolve towards considering wider scenarios for children's interactions with tablets. These characteristics are presented and discussed in the following.

Children of this age group did not seem to understand the idea of an 'icon with no interaction', this illustrates the codes of semiotics and exploration that shape this design category. Every image was regarded as an interactive possibility, hence they tried to tap on loading images and various icons spread across the apps' interfaces. One example of the semiotic acquaintance was that children identified *their* apps, or apps designed for children, with very few of the observed children tapping on other types of apps, such as the safari app or the calendar (both located on the first loaded screen as one opened the device).

Children would point at apps saying 'I know this', 'I have this at home' or 'I have this game in Lego bricks' indicating that they recognise and are familiar with these apps. Looking for something they already knew and choosing known icons (and brands) when they did not necessarily recognise any of the loaded apps indicates how children map the tablet interface, plus the value of the familiar. Feeling comfortable in a known environment points towards a way of exploring – the known appears to be more valuable than the *not known*, which leads to both branding (the feeling of the familiar can relate to icons and shapes that are recognised

as belonging to specific brands, such as *Lego* or *Angry Birds*²³) and semiotic awareness aspects encountered on tablet devices.

The feeling of the familiar linked to the iconography informs one of the ways of appropriating the narratives and therefore, the device, or how digital contexts relate to these children's personal experiences. This characteristic of adopting an experience by making it your own aligns with McCarthy and Wright (2004b), who list it as one of the six processes of sense making 'in and of experience' with technology (2004b, p. 124)²⁴.

The children also appropriated the characters and designs, as for example saying 'it's me' pointing at a character and then creating the combination of ice cream requested by this character when playing the *Lego Food* app; or by acknowledging their role in the game by saying 'we have to make ice cream for people' (see Fig. 9). This role is dictated by the app design, and children participate in this role-play setting by being *there* in the narrative, but not losing sight of the *here*, being aware of their peers in the room. Such an appropriation aspect aligns with other appropriation definitions. For example, when examining the topics of space and place in the context of technology experiences, Dourish (2006) discusses the role of appropriation and proposes:

'The technologically mediated world does not stand apart from the physical world within which it is embedded; rather, it provides a new set of ways for that physical world to be understood and appropriated. Technological mediation supports and conditions the emergence of new

23 I did not have the *Angry Birds* apps installed, but I did have *Bad Piggies*, which is designed by Rovio and has the pig characters from *Angry Birds*, which many children recognised.

24 McCarthy and Wright (2004) in their book *Technology as Experience* present 'technology to be deeply embedded in everyday experience, in ways that are aesthetic and ethical as well as functional' (preface). They present six aspects which build the core process of current experiences with technologies: anticipating, connecting, interpreting, reflecting, appropriating and recounting. They exemplify how relationship to devices exists through a sensorial engagement. By appropriating a technology, children attach a significance to the whole of the experience beyond the just pragmatic use of the device and interface.

cultural practices, not by creating a distinct sphere of practice but by opening up new forms of practice within the everyday world, reflecting and conditioning the emergence of new forms of environmental knowing' (Dourish, 2006, p. 6).

I suggest that, among young children, these 'new forms of environmental knowing' incorporate images and symbols from digital spaces and contexts, such as those encountered in tablet devices. These digital spaces are intertwined in the ways

children describe their media experiences. They also inform a set of digital narratives that expand the digital play into physical play situations, as in the case of apps that have physical counterparts, such as *Lego*.

The aspects of building on digital narratives of physical counterparts through tablet and app design interfaces, together with how these interfaces are appropriated, brings me to the theoretical code of 'toy'. As described in the literature review chapter, toys are culturally bound objects with a symbolic purpose, an agent of and for the imagination (Fleer, 2014; Marsh, 2010; Sicart, 2014; Sutton-Smith, 1986; Vygotsky, 1978). In the case of tablets, and due to their ubiquity in both societies observed, the object, the design, brands and apps join in creating a play symbol, which has become *universal* in these realities.

Despite any differences these distinct cultures may portray, I would argue that in a children's play universe, tablets have become a desired device. As a toy, tablets certainly bring children into an array of narratives and contexts, and fulfil their role of bridging fiction and reality (Fleer, 2014; Marsh, 2010; Sicart, 2014). Tablets offer enough material for children



Figure 9: Making ice cream for people. In this case, a giraffe and the child create an ice cream based on own taste (not the one requested by the giraffe).

to be imaginative and creative as they explore some of the physical affordances of devices, such as reflections as well as app capabilities, by disrupting a game narrative and creating a game from the photo and camera utility functions.

Notwithstanding these creative assets and that the number of apps keeps increasing, app designs must still evolve in order to afford the growing creative inputs and expectations of children, such as being able to create an image in one app and import that image into another story or context. Current designs include a number of limitations. For example, one cannot create a *Lego ice cream* and feed it into *Talking Tom*. Current (and older) computers allow for inter-app experiences with simple commands such as copy and paste; tablets, being newer devices, are many steps behind in this design aspect. E.g. an image created in a drawing app on a computer can be imported into a text document, it can be animated in another app or it can just be printed, becoming a physical toy. However in tablet devices, this option remains highly limited, with even simple commands of copy and paste being unsuitable for images, drawings or icons; creating app silos where, despite the multimodal aspect of the device, limited cross-interaction occurs²⁵. This design aspect also informs the expanding concept of digital toys. Whereas any physical toy can gain specific characteristics depending on the type and context of play taking place, on current apps, these characteristics are pre-defined and can rarely be changed, they vary from basic character personalities to set environments.

As an overarching reflection, digital scenarios, which could be seen as having maximum flexibility, are currently limited, since apps have very defined settings with limited or no possibilities for exchanges of their digital properties. If limitations such as these are overcome, the realm of creative possibilities expands, mixing other types of physical

²⁵ It is possible to take screenshots and save them in the photo library, and some apps allow importing of material from the photo library. However, editing and sometimes even executing this *simple* process can be cumbersome if the user is not well acquainted with this device capability.

affordances into digital narratives. These limitations also currently constrain the available hardware and software multimodal affordances such as moving images, speech, writing, sounds, spaces (Gillen et al. 2010). As a consequence, the designs delimit the types of interactions children experience. After my observations and despite the heterogeneity in children's user knowledge, I believe a wider range of multimodal interaction could be explored and acquired together with the current modes available through further developments in the devices' systems and functionalities.

This imminent design evolution must also align with other aspects, such as those involving children's rights (Livingstone, 2014a) and media literacies. For example, the theoretical code of privacy emerged from the aspect that children hardly ever close the apps. Children go from one app to another simply by pressing the physical button to return to the areas where the apps are located. Thus, apps remain open in the background and there is nothing on the app itself that allows for them to be closed. Although children who are experienced in using tablets used \times symbols with little problem to close warnings, none of the children's apps used provided this possibility to close them. The user has to know a wider range of interactions in order to do a simple task, such as closing an app. Perhaps another obvious point is that children are not necessarily concerned about closing apps, since they are unaware of open apps harvesting data and what this means or what is happening in the background of the device. Therefore, together with learning to use a digital device, children should be informed about aspects of data being collected in the background while devices are in use. This data knowledge is one of the many aspects that should compose the media literacy skill set.

The data aspect points towards media literacy education and how small ways of interacting with the device require taught knowledge or a change in the design. Buckingham (2006) suggested that media literacy development involves a broad competence in relation to the widest range of media. So one way of dealing with these data scenarios might also lie in the design and policy making. Accessing and engaging with online devices

is a children's right in our digital times (Livingstone, 2014a). Companies developing apps for children should engage with this scenario not only from a commercial perspective but also from a socially responsible one, where small design decisions could offer positive solutions. For example, apps could be designed to close after a small period of time running in the background, or this setting could at least be available for selection by the user. One requires no further instruction, whereas the other requires an awareness of the need to close the app and some instruction. Both would amend the current setting, where one needs to double tap on a physical button and slide apps up or down to close them, as in the case of the apple operating system (IOS) or the Android operating system.

Among the device limitations, besides the design constraints I have previously discussed, there are points relating to its actual physical affordances. For instance, with a doll you can dress it, cut its hair, or conversely, with a piece of paper you can fold it and make it into an animal. Although these physical characteristics are not necessarily the same on digital counterparts, tablets can be great sources of inspiration offering possibilities that exceed physical limitations. It is true that occasionally some of the physical actions happen by chance, such as discovering that you can tear a piece of paper, or fighting for a doll and a limb comes off. Random aspects like these are less likely to happen physically with a digital device, but some of the digital responses can be as random as these physical affordances in the digital context. Therefore, tablets appear to work as a great source for narratives and creative inputs, as the more content, the richer the world around the children.

The design category covers ways children engage with current physical and digital tablet designs. Browsing for familiar icons, recognising children's apps and brands, combined with appropriating and expanding narratives, characters and spaces, shapes the tablet as a commodity in the play sphere. However, this *toyblet* design is still in its infancy regarding how it should address a range of current system and interface limitations and how it can be further expanded and developed as a toy.

Play

Play: refers to how tablets have entered and become a dynamic playground, and how, through children's play practices, they evolve from device to toy, promoting playfulness and experimentation.

Theoretical codes: cultural aspects, (play and design) expectations, play experience, toys, problem-solving, engagement, fun, digital spaces, familiarity, curiosity, game literacy, literacies, agency.

The play category deals primarily with how classic aspects from play theories such as agency, fun, game literacy, role-playing, toys and problem-solving are manifested in digital play practices with tablets. Although all the categories are within the tablet play taxonomy, the play category emerged like the other categories, as the one word that intersected aspects from within the theoretical codes dealing with valuable topics from scholarly play research.

The theoretical codes are discussed through the examples and the theories presented earlier in the literature review chapter. The cultural aspects, experience, curiosity, fun and toy codes are linked to play theories (Fleer, 2014; Huizinga, 1949; Marsh, 2010; Sicart, 2014; Sutton-Smith, 2001) as they compose a wide frame for the way in which young children engage with tablets. The socio-cultural context shapes aspects of intertextuality and child consumption composing the familiarity and expectation codes (Buckingham, 2007b; Crescenzi, Jewitt, & Price, 2014; Marsh, 2014; Marsh & Bishop, 2013; Marshall, 2002; Ong, 1998; Sefton-Green et al., 2016). Finally, the topic of appropriation is revisited through how play narratives and game rules are experienced, intersecting the theoretical codes of agency, game literacy, literacies, digital spaces, engagement and problem-solving (Dourish, 2006; Gaines, 2006; Gee, 2003, 2015, Marsh, 2010, 2014; Seymour Papert & Harel, 1991; Pink et al., 2015; Thornton, 1995). A number of examples illustrate all these aspects and are presented in the following paragraphs.

Cultural aspects usually play a role in how play evolves and develops in a culture, or in Huizinga's perception, cultures emerge from play (Huizinga, 1949). According to Sicart (2014), play is the way we engage with the world around us. Tablets, together with their apps and digital games, have entered the children's social, cultural and play contexts, and, as observed in both Japan and Denmark, interacting with tablets is a playful activity. Children recognised the devices and even children who had not necessarily used one before knew they could play on these devices and had a notion of how to do it (using their hands). The majority of children were keen to try the devices, with only three children out of eighty-four not showing much interest. In both Denmark and Japan, smartphones and tablets are highly pervasive in the public sphere and in home environments. Thus, children are exposed to these mobile devices from an early age. Besides the physical social sphere, tablets and mobile phones are also portrayed in cartoons, and a variety of narratives display these devices, making them a familiar item.

This familiarity transcends the devices; it also informs a way of interacting with their interfaces. Familiarity aspects are constructed through children's social and cultural exchanges (Crescenzi et al., 2014; Sefton-Green et al., 2016). Familiarity brings children into a comfort zone just like seeing a familiar face. When navigating digital spaces, a number of actors (Latour, 2005) construct this familiar space in the socio-cultural sphere in Denmark and Japan. For example, this familiarity ranges from children seeing their friends and parents using such devices, to doing some of these activities at home with their parents, siblings or friends, or knowing the characters from TV shows, toys, clothes, etc. This recognition aspect became a visible characteristic during the observations as children engaged with foreign²⁶ devices. As described in the design category, children looked for known icons, symbols and certain apps based on their previous experiences with tablet devices. When they found one, they chose that instead of an unknown app, and children confirmed this choice many times

26 A device they do not own or that is not owned by their family.

themselves by saying: 'I have this app', or 'I have played this game'. The familiarity aspect then informs how the play unfolds with digital devices. The first part of the play was finding a known app. This aspect might differ from its physical counterpart, as when children enter a room full of toys, they would not necessarily choose a toy they know. They might as well choose something they saw on TV but do not have, or even be attracted to something similar to something else that they might know. In both digital and physical cases, intertextuality (Marsh, 2014; Marshall, 2002; Ong, 1998) plays a part by leading to a known or recognised symbol. However, in the digital platforms, children appeared to be more careful, with almost no children jumping straight at the chance to play with the device with the first app they saw. A short phase of recognition and exploration frequently occurred before children chose to interact with an app; first they browsed through the areas on the device and the apps installed. Looking for the familiar also informs the perception of the child as an active consumer, deciding what to engage with and when, together with how children practice their agency when interacting with tablets (Buckingham, 2007a; Marsh & Bishop, 2013).

Despite the ubiquity of digital devices in daily narratives and the familiarity aspect that influences how children choose which app to interact with, the children from the study did not have a strictly defined expectation of what they would encounter when being presented with an unfamiliar device (there were other types of play expectations which will be described later). Children knew they had to swipe to interact with the screen, but the content available and what was expected from within the different apps came as a bonus. Children explored the interfaces through breaking them down into small problems to be solved. During the observations, some children appeared to reflect on the interfaces, strategies and narratives of the apps by briefly reflecting aloud while engaging with them. For example, after playing for a few minutes with a match-the-dot app (*Match The Dots/ Dotster*), one child started to talk, saying that the game was about matching the red dots together. The child articulated her understanding of the game while playing and not necessarily addressing me, but almost as a self-reflection on the interaction. Added to this thinking aloud, she played with

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this app with the device in an upside down position, which did not seem to affect the play nor the fun she had playing with it. I coded this reflection as a problem-solving aspect. These utterances were encountered many times during the observations, both when children played individually, and when they played in groups where they made similar reflections while talking with their peers.

Another related example occurred when children played by making different combinations in the *Bad Piggies* app (see fig. 10), where one has to first put together a cart in order to run along a path afterwards. Children were curious to experiment with creating various combinations of these carts, having fun seeing the carts collapse and fail, many times in funny ways. Although they wanted to get it right when they first started playing the game, the failed attempts seemed so funny (children laughed out loud when the cart began to dismantle and collapse with all the pieces flying around) that the children chose to continue doing wacky combinations to see more carts collapse. In this *collapsed cart* case, children problem-solved to succeed in having fun, instead of succeeding in the game.

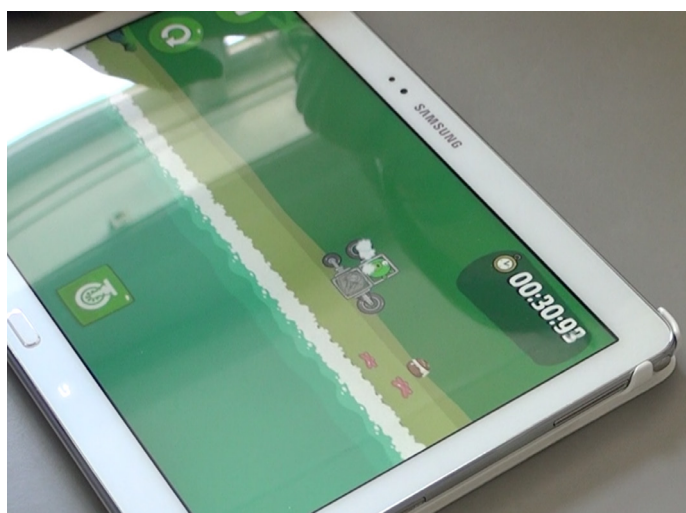


Figure 10: Playing with the vehicle possibilities

These examples indicate how fun and curiosity lead to distinct patterns of digital play, which distinguish themselves from those dictated by the app. Both cases also align with Thornton's perception of problem-solving, regarded an innate characteristic of children from a very early age (Thornton, 1995).

These problem-solving examples also illustrate how young children practice their agency (Marsh, 2010, 2014) over the designed interaction.

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Some apps, such as the *Lego Food* or *Bad Piggies*, allow for this type of experimentation. However, I cannot say if this *failed fun* aspect was intentional from the designers' side, or if it was an aspect overlooked in the design process. In either case, some apps appear to promote more experimental interactions, hence allowing for a higher degree of appropriation (Dourish, 2006; McCarthy & Wright, 2004b; S Papert & Harel, 1991; Pink, Horst, et al., 2015) and agency than others.

Pink et al. describe appropriation as 'the process by which people assign meaning to things, people, places and activities' (Pink, Horst, et al., 2015, p. 60). This appropriation aspect in the play category intersects with the appropriation aspect described in the design category and can be further illustrated through one more example, this time when children played with a *Toca Tailor* app. In this app, children can design and dress the character in different clothes. Lengths and widths can be changed in the designs with easy swipes along the edges of the clothes.

In one instance, a child, instead of focusing on dressing the character, focused instead on creating patterns through a combination of available suggested clothes details (see Fig. 11). The child ignored the character's expressions, the indication of the season through the window (winter) or any other available interaction and focused on digitally drawing with the given patterns. While he played with it, I asked if he preferred to draw with a pencil or a finger, he replied that it did not matter, that they were the same. As figure 11 shows, this child did not care about the positioning of the device. So even though the app had a vertical orientation, the child ignored that in favour of adopting his own approach. In this case, the child appropriated the game by focusing on drawing and

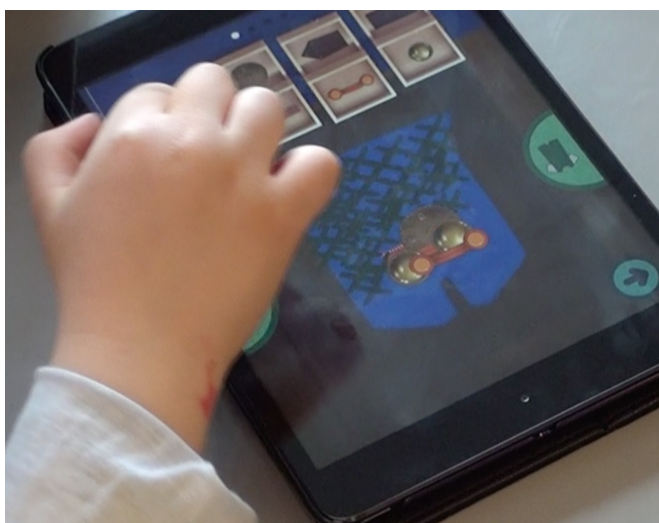


Figure 11: Creating patterns on a piece of clothing

creating patterns, overruling the core narrative and even ignoring the character. Whereas in the design category, children appropriate icons, either by entering the role-playing and identifying themselves with a character or by a sense of ownership when acknowledging that they know or have the app. In the play category, this appropriation is linked to overruling, creating or transforming a game narrative based on their play.

When asked what they liked about tablets, children from both Denmark and Japan repeated in their own languages the same short sentence ‘it is fun’. I did not engage them in further conversation to extract why they considered tablet playing as fun. Instead, I only coded it and incorporated it in the play category as one of its aspects. There can be several reasons why each child recognises this type of play as fun. However, in the context of this research, fun, as a common thread, links to motivation, wanting to use the device; and an expectation that using the tablet will be an enjoyable activity. I would not go as far as saying that these aspects related to fun necessarily cross all current activities involving tablet devices, as I can only make an assessment based on my own research setup, which focused on play. However, regarding play, the fun aspect identified agrees with Sutton-Smiths acknowledgement that twentieth-century children identify play as pleasure, friends, voluntariness (Sutton-Smith, 2001). I complement that by saying that twentieth-first-century young children recognise tablet play in similar terms. However, I would not necessarily stretch this aspect to cover future uses of digital devices just yet. As children grow and devices become necessities with other types of functionalities, not all interactions might be considered fun. At the same time, these future interactions might be associated with playful memories of fun moments, leading back to early tablet experiences and nostalgia.

An outcome of this explorative mode of playing characterised by few expectations and problem-solving leads to yet another valuable characteristic of young children’s digital play: engagement. By offering multiple contexts through several apps and stories, and having no fixed narrative, tablets allow for exploration in various modes and through fast alternations. Children enjoyed these characteristics during the observations,

as they did not appear to get frustrated when the interaction did not succeed. For example, if icons failed to move, if controlling the icon was too difficult or it was not clear how to interact, etc. Instead, children either discontinued that activity to choose another app to play with or simply engaged in trying some more. When they quit the *unsuccessful* app for another one, sometimes they would return to the *unsuccessful* app to try it again. However, none of the observed children appeared to get frustrated with the device. With a tablet loaded with apps, it was the equivalent of children finding themselves in a room full of toys. You can become tired of one toy and choose another one, but you will not necessarily leave the room; hence the engagement with the device.

Beyond the socio-cultural narratives permeating young children's perceptions of digital devices, children's experiences with tablets show that their play expectations go beyond some of the design characteristics currently found on apps. This expectation was visible when children tried interacting with non-interactive images or loading icons, creating their own play narrative by imposing their tastes and logic, and using the backward or forward arrows to continue playing. Through these play practices, where expectations lead to open experimentation such as trying to tap on any image available, browsing through the device, doodling by moving app icons around, 'taking him there', etc., children acquire perceptions of digital spaces. Notions of active and non-active areas and symbols, digital geographies emerging from content (as in the case of full areas inside apps), as well as content creating geographies (such as adding pages by dragging apps to this extra space beyond the screen) are negotiated and create a thirdspace (Gaines, 2006). The narrativised semiotic system (Marsh, 2014) is formed in this thirdspace, where children move through roles, rules and signs that are contextualised through their play (polysemous experiences, as described in the literature review).

These polysemous experiences shaped by play practices also converge into one overarching perception of the tablet object as a toy. Tablets offer a wide range of play modes that match a wide range of interests, children can hear stories, take pictures, colour, draw, solve puzzles, move cars,

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trucks, boats and trains; each with its own types of rules and interaction. The tablet could be compared to a room full of toys spread around, and children seem to enjoy this multi-aspect. The variety of play options within one toy is also perceived as an advantage by some parents. For example, in an informal conversation with one child's parent, she mentioned that they (a couple) preferred tablet games, as space in city apartments can be an issue, and the tablet provided the *same* experience of various toys without 'filling up' a room. It was also mentioned that 'old' apps could be deleted and new ones downloaded as kids grow with much less hassle and avoiding the time used in selecting which toys to give away.



Figure 12 and Figure 13: Playing with the map in the Chuggington app.

App narratives differ in various ways, as some have rewards for an *expected interaction*, and no or little reward for any other unexpected interaction (*Lego*, *Gocco* and *Yogome* apps); others have no clear path (*Toca Boca* apps). Based on the observations, young children who had not previously played with the apps available did not necessarily decode the designed narratives, rewards and what they were expected to do at first. Their play followed their interests and it did not focus on successful *missions*. Instead, their play focused on having fun and entertaining interactions. They also creatively explored the possibilities in the apps and

the devices (even minimal hacks, such as using the back button to re-play an interesting level instead of following the app's design flow). However, the children who appeared to have experience of playing on tablets were quick to identify basic narratives such as follow a path, get rewards, beat the *bad guy*, follow a mission, etc. As children played, they also decoded narratives, sometimes choosing to follow them, sometimes prioritising fun instead of the app's goal. The knowledge of these game narratives indicates a degree of game literacy (Gee, 2003), as described in the theoretical chapter. The child was capable of decoding, interacting with the physical and digital interfaces, and understanding the semiotic domain, its icons, narratives and modes. Beyond decoding and understanding, young children appeared to reflect and challenge given designs while problem-solving the interaction by exploring and experimenting with the designed narratives, as in the case of the *Chuggington* app. When playing with this app, children who had chosen the app because they recognised the character (as said aloud), explored the map by dragging it around instead of following the mission requested. Even though arrows indicated directions on the tracks, children frequently ignored the designed suggestions and just played by dragging the map and/or the character around (see Fig. 12 and Fig. 13).

Another example illustrating game literacy occurred when children talked about what they had to do in a certain app, as described earlier in the *Lego* apps. When saying they had to take 'him there', they had identified the goal of that mission, acknowledging who were the active actors: they, the children as the ones doing the action; the character, in this case the rescue boat, which is what can be moved; and 'there' representing the other character that needs to be rescued to complete the mission. In this example, children appear to have a clear map of the digital narrative together with their own role in it. This example also illustrates how tablets bridge realities through rich universes where children engage, explore, recognise and expand a wide range of symbols and narratives, agreeing with similar perceptions described by a number of scholars (Fleer, 2014; Marsh, 2010; Sicart, 2014). The *there* and the *here* co-exist and belong to the same playground, where digital and non-digital spaces compose multi-

layered and multimodal experiences. All these experiences are culturally bound and shape tablets as an object to play with – a toy.

The play category covers interactions with tablets that fit and complement play related theories. This category intersects with the other categories within the *toyblet* taxonomy. As videogames redefined play in the eighties, tablets are redefining play in the twenty-first-century. Instead of cartridges, we have a digital library and stores or one console carrying an almost infinite amount of play choices. The tablet as a console affords play as play might have afforded the tablet console (S. Johnson, 2016)²⁷.

Interaction

Interaction: refers to how physical interactions with tablets develop an embodied knowledge, which is performed through the hands. It takes into consideration some of the physical and digital affordances of current devices, while also acknowledging how digital and physical symbolisms, narratives and actions compose the tablet as a material.

Theoretical codes: hand knowledge, exploration, familiarity, privacy, fun, multimodality, literacies and engagement.

The interaction category is composed of seven codes. They all intersect in dealing with physical and tangible aspects of digital exploration. Using digital devices is the only way of learning the tangible and tactile interaction they afford – how much pressure, how much movement is needed to swipe, where and when to tap on icons, etc. If a child has never played with

²⁷ Following the thought that culture emerges from play (Huizinga, 1949), and as technological developments are contextually and culturally bound, we could infer that it was playing with possibilities and tech scenarios that led to our current technologies. This perception has been recently addressed by Johnson in his book *Wonderland* (2016). Still aligned with this thought, in 2005, together with Andreas Brøgger, I co-designed and co-taught a course entitled ‘the culture of play’ for Copenhagen University (KUA), where we presented and debated this idea of how play had been the key component in technology development and our current playful culture. I have further developed this course and taught it twice more since then, both at KUA and in Mexico.

a touch-sensitive device, he/she will only learn it by playing on one. Tablet play could be compared to puzzle interaction – every first interaction with a device or an unknown app represents an imageless puzzle to solve. Furthermore, children between the ages of four to seven years old do not necessarily refrain from trying and experimenting, turning the puzzles into desirable obstacles. Therefore, this type of interaction pushes these children into an early trial and error scenario, leading to a steep learning curve with these devices. Regarding problem-solving, one could say that even deciding which app to play with is the first problem (of choice) to be solved.

Watching others is not sufficient to learn the actual tangible interactions. In spite of this, with some guidance and a good amount of practice, the tactile interactions are quickly learned. These aspects formed the hand knowledge and multimodality codes as hands play a major role when young children play with tablets. These codes also intertwine with familiarity, privacy, fun and literacies codes as the hand knowledge affects the sense of fun and the familiar, notions of ownership and ways of learning. For example, after children had chosen which device to use, their hands hesitated before swiping and they seemed unsure about their actions. Those devices were unfamiliar, not the ones they knew from previous tablet encounters, and children were aware that these devices were not their parents' or siblings' devices. So even though several children were acquainted with the technologies, the context and the experience were not *familiar* and this aspect appeared to affect how they initially approached and interacted with the devices.

As described earlier, digital literacy scholars identify the role of the use in the processes related to acquiring and developing knowledge with digital technologies (Sefton-Green et al., 2016). Consequently acknowledging the communication and relationship emerging from the interactions with digital technologies becomes a valuable aspect of defining digital literacy and related practices. Furthermore, the ways in which children communicate with digital devices also affects how they engage with and explore the possibilities within both online digital narratives and offline

play. This exploratory aspect allows for discoveries and aligns with the narrativised semiotic system, where online and offline experiences mingle, composing young children's play experiences (Marsh, 2014). All these aspects, which shape the interaction category, are presented in more detail in the following paragraphs.

Throughout the observations, some actions became more constant than others, and during the transcription time, I developed a typology of these actions (presented earlier in my second chapter). This process aided me in the transcriptions and analysis as I could better define and transcribe the actions children executed while playing on the devices. This typology also aided me in defining some of the communication the hands executed while interacting with the devices.

One early aspect noted during the observations was that children learn their interactions while using the devices (Dewey, 1916; Schön, 1987). Some children were very skilled and used both hands in the interaction, while others who had little or no experience with similar devices mostly used only one hand. Despite the context of the observations and that the children had not tried those devices or some of the apps before, children's initial interactions adapted and frequently improved during the play. The digital language the device contains in its operating system dictates and shapes the physical interactions to be learned. Children were quick when trying and learning them. However, it was clear that children who had more practice with similar devices had a better *feel* or better 'knowledge in the hands' (Merleau-Ponty, 2002).

Some children struggled with basic swiping, others kept exchanging fingers when the initial tapping did not work, and they also struggled with tilting, convergent and divergent dragging. These basic movements, which tend to be overlooked and are popularly assumed to be intuitive (Clarke & Svanaes, 2014; Connell et al., 2015), were clearly not *given*, and instead children learned while they practised, sometimes also requesting help by asking how to do this or that action. Based on these observed practises, I encourage avoiding using terms such as intuitive when describing

tablet digital interfaces. Children are masters of mimicking as part of their development. It is then not surprising that children also imitate the actions they see others doing when using touch-sensitive devices, such as smartphones and tablets. Therefore, when young children are presented with these devices, they are able to repeat some of these actions, although they have not necessarily acquired the subtleties required for successful interactions. Through trial and error, children develop this *feel* and become more proficient users.

The proficiency is achieved through the embodiment of the knowledge being acquired and developed by the interactions in themselves, or the ‘weaving’ (Ingold, 1994, 2009, 2013). The ‘weaving’, as the phenomenon, represents the process of learning the material through working and experimenting with the material. This phenomenon occurs through the exchanges taking place between the child, the social and play narratives, and the physical device, which are the main actors in this specific interaction. The role of embodiment in the communication exchange between these actors is what shapes what I am proposing as digital penmanship.

Digital penmanship is the tactile skill and knowledge (acquired through the digits) that emerges and develops through the interactions with touch-sensitive digital devices.

This concept suggests the vital importance of the body in young children’s communication with digital devices. Furthermore, digital penmanship adds a valuable aspect to digital literacy studies. This embodied knowledge is a communication not only between the child and device but also a type of language young children *read* and recognise in each other while playing together or watching others play. These aspects became apparent when observing children playing in groups. Sometimes they would play together or interfere with the playing, during or right before an action was about to take place. By recognising the other’s intentions, some children would collaborate or disrupt the play orally or through an action, such as tapping on the device before the other child.

It is valuable to consider the role of the child, narrative and artefacts

when talking about the embodiment of knowledge through playing with digital devices. In the event of tablet play, the child engages as a player, bringing his/her knowledge of play, characters and rules to the play experience. This background aids in making the child curious and motivated towards exploring a novel and pervasive object. The artefact is composed of the object itself, plus symbolisms, rules and narratives composing the digital as the material of the ‘weaving’ (Ingold, 2009) or the ‘crafting’ (Dourish, 2016; Pink et al., 2016). This ‘crafting’ occurs in layers due to the affordances of the digital as material. Moreover, the modes of interaction allow for exploration of the device with both hands, without the child having to prioritise one hand as is the case with writing. As in typing or playing an instrument, tablets (and other touch-sensitive interfaces) afford ambidextrous interactions. These artefact affordances relate to narratives, modes of use (multimodality) and literacies described in the following.

The first digital tablet affordance deals with the device carrying a range of varied activities offering combined or distinct modes of interaction such as touch, voice, and sounds in one portable device without necessarily requiring complimentary pieces. Some games offer physical counterparts that boost your performance when playing on a tablet i.e. in the case of *Angry Birds* and *Fruit Ninja*, where you can buy a physical toy and put it on top of the tablet interface so it boots the player’s attacks, making them more powerful. It can be argued that multimodal platforms where one can play many games have existed in mobile and physical formats before, such as those where one can play chess, ludo, checkers, etc. However, they were not digital, and the actual board is dependent on other physical pieces in order to be used as a play platform.

A second digital tablet affordance regards multiple recognised icons and brands in one device compared with physical toys that carry a maximum of a couple of brands, such as *Lego*, which associates its bricks with other famous franchises – *Ninjago*, *Harry Potter*, *Star Wars*, etc. Other portable digital toys and consoles present similar affordances such as *Nintendo DS*, although due to the app market comprising a wide range of apps at

competitive prices, tablets have a clear advantage compared with other digital toys. These brands, many familiar from children's offline contexts, were quickly recognised and widely chosen by the children when glancing at the devices during the observations. Accordingly, I suggest that brand recognition in a digital environment transforms this environment into a familiar and fun space.

A third digital tablet affordance relates to physical characteristics. Tablets are portable devices that can be carried everywhere, they fit in small bags and backpacks and children carry them around on the go. When playing, they hold the device and it is often kept close to their body. The child *sits still* while playing and this quiet behaviour can fit in various situations, from planes to cafés. Whereas other play activities can be loud and erratic, digital play can be quieter and less chaotic than other types of play, but that very much depends on the activities being used on the device, as some apps can equally promote wandering and physical motion. In both cases, children are engaging in thinking, learning narratives, symbols, etc. and developing their digital penmanship.

A fourth digital tablet affordance relates to distinct semiotic notions of icons and signs having distinct symbolic attributes – for example digital spaces in the concept of adding extra *pages* by dragging an icon to the side of the screen, creating locations for easy access to distinct types of games, videos, apps and content, or moving a device to move digital interfaces (although this aspect is not inherent of tablets, as they have existed for a long time in a variety of interfaces, from game consoles to a desktop mouse). Another example relates to iconography, the symbols gaining specific connotations and meanings, as in the case of faded icons or *locks* to show they are not available. Tablets (together with smartphones) are popularising these features among young children.

A fifth digital tablet affordance can be divided into three aspects, all related to narratives. The first aspect deals with how the device offers a variety of game narratives related to the content option or the types and amount of apps available; the second aspect relates to the meta focus

of the narratives while the child plays –dealing with the overarching play experience – the third aspect relates to the internal processes of the child making sense of his/her play through the device and app narratives with which he/she engages.

These affordances point towards how young children’s digital play practices are ‘heterogeneous engineering’ (Law, 1992), where social, technology, conceptual and textual aspects shape the play (Law, 1992; Medina & Wohlwen, 2014; Sicart, 2014). Taking into consideration the development of digital penmanship, kinaesthetic components complement this ‘heterogeneous engineering’, such as the tactile embodied knowledge enacted by the hands. In sum, a large number of ‘actors’ are combined into another product, in this case, the digital play experience.

The interaction category exposes how physical and digital aspects intertwine in the actions of young children playing with tablets. These actions are interdependent of current tablet affordances. The digital as a material allows for exploration and manipulation. In this category, I have highlighted how the hands learn how to interact by acting on the device. This interaction then shapes the ways the hands act. Through practice, the hands not only learn the feel of digital interaction, they also embody it and create a vocabulary of intentionality. Other hands share this vocabulary knowledge and they communicate the play to their peers while in a group, or even from a distance. In silence, the hands speak.

Digital penmanship composes, together with other actions, the multimodal interactions occurring in children’s digital play. With use, this penmanship turns into a familiar performance with the artefact, shaping the physical and social interactions witnessed in tablet play practices.

Attachment

Attachment: refers to the relational aspects emerging and manifested through the play practices of young children. It also expands into how these physical interactions possibly overflow into personal narratives

shaping one's history.

Theoretical codes: language, branding, identity/digital narratives, familiarity, ownership, agency, cultural aspects.

The last category in the taxonomy refers to attachment, or the relational aspects, which might influence the development of a range of emotions related to tablet devices. In its definition from Collins Dictionary attachment implies relational behaviour between someone and something (or someone else), and little is attributed to the term beyond the relational behaviour. In the case of tablets, it can be argued that there may be an attachment being developed through a digital experience afforded by playing with the device, e.g. customisation of how things are displayed and assessed; which apps are installed; as well as a sense of comfort related to a habit of using the device in specific environments or situations (trips, pastimes, holidays, etc.).

This category is composed of seven theoretical codes. These codes interconnect and blur into the play practices of young children, fostering emotional connections (Fleer, 2014; K Roskos & Christie, 2011). When playing, young children engage with objects and stories composing personal narratives. The play experience shapes how these narratives unfold resonating with emotional values. Again, the concept of appropriation strikes a chord in this category, as it can be linked to the aspect of assigning a meaning to an activity or an object (Pink, Horst, et al., 2015). By playing with tablets, children link their experience to contexts, people and moments, assigning special memories and fostering attachments. So how play is described, how specific images and brands permeate the digital play experiences and how cultural aspects help towards framing this play congregate in the attachment category. Attachment is not necessarily directly visually informed as with other categories. Instead, attachment is an intangible concept and emerges from individual mental and physical processes. I suggest this category based on the analysis of the children's actions together with some of the words children uttered during the observations. I combine these empirical aspects with theories that help

build the argument for the attachment term.

As described earlier, the experience of tablet play is heterogeneous, shaped by a number of actors composing it as a final product. This play experience then weaves itself into personal narratives, cultural perspectives and social history. The ways the apps are displayed and organised in each device also shape a type of narrative. By downloading and organising the apps' locations and creating distinct areas in each device, users dictate some of the interaction and most of that device geography. Each collection of apps creates a mosaic and a visual map (or in this case it could be called *m'app*) of the device with its distinct geographies. Customising touch-sensitive devices such as mobile phones and tablets has become common practice due to the manipulative characteristic they afford, where users can drag icons around and place them into chosen areas marking the devices as *their own*. Tablet play creates notions of digital space and environments defining emerging territories in children's playgrounds. These territories are marked by distinct aspects, which are common in digital landscapes, such as multimodal apps (Gillen et al., 2010; Liestøl, 2007; Weber & Dixon, 2010; Yamada-Rice, 2013) populating areas on the device, together with device affordances to change these landscapes by combining apps into groups or folders, or moving apps into other *spaces* on the device.

Although spatial aspects might not gain much attention during everyday uses of digital devices, when researching young children's play with tablets, the semiotics of space (Gaines, 2006) became apparent. Children negotiated signs and contexts creating their own thirdspace (ibid.). Notions of digital play (Plowman & Stephen, 2014; Verenikina & Kervin, 2011), combined with apps and devices' ability to create *areas* on demand, promote the development of a spatial semiotic knowledge. By customising a device, children engage in visual storytelling, where their preferences and imagery are depicted through the ways the apps might be organised. This visual story weaves itself in a child's own history. The tablet as a twenty-first-century toy becomes a reference to personal imaginaries (Fleer, 2014). Children, as they grow, carry with them these imaginaries and visual memories attached to the device. The familiarity code in this

attachment category carries two (or more) connotations. The first relates to the familiar as an activity experienced with family members and relatives; the second relates to the object as known and recognised, carrying symbols that are also known and recognised, producing future nostalgia. These characteristics emerged through children's actions, e.g. looking for known apps or even choosing first the device they knew, and in their responses when asked when they played with similar devices. To this question, children replied by mentioning sometimes locations (at home, in the car) and sometimes contexts (while parents cook, on holidays).

The customisation also plays a role in the attachment. One invests time when customising a device by creating territories and recognised spaces. This investment is also observed in relationships with other toys or experiences, such as building an area for play and having that area dismantled. Another example would be failing to save a game after reaching some levels when playing a videogame. These cases do not necessarily lead to great frustration, however, momentarily, there is a sense of disappointment due to the individual investment. The tablet, emerging as a toy from the personal, social and contextual interrelations in children's lives (Bodrova & Leong, 2015; Sicart, 2014; Sutton-Smith, 1986), becomes more than a pastime. As a toy and through children's imaginaries while in play, tablets become a symbol in themselves, carrying a greater number of symbolisms through their interfaces with many games and playgrounds within a playground. When identifying oneself with a character ('it's me') or acknowledging one's role in the play ('I have to make ice cream for the people', 'I have to take him there'), children blend layers of reality and imagination, as in role-playing or performance. By physically acting in reality through their hands, children negotiate and blur real and abstract levels in their digital play (Fleer, 2014).

I would argue that the more one plays, the more symbolic value the object gains as more experiences and memories are created with and through it. Furthermore, I believe that by self-referencing, the child develops a sense of unity and involvement between him/her and the digital experience. All these aspects inform the identity, familiarity and ownership

theoretical codes and are consequently linked to the attachment category. Besides, tablet symbols, brands and narratives extrapolate into other forms of play or in conversations that play a role in children's social exchanges with peers, siblings, etc. The social aspect is then noteworthy, considering tablets' pervasiveness in society and how apps' symbolisms and characters populate, besides conversations, other types of social exchanges by being present in clothing and other physical toys, as in the current cases of *Lego* and *Minecraft*.

One other social aspect composing the attachment category refers to the concept of companionship. The idea of with whom (if anyone) children play is embedded in the agency theoretical code. Many of the children mentioned playing with the tablet on their own, while some mentioned sometimes playing with parents or siblings. When playing and engaging with characters, missions and a range of narratives, children role-play in the same way as when creating stories and scenarios for their teddy bears or other emotional rich objects. As pointed out by Fleer (2014) when discussing Leontiev's work on play, while in play, objects are invested with a range of emotions and feelings, and I argue that the same is true for tablet play. As children play with tablets while alone, tablets, like other toys, can become a companion.

An additional aspect of the attachment category refers to a sense of ownership related to a physical characteristic when using tablets (and other types of touch-sensitive devices such as mobile phones). Due to the device's touch dependency, tablets are kept within reach. Children keep the devices close to their bodies, sometimes keeping them between both hands (even when the device is on a surface, as during the observations). This position allows for the use of both hands, but it also indicates a territorial marking as one's own, between one's arms. Children demarked their digital play by embracing the device when wanting to play alone; or opened their *guard* by removing one hand or positioning the device between them and a peer when wanting to play together.

The combination of the characteristics presented here shape the

attachment category in the taxonomy. Nevertheless, further research would be needed in order to inform the intensity of the attachment, or even if and how the attachment manifests itself in later life experiences.

Summary

I have proposed the *toyblet* taxonomy as a way to condense the final theoretical codes, and also to offer a structured angle when studying young children's play practices. In the process of interconnecting the theoretical codes, I repeatedly reviewed the findings and achieved clearer themes. The taxonomy synthesises while also expands the findings, trying to avoid disconnection from the empirical to the theoretical. In sum, the *toyblet* taxonomy covers the key aspects encountered in my empirical data on young children's play practices: vocabulary, design, play, interaction and attachment. Each category can be used alone, and as such can become a single focus of future studies. In the following, I summarise the taxonomy categories unfolded above and then propose how they could be further interlinked to advance my argument:

Vocabulary: refers to the verbal, physical and semiotic vocabulary being shaped and developed through tablet play.

Design: refers to interface aspects encountered in tablets that dictate or inform how to interact with the device. It also covers some of the current design limitations in existing platforms.

Play: refers to how tablets have entered and become a dynamic playground and how they evolve from device to toy, promoting playfulness and experimentation through children's play practices.

Interaction: refers to how physical interactions with tablets develop an embodied knowledge, which is performed through the hands. It takes into consideration some of the physical and digital affordances of current devices, while also acknowledging how digital and physical symbolisms, narratives and actions compose the tablet as a material.

Attachment: refers to the relational aspects emerging and manifested through the play practices of young children. It also expands into how these physical interactions possibly overflow into personal narratives shaping one's history.

Intertwining the taxonomy categories

It is noteworthy that one tablet event can intersect many of the taxonomy categories, but the categories offer distinct foci for the analysis. Firstly, a valuable aspect to consider during children's play with tablets refers to the lack of frustration due to little expectation regarding the interaction. This aspect intertwines the categories of attachment, design and play. As not necessarily seen in other activities, tablets tend to always respond in some way, you tap, an app opens, or you swipe, you change the icons, etc. The only moments when interactions are flawed happen during delays between an action and a reaction on the device or the loading screens, where often there is an icon, although it is not necessarily interactive. As one of the children mentioned, saying she did not like it when the device 'teased' her. So the low expectation regarding which types of responses there will be might offer a high threshold for frustration. Having this attribute combined with the amount and variety of activities available per device might offer a higher opportunity for longer engagement periods with a tablet device.

Secondly, another aspect observed that intertwines the play, design and interaction categories relates to how children played with digital tablets in various ways, e.g. by using some of the apps available as well as sometimes just moving apps around to re-organise the play space. This customisation of the space relates to other known play practices, for example when playing with physical toys, children start by setting up the play, organising bricks before building something, as with *Lego* bricks; building a *house* before playing doll, marking the goal spaces for football, etc. Digital devices offer a similar capability, although children might not initially set up this play space if they do not own a device, instead, a parent or older

sibling might set up this space. Nevertheless, it is not uncommon to have a *child's area* on shared devices. In these *owned* areas, children then have the agency to move around *their* apps and create their digital playground, and this aspect was also coded as exploration and hand knowledge. The action of choosing or moving a certain toy/activity shows something about the children's intentions and will, and it is part of the larger hand vocabulary. Even though I could not always hear the actual thinking behind the action (unless in situations where the child spoke aloud while interacting with the devices), I could code the actions as they were. Following a child's gaze and hands over an interface with multiple choices guided me towards solving the hand communication puzzle and aided me towards seeing the thinking behind the action.

Thirdly, as apps populate digital spaces, children create spatial maps of them, learning their location and thus become comfortable navigating this digital geography. This aspect intersects the vocabulary, design, play and attachment categories. Being able to own/create a space appeared to be a valued aspect when children used the devices. On the first interaction, they were *lost* – not knowing what was available or where it was located. However, after encountering desirable apps – and children were excellent at identifying at first glance which apps were children's apps – they learned their way and appeared to create a visual map of that device. With the map in place, the space for experimentation began, and children then took control of the device and played the role of *master* by being able to explore and customise their play spaces. This spatial recognition was observed as children both got in and out of apps (going back to a previous app and knowing where it was) whereas some children dragged apps icons around as if doodling with app icons, and when they navigated within apps' own stories and activities.

Chapter overview

This analysis and discussion chapter has unfolded the findings in order to further dissect the empirical data while also leveraging them. This

Analysis & Discussion

chapter has presented my coding method by revealing the thinking behind my synthesising process. Through the analysis, I have discussed terms and categories aligning with aspects introduced in the literature review chapter. I have also introduced and grounded the aspects supporting my theoretical contribution, which follows in the next chapter. Lastly, I have added to my discussion by providing some examples of how the taxonomy categories intertwine and provide further insights.

'The sign is used to transmit information; to say or to indicate a thing that someone knows and wants others to know as well.'

Eco (The Sign, 1971)

FROM CATEGORIES TO CONCEPTS

At the end of the literature review chapter, I highlighted some of the questions that had emerged during this research: the role of the experience and the physical interaction informing young children's digital literacies; the breadth of characteristics defining what it is to be digitally literate as a young child; and which current aspects of digital literacies definitions are witnessed during young children's playful interactions with tablets.

The questions served as guiding lights towards expanding, analysing and discussing my data. The questions also led me to identify how my results could supplement existing theories. In order to answer these questions, besides the proposed taxonomy, my contribution lies in proposing a couple of concepts, digital penmanship and multimodal hyper-intertextuality, that shape a final overarching theme, which is the title of this monograph, playful literacy. This brief chapter is an extension of my analysis and discussion. Here, I discuss the concept of digital penmanship introduced earlier and explain how it relates to existing theories. I also propose and discuss the concepts of multimodal hyper-intertextuality and playful literacy.

Digital penmanship

I have previously defined digital penmanship as the tactile skill and knowledge (being acquired through the digits) that emerges and develops through interactions with touch-sensitive digital devices.

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Children's interactions with digital devices happen through physical actions. Hands are the tools of exploration. Through a range of movements and distinct feels, hands inform intentions and learn about responses. This hand-eye-device process teaches the child about digital subtleties apprehended by the fingers. This process is individually coded into hands' knowledge and develops in a continuum of use.

The concept of digital penmanship builds on existing perceptions of how technology is intertwined with tactile experiences (McCarthy & Wright, 2004; Dourish, 2006; Papert & Harel, 1991; Pink et al., 2015). Digital devices as the artefacts afford the creation of an embodied user-knowledge while being manipulated²⁸. This knowledge and its experience are the products of manipulating the artefact.

Digital penmanship addresses the questions related to the role of the experience and the physical interaction informing young children's digital literacies. It highlights the role of the body as the main tool for communicating and composing the digital play experience. This penmanship is acquired and developed through physical interaction, becoming an embodied knowledge obtained through the actual interaction experience with the artefact (Dourish, 2016; Pink et al., 2016). By playing with tablets, children engage in this artefact manipulation, apprehending and challenging its affordances *at their fingertips*.

Insofar as recent related studies have not necessarily focused their attention on the major role of the hands in children's digital play, my suggested concept fills this gap by addressing this embodied learning as a vital part of young children's digital literacy practices. The hands perform and inform some of the learning occurring through tablet (and other touch-sensitive) devices.

28 The term manipulate should be understood here as controlling something with the hands.

Multimodal hyper-intertextuality

Tablets, i.e. versatile toys with diverse modes of play and topics of interest, fit in with children's curiosity and pace. As different apps are available on one device, and more apps can be downloaded through the devices' digital stores, tablets can be described as unique multipurpose and heterogeneous toys that blend physical and digital play experiences. These playful exchanges between the digital and physical, online and offline realms aid the development of a 'narrativised semiotic system' (Marsh, 2014), and expand the concept of 'intertextuality' (Fiske, 1987; Marsh, 2014; Marshall, 2002; Ong, 1998). Intertextuality was defined by Fiske (1987) as:

'Any one text is necessarily read in relationship to others and that a range of textual knowledges is brought to bear upon it. These relationships do not take the form of specific allusions from one text to another and there is no need for readers to be familiar with specific or the same texts to read intertextually. Intertextuality exists rather in the space between texts.' (1987, p. 108)

This definition of intertextuality can be stretched to delineate the ways in which a variety of current media interrelate, shaping the later concept of transmedia intertextuality (Kinder, 1993; Marsh, 2014; Marshall, 2002), when characters or stories converge throughout various media, creating a transmedia intertextual narrative. In the case of digital devices, such as tablets, these narratives are multimodal (Sefton-Green et al, 2016) and are composed of various actors, shaping the 'sociology of association' (Latour, 2005, p. 9). The narrative from one medium intertwines with the use of the next medium, such as read the story, play the game, watch the movie, etc. In tablets, this type of play narrative can occur from within one app, where a child can listen to the story while playing a game with one of the characters, followed by a small video, which can then lead to another activity that relates to the previous one through iconography, genre and/or sound.

The notion of intertextuality is closely connected to ‘hypertext’, ‘hypermedia’ and ‘hyper-intertextuality’ theories. Hypertext (Nelson, 1965) has been described as a reference to distinct pieces of textual information connected by links and not a linear path as in traditional books, that is, texts branching out to other texts or sources, creating a non-linear narrative. Hypermedia (Nelson, 1965) was defined as complexes of branching and responding graphics, movies and sound as well as text. More recently, hyper-intertextuality (Fox, 2001; Régard, 2015) has been suggested as the multimedia version of hypertext, very much in line with the concept of transmedia intertextuality.

Uniting the multimodal and the hyper-intertextual (or transmedia-intertextual) aspects witnessed in current digital devices, I would argue that young children’s play practices with tablet devices, besides multimodal, are also hyper-intertextual.

Thus, I propose that the concept of multimodal hyper-intertextuality refers to the wide array of media and modes of use composing the play experience with digital devices, such as tablets.

The modes include both physical and digital characteristics that build the play experience, from the role of the body (walking, sitting down, moving the device or keeping it still, using a hand or a pen), to the variety of media including video, sound, text, images of various sorts and modes (available/locked/etc.).

The multimodal material is hyper-intertextual since it not only informs activities within the apps, such as playing a game in order to get points to buy certain foods or carry out certain activities with the character, as in the case of *Talking Tom*. These characters branch into other media beyond their own apps, with YouTube videos, songs, plus being licensed for clothing and physical products.

Tablet play converges images, sounds, narratives of various sorts and

sources into a *multimodal hyper-intertextual* experience that shapes and is shaped by children's rich interactions and perceptions of their everyday life. This trend not only defines children's experiences with digital devices, it also prompts other types of interactions to follow suit, i.e. future apps and experiences catering for children in schools or museums can benefit from offering multimodal options, with various types of input and inter-complimentary activities. These modes of interaction can feed into other experiences outside or inside these institutions, creating hyper-intertextual narratives through a range of media that feed from and into one another.

Playful literacy

I propose the concept of playful literacy as a sociocultural practice that involves hyper-intertextual multimodal interaction and communication through the (playful) use of digital technologies.

In short, the concepts of digital penmanship and multimodal hyper-intertextuality compose the overarching concept of playful literacy. A congregation of actors, the interdependent and intertwined communication, and the relationship with digital devices compose the body of playful literacy practices currently witnessed.

My definition builds on the definition of digital literacy proposed by Sefton-Green et al (2016) and Gee's (2003) definition of videogame literacy. Sefton-Green et al (2016) focus on young children in their research and suggest digital literacy as 'a social practice that involves reading, writing and multimodal meaning-making through the use of a range of digital technologies' (2016, p. 15). Gee's research focusing on videogame studies suggests that game literacy involves decoding, understanding and producing meanings with respect to a semiotic domain. Throughout my observations and analysis of young children's play practices, I acknowledged that these definitions complemented each other. These play practices acquaint children with the semiotic domain composing one of the layers of the multimodal meaning making with digital technologies.

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The ‘decoding’, suggested by Gee or the ‘reading’, suggested by Sefton-Green et al., happen through interaction with the device. In my research case, the decoding deals with both the physical interaction as one of the modes shaping the digital penmanship. The other mode refers to the decoding of the semiotic domain, taking place through the multimodal hyper-intertextual experiences with the device’s physical and digital interface. In multiliteracies (Cope & Kalantzis, 2000) and related studies, learning emerges as a product of interaction with things, spaces and people or a ‘sociocultural phenomenon’ (Gee, 2015, p. 35). I suggest that in the case of young children’s tablet play, the sociocultural aspect of the learning supplements the digital literacy definition (Sefton-Green et al., 2016). In the case of my research, their definition requires slight adjustment to accommodate *sociocultural practices* instead of ‘social practices’. Although the cultural aspects are extensively considered in the Sefton-Green et al.’s (2016) full analysis of digital literacies in young children²⁹, this aspect is not obvious in their proposed definition.

In both Denmark and Japan, the aspects of ‘reading’ and ‘writing’ as suggested by Sefton-Green et al.’s (2016) definition are interpreted as decoding and producing. *Reading* relates to children decoding and interacting with digital images and spaces or “‘reading” audio-visual material’ (Livingstone, 2004, p. 1, emphasis in original); and the *writing* relates to children producing something, such as creating patterns, drawing, shaping the digital interactions. None of the terms feed directly into the idea of learning or using the *abc* per se, although a small number of children did engage with the keyboard while playing.

Consequently, writing or producing, as suggested by these scholars, can be understood as communicating. When young children interact with tablets, there are layers of interactions, and they communicate these interactions in various ways. Hands communicate intentions to the device,

29 The authors even illustrate the whole cultural consideration in their article with a model showing how all these aspects converge and inform each other (Sefton-Green et al., 2016, p. 18)

while they also communicate individual intentions to peers. Eyes, posture, movements, and sounds join hands in the communication spectrum contributing to its multimodal aspect. Children's intentions are born with these interactions, responding to the digital narratives present in the device. Therefore, before communicating their intention either through their hands or orally, children first problem-solve and decide how and what the interaction should be by *reading* or *decoding* symbols and genres encountered in the device. The interactions allow for three-way communication, from the child to the device, the device to the child, and child to other children, all through hand movements, sound, and oral and visual inputs.

In other words, digital literacy in young children includes having knowledge in the hands, knowledge of the semiotic domain encountered in digital devices, knowledge of the various modes of interaction (hand-intention typology) and how they are applicable. As this relationship emerges through play, I am suggesting it should be acknowledged as playful. Playful (digital) literacy is acquired through having fun.

In the following section, I give further insights into how these categories and proposed concepts can address current characteristics and limitations encountered in tablet design and children's tablet play. Moreover, I suggest other sets of questions that derive from my results and inform other perspectives related to children's current play practices with digital tablets.

Further perspectives

The digital-material affordances of tablets touch on other discussions related to children's literacies, such as the child as a consumer (Buckingham & Tingstad, 2010). Consumption practices are present in these digital play interactions in a number of forms. For example, how the devices are defined by a specific brand, and how characters, other toys and a universe of icons and merchandise (including digital merchandise) are exposed through digital interfaces. Some of these characters and even the devices are appropriated in children's play through personal and social narratives. Children describe their play using the names of the characters and

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sometimes even the brand of the devices. Some children also mentioned the ‘shop’, referring to the app store, and many knew the characters and some of the companies producing the apps, such as *Lego* or *TocaBoca*. Many also knew that in order to choose a certain thing within an app, they had to buy it or have enough points to exchange it. *YouTube* was also mentioned as one of the activities they engaged with – leading me to believe they are exposed to in-video advertising when watching videos through the platform. Besides, when talking with parents, they mentioned preferring low financial investment regarding apps for children and as a result, free apps were more attractive as a product, as also recently indicated in related research (J. Marsh et al., 2015). This choice of free apps leads to yet more questions regarding the level of the parents’ media literacy with regard to the business and economic models underlying ‘free’ apps. As I did not explore this aspect further during my talks and interviews with parents, I cannot make any assumptions or suggestions. However, I believe that future qualitative research should look closely into both children’s and parents’ media literacy in order to assess notions of data collection and privacy concerns related to media use, in order to map how parents tackle navigating in the digital app landscape.

Further elaborating on the use and knowledge of digital tablets as consumption-ready devices, there are gaps in understanding the models that regulate the device. These gaps include both the design processes and goals behind app development, combined with a deeper lack of understanding or acknowledgement of the business and financial models that rule this digital platform. Children are not necessarily invited to regulate or decide on such models. For example, when using a free app, children should know about the ways developers use children’s information, play modes and choices. Educational institutions are equipping themselves with digital tools, however, little attention is given to questioning further aspects of technology appropriation.

From a speculative angle, as children grow, digital penmanship can evolve to a type of media penmanship. Although I have yet to finalise this concept, media penmanship refers to the applied knowledge of media that

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is required in order to produce and communicate content. When *writing* with/through/for media, media knowledge aligned with the ‘knowledge in the hands’ can deeply affect how and what content is produced and communicated (Ingold, 2009, 2013; Merleau-Ponty, 2002; Pink et al., 2015). While classic penmanship does not affect the content of the material produced (it does aesthetically, but not necessarily the actual content or the core message of the actual text), digital and media penmanship affects how the content being produced is communicated as well as how it is acquired. It is worth noting that media penmanship is not the same as media literacy, as the penmanship refers to the acquired embodied skill of the hand to *dialogue* with the digital device, having the required amount of hand vocabulary combined with design affordances and capabilities of the device. Media penmanship could be part of the set of skills defining media literacy, as the penmanship can be understood as a skilled capacity to use media devices. However, the media penmanship concept is a much narrower concept than media literacy, since it does not address the critical understanding of media’s cultural impacts and aspects.

Further discussion of the concepts of digital and media penmanship provides yet another angle on media consumption. The multimodal aspect of tablet devices informs how apps are designed to be interdependent with the platform on which they run. One example of how a multimodal hyper-intertextual experience bridges online and offline domains involves being exposed to a specific icon at a static location, such as at home, or while on the go, picking up the portable device in order to search for related information on the app store or browser. As you click on one of the images, you are redirected to another application that will allow you to access the information, for example tapping on a video icon that will open *YouTube* and possibly redirect you to the ‘store’ app, where you can then download the app in order to see and explore the searched content in more detail.

If the information relates to a cartoon character, you might be led to a book, movie or game app and so forth. If the content searched relates to music, you could watch a video, listen to a song, and if you like it, add

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it to a playlist. Children, many in the countries where I carried out my observations, are growing up with these everyday practices. These hyper-intertextual practices where materials and objects criss-cross represent a source of continuous consumption, not necessarily of direct products, but consistently of information. This aspect opens up for further studies related to empowering youth with regard to their media use.

A number of questions arise if we expand the concepts of digital and media penmanship towards the adoption of digital devices and the content assessment in standardised testing environments currently practised at schools. By evaluating only results, the process of producing the content is lost, even though this process represents the thinking behind the result. A parallel examination example would be to provide only math results without providing any of the calculations. These production skills should be addressed together with critical thinking and media assessment, as suggested by a number of scholars (S. Livingstone 2003; Ito, M. et al. 2013; Livingstone 2008a; Buckingham 2007; Buckingham 2006, Livingstone 2004). A media-literate young person would have the penmanship skills previously described plus the knowledge of the various models behind the apps and the device required to take informed decisions regarding their digital production and use.

A final remark regarding the media and digital literacy aspects correlates with privacy concerns. Although the privacy aspect has not been among the first set of research questions raised in this study, it emerged as a valuable consideration in the research process. How can children be equipped to grasp their *digital life*? How can companies that design for children secure children's privacy? Despite the parents' mediation, tablets are still *digital informants*. While children might just be playing and learning with these devices, tablet applications collect various sorts of data from their tablet use. How does attachment affect consumption and identity building in digital realms? Learning behaviours and interests, as well as patterns from children, provide a valuable source of information, which might affect future purchases and interactions with similar devices. Thus, I propose that the privacy concept belongs to the attachment category. Nonetheless,

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the concept of children's privacy should also feature in future discussions related to digital literacy practices.

Therefore, aligning the perspectives and considerations described here with the theoretical concepts proposed earlier prompts another set of questions to be addressed in future research, such as:

- How do we apply the knowledge about playful literacy to developing valuable applications, digital platforms and spaces in the future?
- What does it mean to start school equipped with playful literacy (or the skills acquired through digital play)?
- How can we challenge future interfaces based on young children's current digital experiences?

By acknowledging children's playful literacy skills, educators, designers and developers can push the boundaries of creative materials and interactions targeting digital devices. Educators and designers could work closely together to develop a range of activities, including digital and physical activities that build on the playful literacy skills of young pupils. Scholars researching childhood can further investigate whether the hand communication extrapolates the digital platforms into other types of communication, such as when children talk to each other or play with other toys. Researchers from the field of HCI can look into how digital penmanship can be further developed through kinaesthetic communication (haptics). Artificial intelligence (AI) researchers can investigate how devices can learn to *read* the existing hand communication, allowing for further developments in aiding people with limited tactile or motor abilities.

Chapter overview

In this chapter, I have put forward the concepts for the core of my theoretical contribution, and extended my findings into perspectives beyond my initial focus. By expanding the topics presented in this thesis,

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I have illustrated and raised questions for future related applications and research. These open and final perspectives set the tone for my conclusion that immediately follows. In my conclusion, I acknowledge some of my research limitations and offer overarching perspectives on the impact of play in contemporary societies.

‘There is a knowledge shift from static knowledge to a dynamic searching paradigm.

‘In any creative endeavour you will be discomfited and that is part of learning.’

Red Burns, 1998

‘The writer’s audience is always a fiction.’

Walter Ong (Orality & Literacy, 1982)

CONCLUSION

The second *beautiful era* is here. Digital and physical materials of various weights, with *keys* of several shapes and sizes, have supplemented the sewing machines and typewriters. Through these *new materials*, young children play. While playing, children engage with a range of modes, symbols and narratives that shape a body of (embodied) knowledge.

I set out to observe young children's play practices with tablets without being clear about whether this research would lead me to cover ground previously explored. Some of my research findings, such as the fun aspect, did support existing perceptions. However, the choice of grounded theory proved to be very valuable as it opened my perspectives and led me to richer results. Through this methodology, I could see the backdrop for play (children's rich ways of interacting with digital materials) through the *magic wands* (their hands), which brought me to what I believe to be valuable insights. It also led me to refute the idea of digital interfaces as intuitive and children as natural digital masters (Clarke & Svanaes, 2014; Connell et al., 2015; Prensky, 2001). Through a lot of practice and fun, children discover, explore and learn with the digital material that is intertwined in physical devices with digital affordances. Based on these current play practices, I have proposed the concepts of digital penmanship and multimodal hyper-intertextuality, which together compose the concept of playful literacy.

Arriving at these proposed concepts was not a smooth process, and I had to delimit my process by setting a number of defining variables. Therefore, besides the considerations already presented in my methodology chapter, I acknowledge another set of limitations, which potentially

impacted my analysis and results.

The first limitation refers to having to choose which set of data would be in focus due to time constraints. Besides all the videos, I have also collected children's drawings from my sessions, and this material had to be put aside for another round of analysis. With more time, this data material could have aided my analysis and provided further insights regarding how young children understand and depict their tablet play. This material is now saved for future analysis, hopefully, to take place after this thesis is complete.

The second limitation deals with the comparative characteristic of my study. Notwithstanding the similar behaviour observed in Japan and Denmark, the country sample does not constitute sufficient data to say that the similarities are universal or occur in other countries and contexts. In order to make such a statement, this study would need to be replicated in other countries or even other cultural contexts within my countries of choice. Despite the country constraint, the methodological approach chosen allows for other researchers to replicate the study in other contexts.

The third limitation refers to my contribution impact. Although proposed concepts are substantiated by my empirical data, they do not necessarily represent a huge shift in existing childhood related studies. These concepts helped me make sense of my data by offering a frame in which to assess the ways children interact with tablets. My choice of focusing on the hands led me to become aware of something otherwise not always visible, the role of the hands in creating an embodied knowledge in children's tablet play.

Lastly, the process of filtering many hours of videos into twenty-five codes and then into five final categories prompted me to revisit each and every code with a distinct lens. This process became my own 'weaving'. While analysing and writing, I continued to ask questions and search for them in existing work. During this 'weaving', I was able to find answers and to ask further questions, besides also suggesting some concepts that composed my theoretical contribution. Another type of weaving might

have propelled me in another direction.

Despite these choices and limitations, I believe my research contributes to reconceptualising how children's digital experiences are generally perceived. By acknowledging the range of learning taking place when children play with tablets, I suggest these encounters are not based on 'intuition' or 'intuitive', but they develop based on hours of encounters and seeing similar uses of these devices from children's own social context. Additionally, children engage in consecutive trial and error scenarios when using the device, leading to rapid learning. Playing is the method, the process towards, and the product of this learning experience. Consequently, as children engage some of their hours in digital playing, they build a body of knowledge about the device, characters, narratives and symbolic meanings, together with tactile subtleties apprehended by their hands, which shape their digital penmanship.

Understanding digital devices as a new material – just as paper brought the possibility of turning an oral culture into a literate one – digital devices bring the possibility of turning literate culture into post-literate (McLuhan, 1962). When describing the electronic age, or the post-typography, early on, Walter Ong (1998) acknowledged that 'the new medium reinforces the old, but of course transforms it because it fosters a new, self-consciously informal style' (1998, pp. 135–136). This informality is afforded by the multimodal ways in which literacy can be expressed through and with the emerging media. The concept of the digital as a material allows for a multimodal range of performances, visual, sound, tactile, and written combined. This brings the possibility of communicating with a wider variety of cues than the sole literate boundaries. It allows communication to flourish into richer expressions, where hands, eyes and faces comprise one message. Hands are in the spotlight as they shape and are shaped by these devices. From a reverse perspective, sounds and visuals are hand-dependent as the hands' actions are the input keys that make the machine respond. In this post-literate culture, digital devices are the materials that catalyse communication and information into multimodal entities that shape one another. Certainly, AI personal assistants, such as *Siri* and

*Cortana*³⁰, are becoming increasingly popular, which also promote oral interaction. However, when playing with tablets, hands are still the main tools that open the doors to other modes of communication.

Interacting and playing with this digital material (Dourish, 2016; Ingold, 2009; Pink et al., 2016) is characterised by a number of valuable aspects. For example, it would be worth investigating if adults engage with digital devices (such as mobile phones and tablets) with similar motivation to that of children. Digital devices have become not only twenty-first-century children's toys but also adult toys. A significant amount of content assessment, work, socialisation, communication and entertainment all take place through playful interactions. This refers not only to the games available for these platforms, but to interaction as a whole. While doodling on the devices with our hands, swiping, dragging, or talking to our digital personal helpers, we engage in a form of play. The toy emerges out of the context of the interaction with and between people and things (Sicart, 2014), bridging reality and fiction (Fleer, 2014; Marsh, 2010; Sicart, 2014), being an agency for imagination (Sutton-Smith, 1986) and fostering emotional connections and attachments (Fleer, 2014; K Roskos & Christie, 2011) for both children as well as adults.

As *mobile* sewing machines and typewriters set a variety of standards for businesses and fashion over a hundred years ago, mobile digital devices such as mobile phones and digital tablets have entered children's lives as toys, also setting new standards. Children (and we) carry them around like pets. We attend, interact, display and stroke them. Digital materials have allowed for play to return in social and public spheres. Children (and we) engage in our current realities through play, and it 'shall not be boring'³¹.

30 Apple IOS and Windows intelligent personal assistants, respectively.

31 One of the rules for attending the dinners of the Real Time Club (<http://web.realtimeclub.co.uk/>)

Final remark:

As I conclude this thesis, I acknowledge that I answered some of the questions that emerged during these three years of research. The questions left unanswered build the body of, hopefully, a round of future investigations to generate yet more questions. As I recently read in a newspaper opinion article, ‘The question is permanent; answers are temporary. I live in the question.’(Irwin, 2016)

'The hand is the window on to the mind.'
Immanuel Kant (In Tallis' The hand, 2003)

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